Appendix D

Draft Vegetation Management Plan

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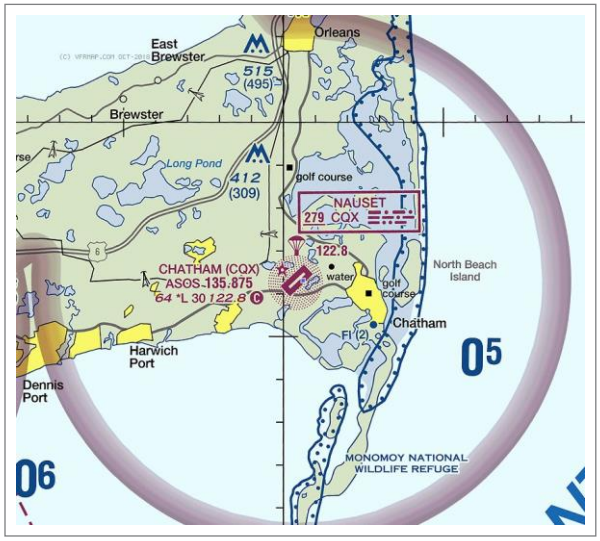
VEGETATION MANAGEMENT PLAN
CHATHAM AIRPORT, MASSACHUSETTS

Chatham Municipal Airport
240 George Ryder Road
Chatham, MA

May 2021
File No. 15.0166692.03



PREPARED FOR:
Chatham Municipal Airport
Chatham, MA

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May 5, 2021
GZA File No. 15.0166692.03

Mr. Matthew Caron
Gale Associates
15 Constitution Drive
Bedford, NH 03110

RE: Vegetation Management Plan
Chatham Municipal Airport
240 George Ryder Road
Chatham, MA

Dear Matt:

GZA GeoEnvironmental, Inc. (GZA) is pleased to submit the enclosed Vegetation Management Plan (VMP) for Chatham Municipal Airport located at 240 George Ryder Road, Chatham, MA. This VMP is in response to the 2018 review of protected zone penetrations and presents a plan to comply with Federal Aviation Administration (FAA) regulations 14 CFR Part 77.

If you have any questions, please feel free to contact Steven Riberdy at 413-237-6860 or steve.riberdy@gza.com.

Very truly yours,
GZA GeoEnvironmental, Inc.

Steven Riberdy, MS, PWS, CWB, CE
Senior Ecologist/Senior Technical Specialist

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Principal-in-Charge

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

Purpose of Document: This report sets forth a safety-mandated plan for vegetation management at Chatham Municipal Airport (FAA code KCQX, or the Airport). This VMP accounts for all protected surfaces, on- and off-airport and within or outside existing airport easements. It sets forth short- and long-term management plans for the VMP areas, which will include identification of Vegetation Management Areas (VMAs) where acquisition of easements may be necessary.

This VMP will identify wetland resources (approximating areas off Airport property, where access is currently restricted) and other environmental constraints. The VMP will: identify VMAs according to methodology for tree removal and other operational constraints that will affect vegetation management activities; evaluate alternative methods for tree removal; identify potential impacts to wetland resource areas and other natural resources; provide mitigation strategies and approaches; and provide a Yearly Operation Plan (YOP) for implementing the VMP.

Vegetation management is required of the Airport by the Federal Aviation Administration (FAA), in compliance with 14 CFR Part 77, better known as FAR Part 77 – Objects Affecting Navigable Airspace, which requires vegetation management in "protected airspace." In general, if an airport accepts funding from the FAA, the airport must then make all reasonable efforts to comply with all FAA regulations including keeping the airspace clear of obstructions–including, but not limited to vegetation. These Part 77 surfaces are determined by the FAA and are based on the type of approach available or planned for that runway which are discussed more fully below.

The VMP will address each of these concerns while identifying the immediate and long-term vegetation management needs of the airport. The VMP also depicts the vegetation management needs for three areas:

- On-airport properties;
- Off-airport properties with existing owner permission to manage vegetation for safe airspace; and
- Off-airport areas potentially requiring avigation easements for vegetation management.

Short-term and long-term vegetation management plans and a five-year YOP are presented for each of these areas in a systematic manner. The vegetation management activities of on-airport areas or areas where access easements have been established are of highest priority. Off-airport areas lacking avigation easements are of lowest priority.

Statewide Airport Vegetation Management Planning: Massachusetts' 37 public use airports are required by the Massachusetts Department of Transportation Aeronautics Division (MassDOT Aeronautics) and the Federal Aviation Administration (FAA) to maintain safe, navigable airspace. Removal of vegetative obstructions is vital to maintain aviation safety. [Note: the Massachusetts Aeronautics Commission (MAC) was reorganized as MassDOT Aeronautics in November 2009. For the remainder of this document, the current name will be used even when referring to actions taken under the former designation].

FAA regulations and standards require that airspace Protection Zones (PZ) be achieved and maintained to assure an appropriate level of safety at each airport, and to maintain eligibility for federal grant funds. The areas of Protection Zones that must be kept free from obstructions are defined by:

- FAA Regulation Part 77 (14 CFR 77);
- FAA Advisory Circular 150/5300-13 (Airport Design);

- FAA Order 6480.4 (Air Traffic Control Tower Siting Criteria); and
- MassDOT Aeronautics approved aeronautical rules and regulations for public use airports (pursuant to 702 CMR, as amended; for airports subject to MassDOT Aeronautics certification pursuant to M.G.L. c.90, Section 39B).

Additionally, to comply with FAA safety regulations and to remain eligible for federal funding of improvement projects, airports must prevent penetration of PZ by natural and man-made obstructions.

In 1992, MassDOT Aeronautics began a long-term vegetation management program to assist public-use airports in the Commonwealth in their efforts to enhance public safety and to comply fully with Federal and State laws, rules, regulations, advisories, and orders with regard to maintaining PZ free from obstructions. The initial action in MassDOT Aeronautics vegetation management program was to work with the MA Department of Environmental Protection (MA DEP) and Massachusetts Port Authority (Massport) to streamline the permit process for vegetation management in wetland resource areas. A Generic Environmental Impact Report (GEIR) for Vegetation Removal in Wetlands at Public Use Airports (EOEA #8979) was completed in 1993. The GEIR evaluated the probable environmental impacts of vegetation removal projects in wetland resources for the purpose of maintaining PZ free from vegetation obstructions at public-use airports throughout the Commonwealth. Regulations governing the limited project provision for airport vegetation removal projects in wetlands were promulgated (310 CMR 10.53 (3)(n)(1)), becoming effective January 1, 1994.

Since the completion of the GEIR, MassDOT Aeronautics and FAA have assisted in funding over 15 VMPs throughout the state at General Aviation (GA) airports, based on available funds and urgency of obstruction removal. These projects included the development of airport-specific VMPs that outline five-year plans for vegetation management, and implementation of the VMPs, including obtaining required permits for vegetation removal.

In November 1999, MassDOT Aeronautics submitted a GEIR update and Expanded Generic Environmental Notification Form (GENF) for Airport Vegetation Management to the MA Executive Office of Environmental Affairs (MEPA office). Annual status reports on the statewide airport VMPs were submitted to MEPA for the years 2000 through 2004, and a new GEIR Update and Expanded GENF for Statewide airport VMPS was submitted to MEPA, jointly with FAA and DEP, in August 2006.

The typical vegetation management process at airports follows a regular, predictable path. It starts with the comprehensive five-year capital improvement plans that are required of each airport for their capital budgeting process and must be prepared and submitted each year by each airport to be eligible for state (MassDOT Aeronautics) and federal (FAA) capital fund allocations. In each of the airports where vegetation management is a required safety measure, it is incorporated into the airport's Capital Improvement Plan (CIP) including the allocation of potential funding for conducting the vegetation management program. For airports with existing VMPs where there are proposed projects that will modify the airspace, the VMP is updated. These updates will accommodate the changes to the protected airspace, modifying the methodologies and Vegetation Management Areas (VMAs) where necessary in the VMP.

Once funding is available, the steps in the VMP process include:

1. Development of Draft VMP,
2. Public Presentation of Draft VMP and Outreach,
3. Preparation and Submittal of Notice of Intent and VMP,
4. Issuance of Orders of Conditions for VMPs that impact Wetland Resources.
5. Finalization of VMP,

6. Implementation of VMP under a continuously updated 5-Year, Yearly Operational Plan (YOP). The VMP/YOP describes and plans the following specific actions:
    a. Short-term cutting plan
    b. Long-term maintenance plan
    c. Monitoring plan, and
7. VMP Update.

At several airports, the passage of time has prompted the need to create a more comprehensive VMP that incorporates a larger area than covered under the original VMP resulting in the development of a "VMP Update". This VMP Update builds upon the original VMP, makes modifications of procedures if necessary, accommodates relevant modifications at the airport since the original VMP, and extends the VMP to off-airport areas, even if outside of the control of the airport. The incorporation of off-airport areas does not authorize any specific activities within these areas but allows for ready incorporation of these areas into future YOP activities should easements or other agreements for vegetation management be acquired.

Vegetation Management at Chatham Municipal Airport: This report sets forth the safety-mandated plan for vegetation management at the Airport. This is the first VMP developed for the Airport. As such, no related actions or permitting occurred in support of this comprehensive plan. The preparation and finalization of this VMP qualify as steps 1-5 above.

Gale Associates, Inc. (Gale) completed the identification of protection zones and performed an obstruction analysis for Chatham Airport in concurrence with the 2018 Master Plan project using photogrammetry and topographic information. Using this information, VMAs were identified and reviewed in the field for consistency and to assess potentially unusual local conditions. Removal methodologies were selected based upon the vegetation present, the landform and potential site access, and environmental and permitting constraints. The YOPs for Chatham are based upon the characterization of the VMAs, as well as safety, environmental, and financial considerations.

1.2 VEGETATION MANAGEMENT PLAN COMPONENTS

The VMP is a planning level document that outlines a strategy to be employed at the Airport for both prioritizing the removal of vegetation which currently penetrates PZs and for preventing other vegetation from penetrating PZs in the future. Specifically, the VMP identifies the following:

- **Protection Zones around the airport.** This airspace must be kept clear of obstructions to meet State and Federal aviation safety regulations.
- **Vegetative communities in the obstructed areas.** The primary communities identified at Chatham include forested uplands, scrub/shrub uplands, forested wetlands, scrub/shrub wetlands, and grasslands.
- **Vegetation Management Areas (VMAs).** VMAs are geographic areas with specific vegetation management needs based on location, topography, soils, plant species, environmental constraints, ownership, easement conditions, and other factors. Some areas are already in routine management. Other areas represent older woodland growth which has been managed only infrequently or needs new management to come into compliance.
- **Environmental resources.** These include, but are not limited to wetland resources, habitat for threatened and endangered species, and historical/archaeological resources.
- **Appropriate vegetation management techniques.** These measures are formulated by taking into consideration the vegetative communities, obstructions, and environmental constraints.

The starting point for a VMP is the identification of PZs around the airport that must be kept free of obstructions. Once the protection zones are identified, an obstruction analysis determines where vegetation currently penetrates or threatens to penetrate PZs. Areas are investigated using available topographic information, estimating existing and potential tree heights, and comparing these heights to the regulated heights of the protected surfaces. Once the areas of obstruction are identified, the vegetative communities and potential environmental constraints on vegetation management are evaluated. Based on the synthesis of this information, VMAs are developed. Some VMAs will require major work to remove woodland obstructions to move these areas to a desired vegetative growth pattern that can be maintained. Other areas are already in routine maintenance and will require less initial work. A variety of removal methods are considered for each VMA and a preferred removal method is selected.

Guiding the overall progression of a VMP are a series of YOPs covering a period of five years. YOPs provide strategies for scheduling and budgeting of vegetation management activities. Well-designed VMPs/YOPs protect aviation safety by:

- Removing naturally occurring obstructions within regulated protected airspace;
- Preventing future obstruction of protected airspace;
- Perpetuating and encouraging growth of herbaceous and low-growing vegetation;
- Minimizing adverse impacts to wetlands and wildlife habitat; and
- Minimizing adverse impacts to other sensitive resources.

Vegetation management at the Airport is designed to be a long-term practical strategy that promotes aviation and public safety while limiting impacts to environmental resources. Properly designed and executed, VMP/YOPs will both improve aviation and public safety and lessen the long-term financial burden of vegetation maintenance by providing a scheme that creates stable low-growing vegetative communities, thus eliminating continual, costly, and disruptive large-scale vegetation removal projects.

1.3 PURPOSE AND NEED FOR THE PROJECT

Removal of PZ obstructions is vital to aviation safety. FAA regulations, such as FAR Part 77, advisories, and orders delineate protection zones. To comply with FAA safety regulations and remain eligible for federal funding of improvement projects in the future, airports must prevent penetration of the protection zones by natural and man-made obstructions. In this case, some of the Airport's protection zones are currently, or have the potential to be obstructed and require management if the operational activity of the Airport is to be maintained. Chatham Municipal Airport currently does not have a formal VMP, and past VMP maintenance has been sporadic and not conducted under the formal program. To be in compliance with FAA regulations, a formal VMP must be established.

2.0 GENERAL AIRPORT INFORMATION

2.1 LOCATION OF AIPORT

Chatham Municipal Airport (KCQX) is located at 240 George Ryder Road in the Town of Chatham, Massachusetts (Figure 2-1). It is southwest of Route 6 north of State Route 28. Table 2-1 summarizes current Airport information. Chatham Municipal Airport is a public-use facility owned by the Town of Chatham and serving the outer Cape Cod area of Massachusetts. Aircraft repair, charter, rental, and hangar facilities are available. Airport access is via George Ryder Road from Route 28 or Old Queen Anne Road from Route 6.

0 1,000 2,000 4,000

SCALE IN FEET

CHATHAM AIRPORT VMP
CHATHAM, MA

LOCUS MAP

PREPARED BY:

GZA GeoEnvironmental, Inc.
Engineers and Scientists
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PREPARED FOR:

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163 LIBBEY PARKWAY
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIG
DESIGNED BY: ARD	DRAWN BY: ARD	SCALE: 1 in = 2,000 ft	**2-1**
DATE: 01/18/2021	PROJECT NO: 15.0166692.03	REVISION NO:	

2.2 CLASSIFICATION OF AIRPORT

Chatham Municipal Airport is listed in the Massachusetts Statewide Airport's System Plan as a General Aviation, municipally owned, public use airport under the FAA National Plan of Integrated Airport Systems (NPIAS). The FAA uses an Airport Reference Code (ARC) to determine guidelines for airport planning and design. Two components are used to determine an airport's ARC:

1. The aircraft approach category (depicted by the letters A through E); and
2. The airplane design group (depicted by roman numerals I through V).

The approach category refers to the aircraft approach speed, and the design group refers to the aircraft wingspan. The critical or design aircraft is defined as the most demanding aircraft that operates at the airport on a regular basis. Based on the Chatham Municipal Airport Master Plan Update completed in January 2021, the Airport's design aircraft was identified as the Beech Baron B-58, classifying CQX as a B-I facility.

2.3 OPERATIONAL DESCRIPTION

The Airport has one paved runway: Runway 6-24, which is 3,001 feet long by 100 feet wide, marked as basic, and served by medium intensity runway lights and a two-light PAPI on each runway end. Runway 6-24 was last reconstructed in 2009 and does not have displaced thresholds. Currently, Chatham has only visual (circling) approaches and is served by a non-directional beacon (NDB).

Table 2-1: Airport General Information Summary Sheet	
AIRPORT NAME & ID NUMBER	Chatham Municipal Airport (KCQX)
AIRPORT LOCATION	Chatham, Massachusetts
AIRPORT OWNER INFORMATION	Town of Chatham Huntley Harrison, Airport Commission Chairman Chatham Municipal Airport 240 George Ryder Road Chatham, MA 02633 (508) 945-9000
AIRPORT COMMISSION INFORMATION	Huntley Harrison, Airport Commission Chairman Town of Chatham 549 Main Street Chatham, MA 02633 (508) 241-1947
AIRPORT MANAGEMENT INFORMATION	Tim Howard, Airport Manager Chatham Municipal Airport 240 George Ryder Road Chatham, MA 02633 (508) 945-5747
ADDITIONAL AIRPORT INFORMATION	
NUMBER OF RUNWAYS	1
CONTROL TOWER	No
COMMUNITIES AFFECTED	Chatham, MA
NAVAIDS	PAPI, REILS, NDB, Rotating Beacon, Windcone, Segmented Circle
APPROACH LIGHTS	No

3.0 VEGETATION MANAGEMENT PLAN OBJECTIVES AND STRATEGIES

The objectives and strategies for vegetation management at the Airport have been formulated based on the particular needs of the Airport and the guidelines jointly developed by MassDOT Aeronautics, FAA, Massport and MA DEP in the following documents:

1. *GEIR for Vegetation Removal in Wetlands at Public Use Airports (1993);*
2. *GEIR Update and Expanded GENF for Airport Vegetation Management (1999);*
3. *Vegetation Management at Airports, A Guidance Document to Conservation Commissions (2004); and*
4. *GEIR Update and Expanded GENF for Airport Vegetation Management (2006).*

Objective: To promote and maintain public and aviation safety by removing vegetative obstructions in the protected zones.

Strategy: Clear vegetation that presently obstructs or threatens to obstruct the primary, approach, transition, and other protected surfaces at the Airport.

Objective: To promote environmentally sound and practical removal techniques that successfully maintain public and aviation safety.

Strategy: Select appropriate short-term and long-term techniques and mitigation measures for each VMA, taking into consideration environmental issues, vegetative communities, and obstructions. Limit adverse impacts to environmental resources such as wetlands, water quality, and wildlife. Coordinate with the Chatham Conservation Commissions and MA DEP to meet these goals.

Objective: To provide feasible long-term vegetation management strategies that will preclude the need for future large-scale vegetation removal projects.

Strategy: Where feasible, formulate plans for each VMA to perpetuate and encourage growth of herbaceous and low-growing vegetation. Coordinate with Chatham Conservation Commissions and MA DEP to make on-going maintenance of the VMAs an expectation and condition of YOPs, minimizing the need for future large scale VMP activities.

Objective: To identify the most cost-effective maintenance activities that keep the cleared VMAs free from future obstructions.

Strategy: Evaluate the airport's ability to maintain cleared VMAs with their current equipment and personnel. Determine the long-term maintenance activities to facilitate obstruction prevention and limit the need for future large-scale vegetation removal activities.

Objective: To promote the full use of the proposed airport facilities.

Strategy: To maintain clear PZs around runways to increase public and aviation safety.

4.0 PROTECTION ZONE OBSTRUCTION ANALYSIS

4.1 PURPOSE

The PZs (sometimes called "imaginary surfaces") that must be kept free from obstructions are defined by:

- FAA Regulation Part 77 (14 CFR 77);
- FAA Advisory Circular 150/5300-13 (Airport Design);
- FAA Order 6480.4 (Air Traffic Control Tower Siting Criteria);
- MassDOT Aeronautics approved aeronautical rules and regulations for public use airports (pursuant to 702 CMR, as amended; for airports subject to MassDOT Aeronautics certification pursuant to M.G.L. c.90, Section 39B); and
- Obstructions are defined in Part 77 as:

  "any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment and materials used therein, and apparatus of a permanent or temporary character; and alteration of any permanent or temporary existing structure by a change in its height (including appurtenances), or lateral dimensions, including equipment or materials used therein."

The FAA has developed regulations, orders, and advisory circulars specifying areas in and around airports that must remain free of obstructions. FAA regulations contained in 14 CFR Part 77, "Objects Affecting Navigable Airspace", describe the dimensions of imaginary geometric surfaces centered on airport runways that must be maintained free from obstructions. These zones of protection are crucial elements of aviation and public safety because when maintained they ensure unobstructed flight paths and views for pilots, air traffic controllers, and ground crew, enabling safe takeoffs, landings, and ground movements.

Wherever vegetation is growing, or has the potential to grow, into the protected airspace, such areas become part of the VMP. For most airports, the critical airspace that affects most VMPs is the FAR Part 77 surfaces.

An airport agrees to make all reasonable efforts to keep its protected airspace free from vegetative penetrations and obstructions, as a condition of accepting FAA funding. The FAA may disallow use of a particular airspace if the airport owner fails to regulate potential obstructions. In addition, compliance with FAA regulations, orders, and advisories is necessary for eligibility for federal funding for airport projects. Part 77 also discusses the limited potential for special analysis and marking of obstructions in specific cases as an alternative to removal.

4.2 PROTECTION ZONE IDENTIFICATION

Removal of penetrating vegetation allows for visually unobstructed landings, takeoffs, and ground movements. Unobstructed views of crucial parts of the airport, as defined in the Part 77 regulations, enable pilots in the air and on the ground to maintain a margin of safety for aviation operations that reduces the possibility of aviation accidents and enhances public safety. Part 77 specifies the dimensions of imaginary surfaces for each individual airport based on the runway type (visual, non-precision instrument, or precision instrument runway), the runway surface treatment (grass or pavement), and approach visibility minimums.

Five imaginary surfaces are identified under Part 77: Primary Surface, Approach Surface, Transitional Surface, Horizontal Surface, and the Conical Surface. Typically, only the Primary, Approach, and Transitional surfaces are involved in VMPs. Dimensions for each of these surfaces are prescribed by Part 77, though surface dimensions may differ from runway to

runway depending upon the criteria outlined in Part 77. The various surfaces are defined as follows and depicted in Figure 4-1 below:

Primary Surface – A rectangular shaped surface longitudinally centered on the runway centerline with the same elevation as the nearest corresponding point on the runway centerline. The primary surface width will vary depending upon the runway approach type and the type of runway surface, but all primary surfaces extend 200 feet beyond a runway's end.

Approach Surface - A trapezoidal shaped surface centered on the runway centerline and extending outward and upward from each end of the primary surface at a prescribed slope angle. Approach surface lengths, widths and slope angle vary according to the runway approach type (visual, non-precision instrument (NPI) or precision instrument).

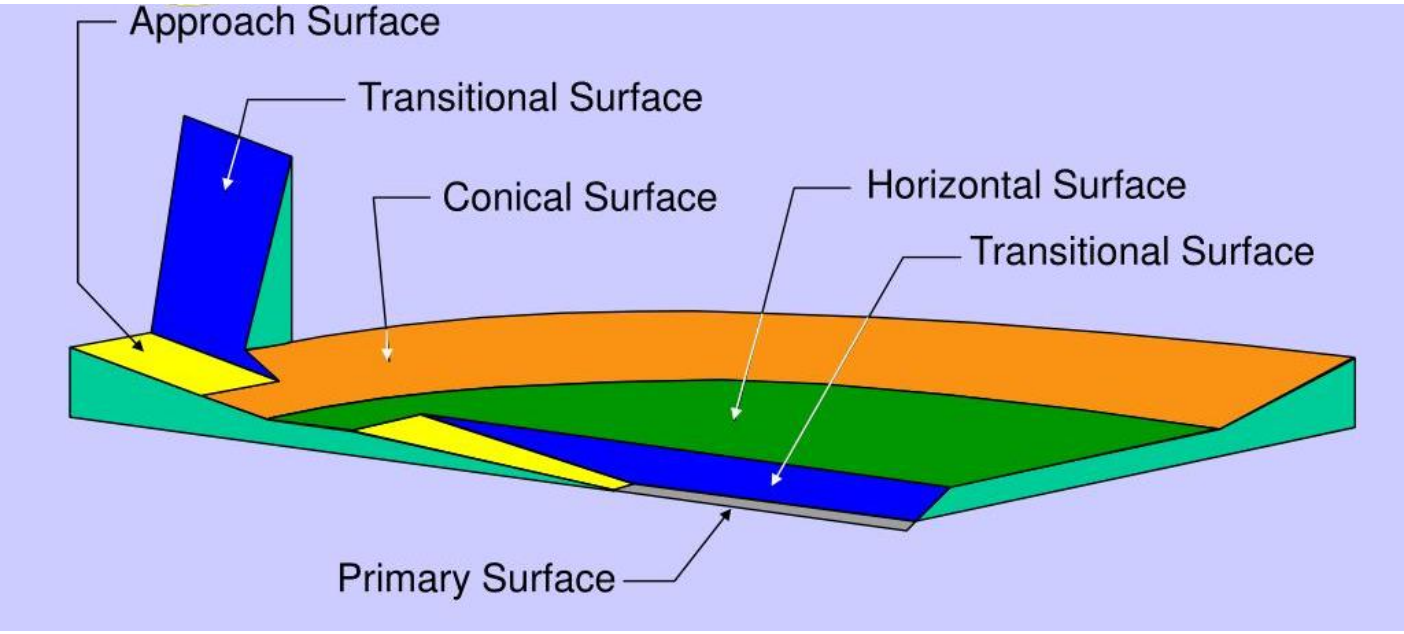
Transitional Surface – This surface is an inclined plane running parallel to the runway centerline beginning at the edges of the primary and approach surfaces. They then extend upward and outward at a slope of one-foot vertical for every seven-feet horizontal from the sides of the primary and approach surfaces to the horizontal surface (150 feet above the airport elevation).

Horizontal Surface – This surface is an oval shaped, horizontal plane established by Part 77 to be at 150 feet above the airport elevation. It is established by swinging arcs from the intersection of the extended runway centerline and primary surface at each end of the runway and then closing each area with tangent lines. In areas where the primary, approach, and transition surfaces may overlap, the surface with the lowest elevation is the controlling surface.

Conical Surface - A surface extending upward and outward from the edge of the horizontal surface at a slope of one-foot vertical for every 20-feet horizontal for 4,000 horizontal feet from the edge of the horizontal surface.

A way to visualize the shape of these surfaces is to imagine an oval football stadium closed at both ends. The **Primary Surface** is represented by the football field, sidelines, and end zones. The seats along the side lines and the stadium rows along the length of the field represent the **Transitional Surfaces**. The ends of the stadium, behind the goal posts, represent the **Approach Surfaces**.

Figure 4-1: Part 77 Imaginary Surfaces



4.3 OBSTRUCTION ANALYSIS METHODOLOGY AND RESULTS AT CHATHAM AIRPORT

For Chatham Municipal Airport, the Part 77 surfaces are the primary determinative factors for establishing the protected airspace in proximity to the runways. However, in addition to these Part 77 surfaces, the airport must also maintain the **safety areas** for the runways and taxiways**.** The safety areas often extend beyond the primary surface at the runway approaches and present a more conservative height limitation for vegetation in these areas.

Part 77 Analysis: The primary surface is essentially the runway surface and its immediately adjacent areas. The Airport has one runway, 6-24. The primary surface of Runway 6-24 is 500 feet wide and extends 200 feet beyond each runway end. The transitional surface slope is at a ratio of 7:1, meaning that it extends 7 feet horizontally for every 1-foot increase in elevation. The slope of the approach surface is a function of the instrument approach serving the runway and the type of aircraft using the runway. The runway dimensions and PZs are defined in Table 4-1.

If a structure or an object, such as vegetation, penetrates any of the Part 77 surfaces, it is considered an obstruction to air navigation [FAR Part 77 § 77.23(a)(5)]. When obstructions exist, an airport must either remove the obstruction, modify airport operations such as with a displaced threshold, or install lighting/marking on the obstruction and/or change the aircraft approach or departure minimums. When vegetation penetrates the approach surface to the runway, the threshold must be displaced (i.e., moved) away from the approach end of the runway shortening its available use to aircraft. Nevertheless, continued management of the penetrations to the airport's airspace will maintain the maximum space available for landing, avoid future displaced thresholds, provide pilots with the maximum landing space available, allow for more decision time and options for action should an emergency arise during a landing, and maintains the appropriate level of safety required for airports. Displacement of a threshold is never a desirable option for FAA, which views preservation of the full airport runway capabilities through vegetation management as a first priority in order to provide the highest margin of safety associated with required airport design standards.

Gale Associates performed an obstruction analysis in 2018 for the Airport using Part 77 surfaces, and other PZs, existing topography and photogrammetry of tree heights. Definitions of the Part 77 imaginary surfaces are presented in the following sections. The imaginary surfaces at the Airport are based on the runway characteristics summarized in Table 4.1. The obstruction analysis also identifies obstructions that penetrate these surfaces as well as those that threaten to penetrate PZs (i.e. within 10 feet), presuming that the tree vegetation can grow to this height within a relatively short period of time. Prudent maintenance requires removal to allow several years before maintenance is required again.

Runway 6-24 has Medium-Intensity Runway Lights (MIRL). Table 4-1 lists the dimensions for each Part 77 surface relevant to each runway. The compliance status for each applicable surface is briefly discussed below.

Runway 6-24 Primary Surface: This surface is centered laterally on the runway centerline with a 250-foot perpendicular width to each side of the runway. The primary surface extends 200 feet beyond each runway end. The elevations allowed for the primary surface are the same as the nearest point on the runway centerline.

Runway 6-24 Approach Surfaces: Approach surfaces begin at the end of the primary surface. The approach surface dimensions are as indicated in Table 4-1. The approach surface is trapezoidal shaped, centered on the runway centerline, and it extends outward and upward from the end of the primary surface. The approach surfaces currently require maintenance of vegetation due to obstruction.

Transitional Surfaces: A transitional surface starts at the edges of the primary and approach surfaces and extends outward and upward from these surfaces at a slope of 7:1 perpendicular to the Runway centerline. The end elevation of the transitional surface is 150 feet above the Airport elevation of 50 feet above mean sea level (msl). The transitional surface to Runway 6-24 is due for some maintenance on both sides of the runway.

Horizontal & Conical Surfaces: These surfaces do not have vegetative penetrations at the Airport at this time. The Horizontal Surface is established at 150 feet above airport elevation, or elevation 200 feet MSL. The Conical Surface extends upward and outward from the edge of the horizontal surface for 4,000 feet measured horizontally. The end elevation of this surface is 350 feet above the airport elevation or 400 feet above MSL.

Table 4-1: Part 77 Surface Dimensions[1]

Runway	Primary Surface Width	Primary Surface Length Beyond Runway End	Approach Surface Width at Inner End	Approach Surface Width at Outer End	Approach Surface Slope	Approach Surface Length	Transitional Surface Slope	Horizontal Surface Radius	Conical Surface Slope	Conical Surface Radius
RW 6	500	900	500	2,000	20:1	5,000	7:1	5,000	20:1	4,000
RW24	500	900	500	2,000	20:1	5,000	7:1	5,000	20:1	4,000

[1] All dimensions (except slopes) in feet

4.4 OBSTRUCTION ANALYSIS RESULTS

The areas with obstructions were identified by applying the FAR Part 77 Imaginary Surfaces criteria to the actual conditions at the Airport. The individual short-term VMAs are shown in Sheet 1 (Appendix A) and were identified based upon various factors related to the obstructions and their respective vegetation management. The conditions at the Airport were determined by comparing the projection of the protected surfaces on existing aerial photogrammetry, topographic mapping, and tree height mapping. The areas with obstructions identified, using this method, were used to develop the VMAs and assign appropriate methodologies for treatment and removal. Based on the analysis, there are 55.49± acres that contain either penetrations or objects which are within 10 feet of penetrating the protection zone. Of this area, 36.66± acres are located on airport property, 7.07± acres are located within areas where landowners have previously granted permission for vegetation management with an easement, and 11.81± acres are located on non-airport property where no avigation easements are held (Table 4-2). As a comprehensive plan, this VMP accounts for both on-airport and off-airport obstructions.

Table 4-2: Summary of Areas with Vegetative Penetrations[1]

Location	Area± (acres)
On-Airport ("-1" areas on Sheet 1)	36.66
Off-Airport with Easements ("-2" areas on Sheet 1)	7.07
Off-Airport without Easements* ("-3" areas on Sheet 1)	11.81
Total	55.54

[1] Current MassDOT Aeronautics plans for vegetation removal focus on areas within airport property or where current avigation easements or permissions exist.

4.5 PRIOR VMP CLEARING PROJECTS

Before the GEIR was accepted by MEPA and the wetland limited project regulation was adopted by the MA DEP, the FAA would not usually fund clearing projects more than once in a specific location at any airport. However, since the adoption of the wetland limited project regulation in 1994 for tree clearing in wetlands at public use airports, the FAA agreed to once again fund tree clearing projects where it had previously done so. This response is likely in recognition that attempts by airports to maintain previously cleared areas (particularly wetlands) was, in many cases, not practical due to the extensive and expensive permitting required before wetlands could be altered by tree clearing. There have been no formal

vegetation removal activities on the Airport. Table 4-3 presents a list of previous vegetation management efforts performed outside a VMP.

Table 4-3: vegetation Management Projects at Chatham Municipal Airport		
Year	**Area Cleared**	**Current Status**
Ongoing	Periodic mowing of airfield	Maintenance required
Annual	Brush hog clearing of grassy areas around NDB	Maintenance required
2010	Vegetation clearing around perimeter fence	Maintenance required

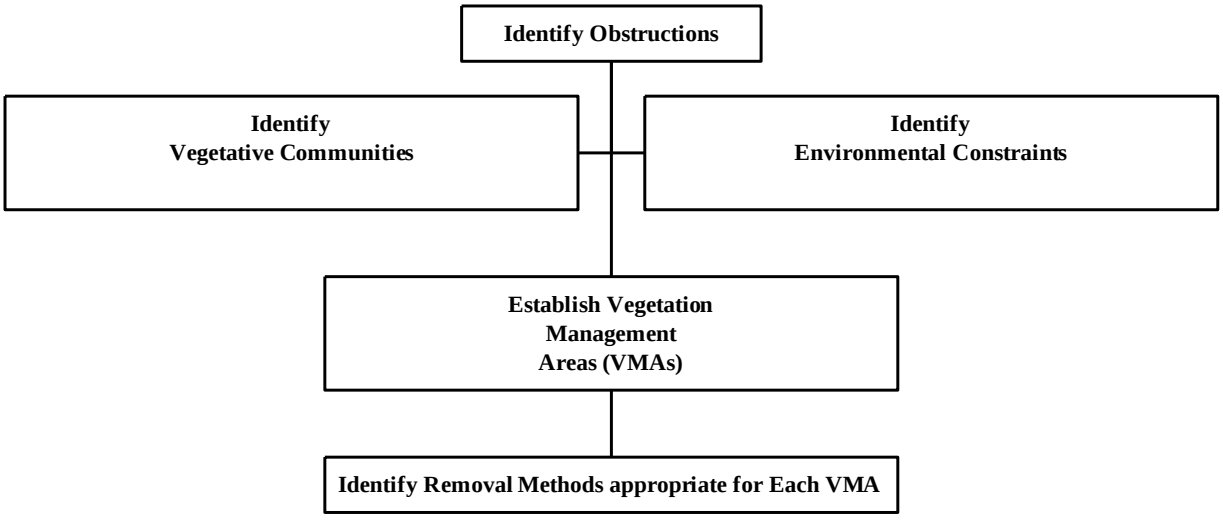
5.0 VEGETATION MANAGEMENT AREAS AND POTENTIAL ENVIRONMENTAL CONSTRAINTS

5.1 OVERVIEW

Vegetation Management Areas (VMAs) are distinct areas where a particular type or combination of vegetation management method(s) is recommended. The preferred methods of vegetation removal are a function of the obstructions present, the physical conditions of the site (soils, vegetation, topography, hydrology), and the presence of environmental constraints. Environmental constraints include, but are not limited to, the presence of wetland resources, water supplies, rare species, and/or steep or otherwise unstable soils.

The identification of VMAs in a VMP integrates information gathered from field investigations, computerized obstruction analysis, existing studies and mapping, and correspondence with federal, state, and local agencies. The process for VMA identification is shown schematically in Figure 5-1.

Figure 5-1: Schematic of VMP Process



This section presents the detailed approach to the VMP at the Airport in the following order:

- Section 5.2. Identification of Vegetative Communities;
- Section 5.3. Identification of Environmental Constraints;
- Section 5.4 Description of Vegetation Removal Methods;
- Section 5.5. Short-Term & Long-Term VMP Plans; and

- Section 5.6. Identification of Potential Environmental Impacts.

Section 6 will present the anticipated sequencing for implementation of the VMP at the Airport and present the YOP for the next 5-year period. The VMP plans and approach have been organized into "Short-Term" and "Long-Term" Plans, with the "Short-Term" Plan focusing on major areas of tree removal where the woodlands are relatively mature and have not been managed recently, and more aggressive treatment is required. The "Long-Term" Plan focuses on a scheduled maintenance approach to VMAs once the "Short-Term" Plan is implemented. While the titles imply a sequence of implementation, the time schedules are less clear, with some of the "Short-Term" activities not likely to occur within the near future. For example, some of the initial tree removal activities identified in the "Short-Term" Plan need to occur off-airport where no permissions or easements exist, likely extending implementation of this additional vegetation removal beyond the limits of the 5-year YOP.

5.2 IDENTIFICATION OF VEGETATIVE COMMUNITIES

Based upon the Part 77 surfaces and available ground topography, contours were developed surrounding the airfield at 10-foot intervals, depicting the permissible heights of vegetation. These contours extend through the Airport property but also extend onto adjacent properties. Tree top elevations depicted on the aerial photogrammetry provided the locations where vegetation removal is required. These areas were first evaluated using various data sources including:

- MA GIS aerial photographs;
- U.S. Soil Conservation Service, Soil Survey of Barnstable County, Massachusetts; and
- U.S. Geological Survey Topographic Map, (1:25,000).

Vegetative communities on and off the Airport were then field inspected within these contour intervals to evaluate and describe vegetative communities present. Field investigations of vegetative communities and delineation of the vegetation management areas on Airport property occurred in November 2020, based on the updated obstruction analysis. Areas outside of Airport property were also investigated to estimate potential resource areas and VMAs. For both wetland and upland areas, dominant vegetation types, general vegetative density, topography, ground cover, and soil types were used to characterize the VMAs.

As stated in Section 1.2, VMAs are geographic areas with specific vegetation management needs. At the Airport, VMA delineation included property ownership considerations in addition to the environmental constraints and other factors that might affect the methodology or progress of vegetation management.

The basic vegetative community types in the VMAs at the Airport are:

- Cultural Grasslands (both Frequently and Infrequently Mown),
- Vernal Pools,
- Pitch Pine Upland Forest,
- Mixed Oak-Pine Forest, and
- Landscaped Developed Upland.

Table 5-1 and Figure 5-2 summarize the vegetative communities within the VMAs, both on and off Airport property. The total acreage involved with the on-Airport or easement VMAs requiring tree removal is about 43.73 acres. The off-Airport areas in private or other ownership, where easements will need to be sought for tree removal and vegetation management, include about 11.81 acres.

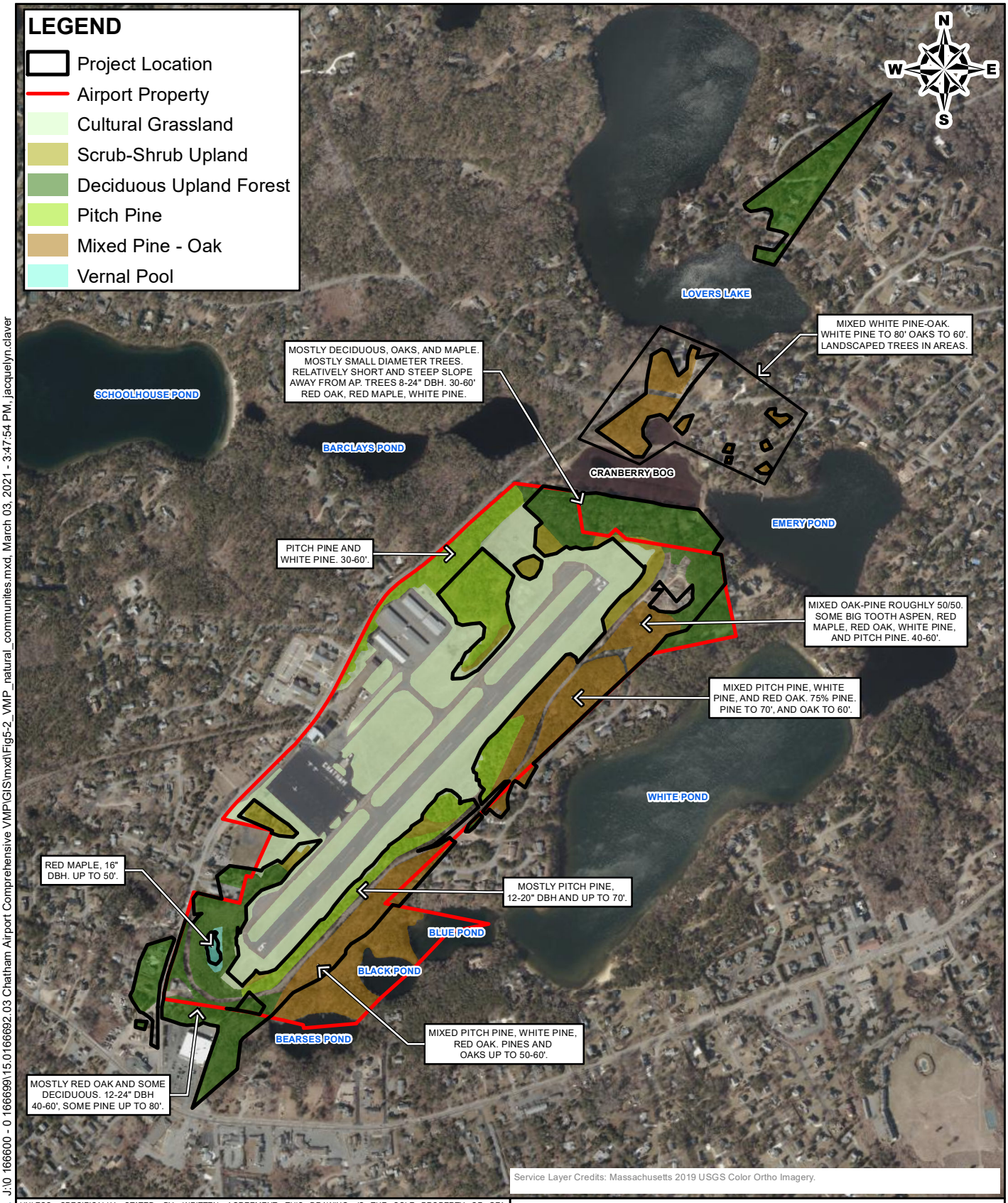
Wetland areas within the VMAs are primarily coastal ponds along with limited areas containing small emergent areas or "potential vernal pool habitats" (as identified by MA NHESP GIS data layers). Detailed descriptions of these wetland communities are described in Section 5.3.12 of this document.

Upland wooded areas within the VMAs are best characterized as either monotypic stands of mature pitch pine (*Pinus rigida*) or mixed oak-pine forests. Within the stands of pitch/white pine, tree canopies reach 80-100 feet with tree diameters in the 18-24 inches class at breast height. Approximately 60% of the upland forest is composed of these monotypic stands of pine. The mixed upland forests are a mix of deciduous trees (mainly red oak (*Quercus rubra*), black oak (*Q. velutina*), white oak (*Q. alba*) and red maple (*Acer rubrum*)), with inclusion of white pine of varying age across the VMP area, with most of these communities being mature (60-70' oaks, with inclusions of 100' white pines). The composition of these vegetative associations is further described in sections 5.3.12 and 5.3.13 of this document.

The primary environmental constraints identified on and off Airport property for vegetation management would be associated with wetlands, with some areas of the wetlands having higher functions and values than others (e.g., vernal pool characteristics). These and other issues are discussed in Section 5.3. More detailed descriptions of the individual vegetative communities within vegetative management areas are presented in Section 5.4 and in Table 5-1.

Table 5-2: Summary of Vegetative Communities within Vegetation Management Areas

Location		Ownership or easement	Acres	Veg. height	Upland					Wetland
					Grassland	Scrub-Shrub	Mixed Pine-Oak	Pitch Pine	Deciduous Forest	Vernal Pool
Central Airport	On Airport	Yes	31.30	<1'	31.30	-	-	-	-	-
RW-6	On Airport	Yes	17.81	5-70'	-	1.41	8.14	2.84	4.91	0.51
	Off Airport	Yes	1.01	40-80'	-	-	-	-	1.01	-
	Off Airport	No	4.43	40-80'	-	-	0.55	-	3.88	-
	TOTAL		**23.25**		**-**	**1.41**	**8.69**	**2.84**	**9.80**	**0.51**
RW 24	On Airport	Yes	23.36	30-60'	-	2.34	7.05	8.22	5.75	-
	Off Airport	Yes	0.11	30-60'	-	0.11	-	-	-	-
	Off Airport	No	8.21	30-80'	-	-	3.91	-	4.30	-
	TOTAL		**31.68**		**-**	**2.45**	**10.96**	**8.22**	**10.05**	**-**
TOTAL			**86.23**		**31.30**	**3.86**	**19.65**	**11.06**	**19.85**	**0.51**



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CHATHAM AIRPORT VMP
CHATHAM, MA

NATURAL COMMUNITIES

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FIG **5-2**

5.3 IDENTIFICATION OF ENVIRONMENTAL CONSTRAINTS

5.3.1 Overview

Various state and federal regulations protect natural and historical resources. For the purposes of this VMP, protected resources and their accompanying restrictions are defined as environmental constraints. A summary of the environmental constraints requiring review are summarized in Table 5-2 and discussed in more detail in the following sections.

Table 5-2: Summary of Environmental Issues and Regulatory Agencies

Issue	Controlling Agency / Reference Material	Environmental Issues
Agricultural Land	MA Dept of Food and Agriculture	There are no prime farmland soils within VMAs nor is there active agriculture within the project area.
Areas of Critical Environmental Concern (ACECs)	DCR – ACEC Program	A small portion of some off-airport VMAs are within the Pleasant Bay ACEC
Hazardous Waste Sites	DEP –- Bureau of Waste Site Cleanup	Reportable releases are outside of immediate project area or have had corrective action taken.
Historical and Archaeological Resources	Massachusetts Historical Commission	There are potential resources in the vicinity of the Airport; additional due diligence may be required based on the proposed work and methodology.
Land Ownership	Town Assessor's Office	Easements required from public and private landowners.
Outstanding Resource Waters (ORW)	DEP – Office of Watershed Management	Lovers Lake is mapped as an ORW additionally, the certified vernal pool on the airport qualifies as ORW. Other "Potential Vernal Pools" are indicated on NHESP GIS data layers but would require field/seasonal verification.
Floodplains	FEMA	No vegetation management is proposed within surrounding floodplain areas.
State and National Forests and Parks	DCR - Division of Forests and Parks	None within project area.
	National Park Service	None within project area.
Water Quality and Water Supply	DEP –Water Supply & Wellhead Protection	The Airport is within EPA Sole Source aquifer and Zone II wellhead protection area.
	Local	Private wells may be in the vicinity of Chatham Airport.
Wetland Resources	Field delineation on-airport and preliminary reconnaissance and examination of soil surveys and aerial photos off-airport.	One vernal pool located on Airport. Coastal ponds and one cranberry bog located off property.
Endangered and Threatened Species	MA Division of Fisheries and Wildlife & Natural Heritage and Endangered Species Program	NHESP identifies priority habitat off-Airport but within some VMAs.
	U.S. Fish and Wildlife Service	Federally listed bats are identified on or near the Airport; therefore, compliance with the 4(d) rule will be required.
Wetland Restriction Orders	DEP –Wetland Restriction Program	No wetland restriction orders in project area.
Wild and Scenic Rivers	DCR – Department of Conservation and Recreation	No Wild and Scenic Rivers in vicinity.

5.3.2 Agricultural Land

Prime farmland soils, as defined by the U.S. Department of Agriculture (USDA), are characterized as soils having the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. In particular geographic regions, specific soil units are classified as prime farmland soils. However, if the land use is urban, then the soils will not be designated as prime farmland soils, even if they are among the soils generally classified as such. For example, prime farmland soils could be in areas where pastureland or forests are present, but prime farmland cannot exist in urban built-up land.

According to the Barnstable County Soil Surveys (USDA 1993), approximately 8.7% of the county is considered prime agricultural soils; however, these areas are mainly contained in the western portion of the county. No prime agricultural soils are mapped within or in the vicinity of the proposed VMA areas.

5.3.3 Areas of Critical Environmental Concern (ACECs)

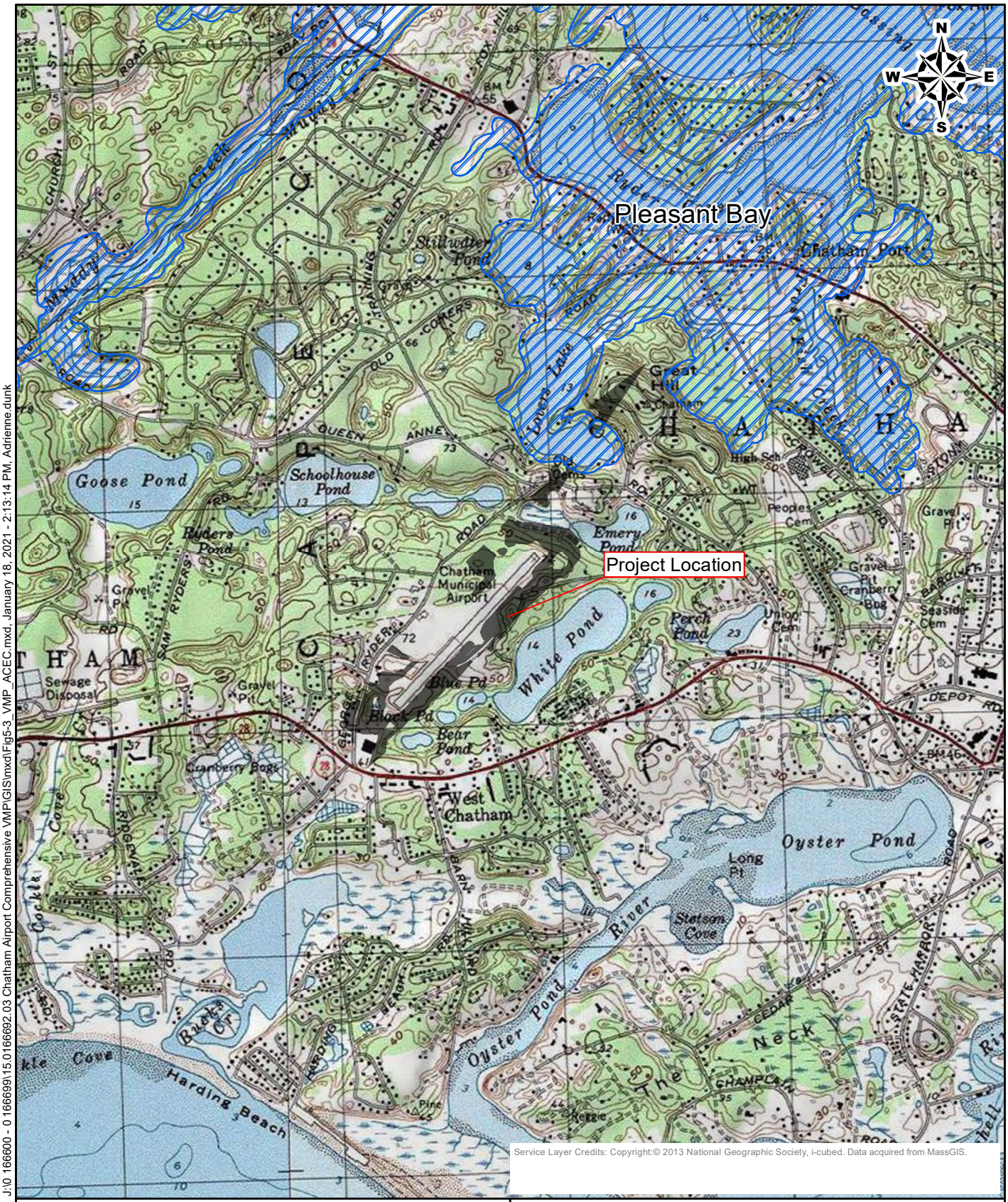
ACECs are defined by 301 CMR 12.03 as "areas within the Commonwealth where unique clusters of natural and human resources exist and which are worthy of a high level of concern and protection." The ACEC program is managed within the Massachusetts Department of Conservation and Recreation (DCR), and areas must be nominated, reviewed, and approved through a defined regulatory process. ACECs must be either areas of regional, state, or national importance or contain significant ecological systems with critical interrelationships among a number of components.

ACECs must contain at least four of the following: fishery habitat, coastal features, estuarine or inland wetlands, surface waters, drinking water aquifer or watershed, floodplain or erosion area, habitat for rare plants or significant wildlife, or a natural, scenic or public recreation area. A review of the designated ACEC areas on MassGIS indicates that a small portion of some off-Airport VMAs are within the Pleasant Bay Coastal ACEC (Figure 5-3). The ACEC is limited to the areas within and adjacent to Lovers Lake, which is in the outer portions of the Protection Zone (PZ); therefore, required management will be minimal. For that minimal work, an ACEC designation does confer a higher degree of environmental sensitivity. Depending upon the degree of work required within this zone, additional MEPA and other permitting requirements could be triggered and additional mitigation required for impacts.

5.3.4 Hazardous Waste Sites

The MA DEP publishes a searchable online database identifying reported releases of hazardous materials for the previous 20 years within the Commonwealth. As of December 31, 2020, a total of 102 records exist for releases within the boundaries of the Town of Chatham. Of these records, one release (Tracking Number 4-0001147) occurred at the Airport. This release dates to 1990 and was closed in 1999 with the issuance of an Underground Injection Control Program Closure Assessment which was accepted MA DEP. The cause of the release was a non-compliant floor drain and four aboveground drums used as a leaching pit. The drain was filled, and the drums removed prior to the 1999 closure report.

GZA commissioned EDR, an environmental database search company, to produce a report for the Airport. To prepare this report, EDR searches multiple environmental databases at the local-, State-, and Federal-level within pre-determined search radii from the Airport. If there is a record, EDR provides summary details about the location and materials involved. According to the report performed for the Airport, there are six (6) records associated with the Airport which are not associated with the above RTN. None of the six records are associated with ongoing environmental concerns. Four (4) of the records are database listing due to permits such as NPDES and are not related to spills. The other two records are for underground storage tanks which have been removed and hazardous waste or oil generation. The six reviewed records do not indicate that hazardous waste sites impose a constraint on vegetation management at the Airport.



Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed. Data acquired from MassGIS.

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ACEC MAP

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5.3.5 Hazardous Materials, Pollution Prevention, and Solid Waste

The Airport's Stormwater Pollution Prevention Plan (SWPPP) is being updated and will be submitted for coverage under the 2021 MSGP dated March 2021. The Airport is also developing a new Spill Prevention Control and Countermeasure Plan (SPCC Plan) to meet EPA requirements which will be finalized shortly after the March 2021 SWPPP. Combined, these documents provide pollution prevention and spill prevention and response strategies for the Airport. Hazardous materials are not manufactured on-site. Airport and tenant facilities on the site may store and use some hazardous materials, but these are not within areas subject to vegetation management. All known hazardous materials spills in the project area have achieved a level of no significant risk according to the MA DEP database.

5.3.6 Historical, Architectural, Archeological, and Cultural Resources

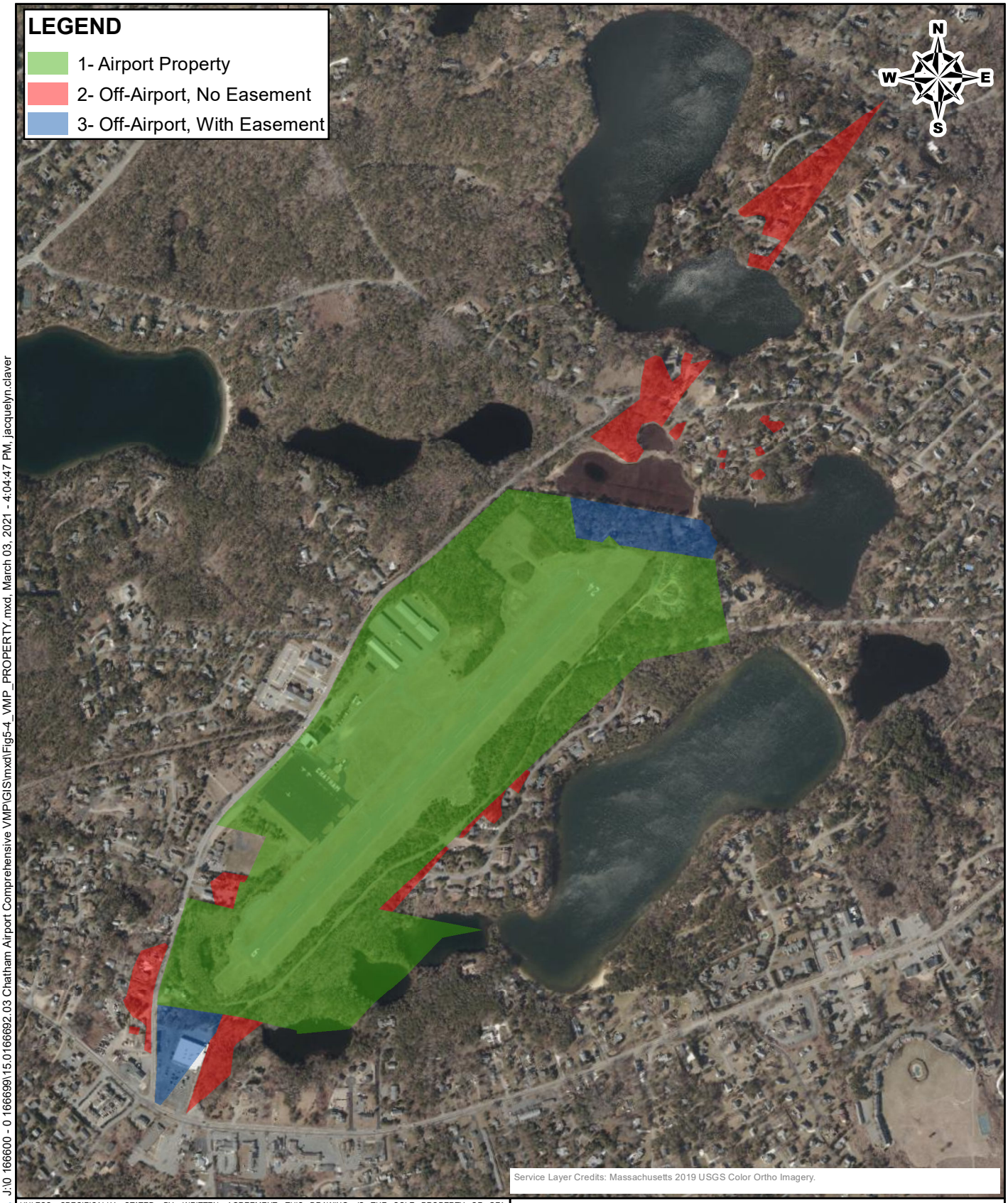
In accordance with Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800 and Executive Order 11593) Massachusetts General Laws Ch.9, Sec. 26-27C (950 CMR 71), and MEPA (301 CMR 11.00), the Massachusetts Historical Commission (MHC) may need to be contacted regarding potential historic and archaeological resources at the Airport as part of airport improvement projects and/or when ground disturbance is proposed. Vegetation removal activities do not typically result in ground disturbance and therefore are unlikely to cause impacts to cultural resources. Nevertheless, MHC and the applicable Tribal Nations may need to be contacted during the permitting phase of the project.

5.3.7 Land Ownership

As discussed in Section 4.3, obstructions to PZs are located on-Airport property, within existing avigation easements and off-Airport property where no easements are held. Based upon the 2018 obstruction analysis, 7.07 acres of the area of obstruction is located on private property in Chatham where avigation easements are held (Figure 5-4 - associated VMAs have "2" in the name). Twenty one percent or 11.81 acres of the area of obstruction is located on private property in Chatham where no avigation easements are held (Figure 5-4 – associated VMAs have "3" in the name). Private land ownership may present a constraint to vegetation removal on off-Airport property. The Airport may request permission to remove vegetative obstructions on some private, off-airport property, as part of this VMP or seek avigation easements for these areas. A large portion of the off-airport property is considered "landscaped residential or commercial". Prior to vegetation removal in these areas, more accurate easement evaluations and assessment of access to these areas is required. Once the new avigation easements or permissions are obtained, the YOPs can be refined to incorporate the new easement areas.

5.3.8 Outstanding Resource Waters

Outstanding Resource Waters (ORWs) are defined under 314 CMR 4.04(3) as waters that constitute an outstanding resource as determined by their exemplary socio-economic, recreational, ecological, and/or aesthetic values. The quality of these waters is protected under the Massachusetts Surface Water Quality Standards (314 CMR 4.00). The MassGIS data layer for ORW indicates that Lovers Lake is an ORW. Lovers Lake is located adjacent to proposed VMAs; however, because there is no tall vegetation in the Lake that requires management, no work should be proposed within the limits of this ORW. Additionally, there is a certified vernal pool in the northwest corner of the Airport. All certified vernal pools are ORWs by definition, and VMP cutting within and in proximity to this vernal pool is designated as its own VMA with specific cutting methodologies to minimize impacts to these habitats.



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PROPERTY OWNERSHIP

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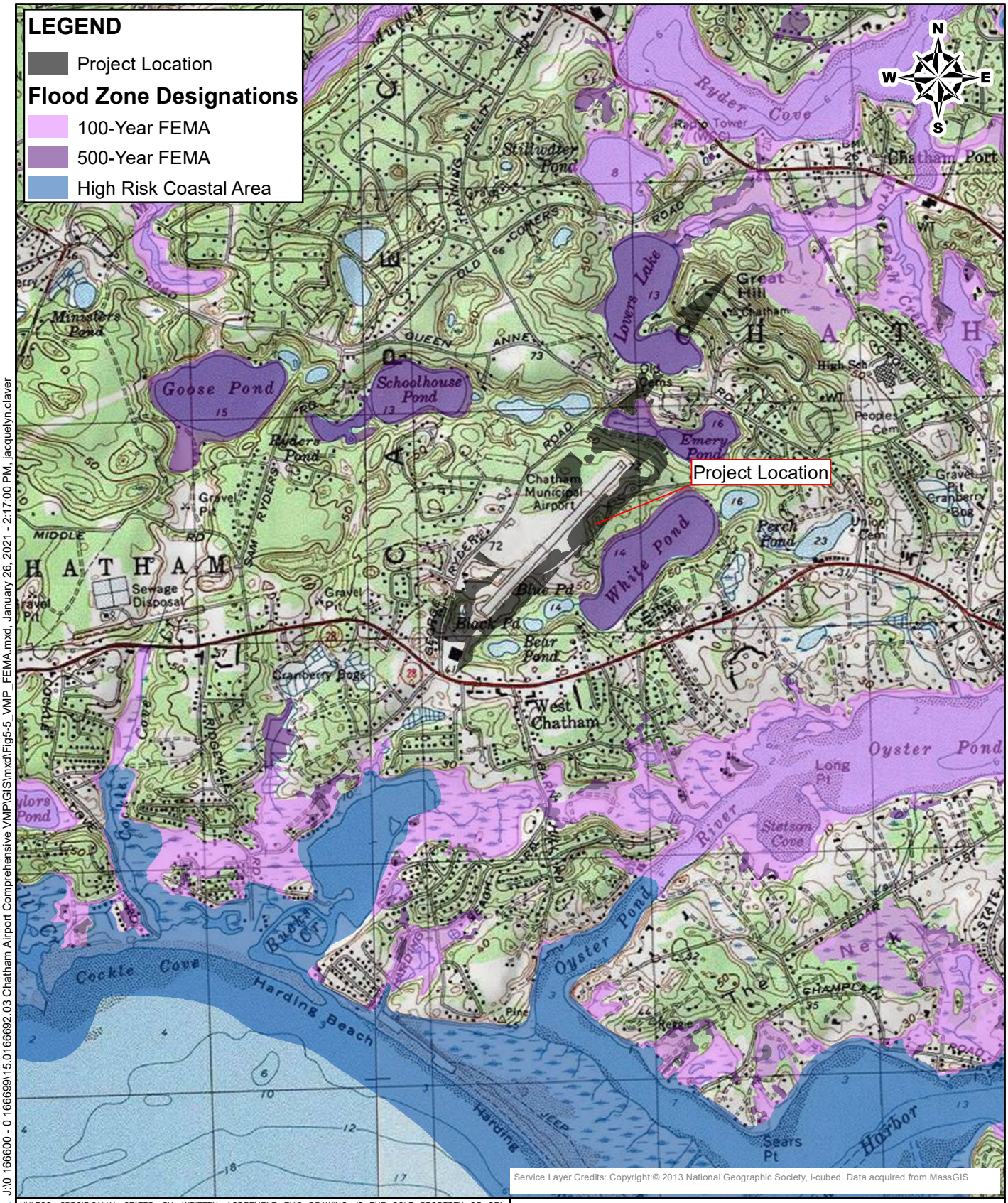
FIG **5-4**



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FEMA MAP

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DATE: 01/26/2021	PROJECT NO: 15.0166692.03	REVISION NO:	

5.3.9 Floodplains

Floodplain exists within the runway approach; however, no floodway is mapped within the project area (Figure 5-5). According to the FEMA FIRM Map, the upper reaches of Bucks Creek and Frost Fish Creek are in the 100-year floodplain with undetermined flood elevation. White Pond, Emery Pond, and Lovers Lake are in the 500-year floodplain. No vegetation management is proposed within these floodplain areas; therefore, no impacts to floodplains will occur as a result of VMP implementation.

5.3.10 State and National Forests and Parks

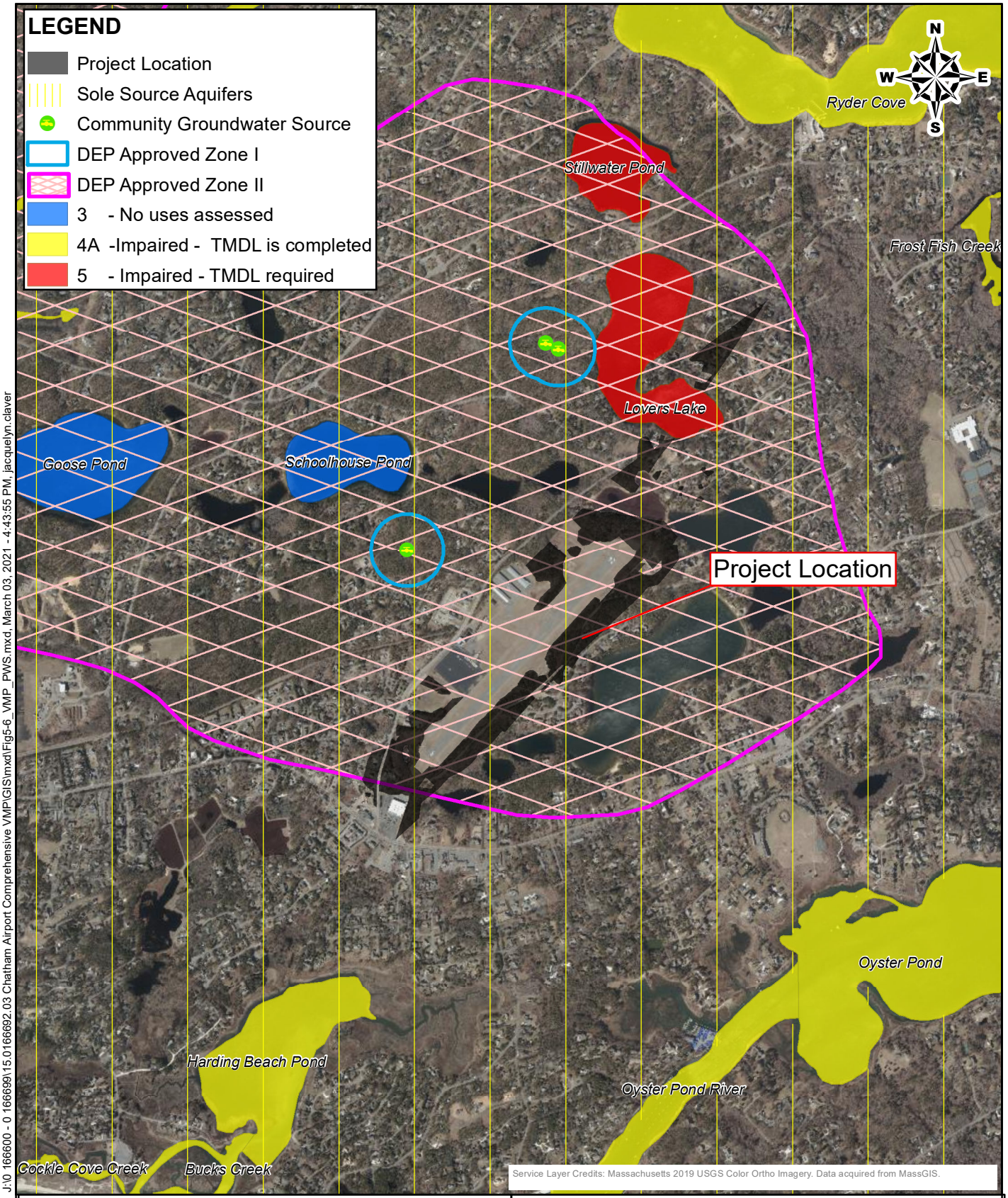
There are no State or National Forests or Parks within the VMP areas (MassGIS Protected and Recreational Open Space Data Layer, December 2020). However, there are local conservation lands in the vicinity including White Pond Beach and multiple conservation parcels which are contiguous with the Airport. Although no management needs to occur within these areas at this time, the Airport may need to seek additional permissions or easements to maintain safe airspace on these publicly owned lands should penetrations occur.

5.3.11 Water Quality and Supply Resources

The Airport lies within the Cape Cod Watershed, and is surrounded by several coastal ponds, some of which also support wetlands. No streams or rivers are mapped in the immediate vicinity of the Airport; however, Ryder Cove, Frost Fish Creek, and Pleasant Bay ACEC which includes Lovers Lake, are classified as Outstanding Resource Waters under the Massachusetts Surface Water Quality Standards (314 CMR 4.00).

According to the Massachusetts Year 2016 Integrated List of Waters, Ryder Cove, Oyster Pond, and Harding Beach Pond are classified as 4A – impaired, and the Total Maximum Daily Load (TMDL) is completed for total nitrogen, fecal coliform, and estuarine bioassessments. Stillwater Pond and Lovers Lake are classified as Category 5 – Impaired and the TMMDL has not been completed for turbidity. Given the use of suitable vegetation removal methodologies and necessary sediment and erosion controls, no impact to surface water resources is likely to result from the proposed vegetation management activities.

The Airport and vegetation management areas are located within an EPA-identified Sole Source Aquifer and MA DEP Approved Zone II Wellhead Protection Area (Figure 5-6). The Zone II area includes three wells—Indian Hill (0.2 miles east), Well 8 (0.35 miles north), Training Field (0.4 miles north). The wells and associated Zone I areas are located outside of vegetation maintenance areas. In addition to these community groundwater sources, there may be additional private irrigation and drinking water wells in the vicinity of the Airport. The proposed vegetation management should not affect the groundwater within the work areas.



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PUBLIC WATER SUPPLIES

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5.3.12 Wetland Resources

Overview: The Chatham Municipal Airport is abutted by forests, scrub-shrub, and upland grasslands to the north, south, and west. White Pond, along with several smaller ponds, are located predominantly along the southeastern edge of the Airport. Wetlands in the area are limited to coastal ponds and a cranberry bog. The coastal ponds and cranberry bogs have well defined banks and limited fringing wetlands and are typical ponds found on Cape Cod. They have limited, if any, hydrologic connection with Pleasant Bay. Wetland resources are depicted on Figure 5-7.

Regulatory Status: On-airport wetland resource area boundaries have been delineated utilizing methods approved under the Massachusetts Wetlands Protection Act (MA WPA, 310 CMR 10.00) and Section 404 of the Clean Water Act (U.S. Army Corps of Engineers (ACOE) methodology), which include the evaluation of vegetation, soils, and hydrology. The VMP also covers some off-airport areas with wetland resources, whose boundaries have been determined by different means. The wetland boundaries can be assigned into two basic categories (see Figure 5-7) and are as follows:

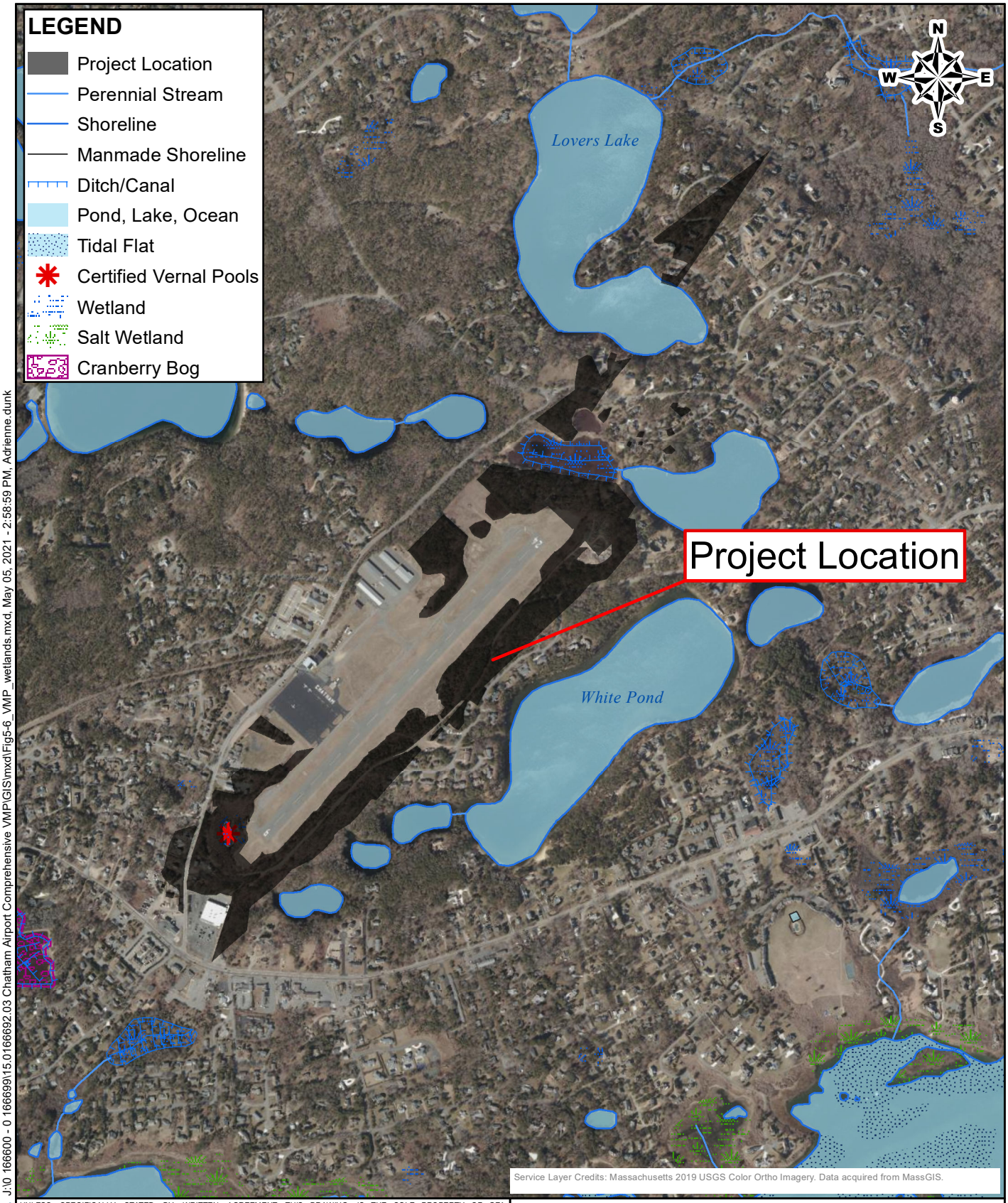
1. On-airport wetland resource boundaries re-assessed and delineated in July 2018 by GZA.
2. Off-Airport unflagged and un-surveyed wetland boundaries, estimated based upon MA GIS wetland data layers, aerial photography, and site inspection.

The wetland resource boundaries for the VMP have not been approved by the Chatham Conservation Commission. The on-airport wetlands will be presented as part of future permitting efforts under the MA WPA. The off-airport properties lacking existing easements for vegetation management were not formally delineated and codified under the MA WPA and may require additional detailed delineation, survey, and filing of permit applications prior to VMP activities. Off-airport areas will also require the acquisition of easement rights through negotiations with landowners.

State-regulated wetland resource areas within the project area wetlands include Isolated Land Subject to Flooding (ILSF), Bank, and Land Under Waterbodies and Waterways (LUWW) (see Figure 5-7). Because access to areas off-property or outside of existing easements is limited, vegetation removal activities in these areas will require additional detailed delineation and survey of the identified wetland resource areas to a level appropriate for the filing of a Notice of Intent under the VMP. Off-site wetland boundaries as shown in Figure 5-7 were estimated from aerial photographs, limited on-site observation, and available GIS data. Descriptions of the wetland resources are given below.

Wetland Resource Areas: This VMP includes one wetland resource. The wetland is the vernal pool which is isolated land subject to flooding (ILSF) under the MA WPA and qualifies as an Isolated Vegetated Wetland regulated by the ACOE Section 404 and MA Section 401 Program (Figure 5-7). This wetland is also a Certified Vernal Pool and is protected by the Town of Chatham Wetlands Protection Bylaws. The wetland is located on Airport property approximately 250 northwest of the Runway 6 end. This wetland is a palustrine forested wetland (PFO) and is predominantly vegetated with red maple, sweet pepper bush, and highbush blueberry. The open water areas contain primarily emergent and some submerged aquatic, and floating vegetation.

Additional wetlands identified off-Airport include a cranberry bog to the northeast of the Airport as well as several coastal ponds located along the southern side of the bike trail. These wetland resources were identified by aerial interpretation, MassGIS Wetland data, and confirmed with a site visit. Given the type of wetlands, limited, if any, vegetation management will be required within the resource areas; however, vegetation management in the associated Buffer Zones may be required.



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CHATHAM AIRPORT VMP
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WETLANDS MAP

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5.3.13 Wildlife Habitat

The wildlife habitats present within the VMAs at the Airport largely follow the vegetative communities discussed in Section 5.2. The natural communities within the VMP areas (Figure 5-2) can be characterized as:

- Cultural Grasslands (both Frequently and Infrequently Mown) (G)
- Scrub-Shrub Upland (SSU)
- Upland Forest (UF)
    - Pine Dominated Upland Forest (UF/C)
    - Mature Mixed Deciduous Dominated Upland Forest (UF/D)
    - Late Successional Mixed Deciduous Dominated Upland Forest (UF/M)
- Vernal Pools (VP)
- Landscaped Developed Upland

Each of these habitats is discussed in detail below. Anticipated wildlife species per habitat are listed in Table 5-3A-D.

Cultural Grassland: The cultural grassland areas are primarily associated with the runway and other maintained areas in proximity to the runway and airport infrastructure. This is a manmade and maintained habitat dominated by graminoids including little bluestem grass (*Andropogon gerardii*), spotted knapweed *(Centaurea maculosa)*, clovers *(Trifolia spp.),* lance-leaved plantain *(Plantago lanceolata),* and various fescues *(Festuca spp.)*. This community has less than 25 percent tree and shrub cover, and includes patches of open, mineral soil.

At the Airport, this community has less than 1 percent tree or shrub cover and occupies 31.30± acres. Most of that acreage is adjacent to paved surfaces and the grasses are maintained at less than 12 inches tall to comply with FAA safety standards. The cultural grassland provides nesting and foraging habitat for voles, meadow jumping mice and grassland birds. Sandy areas with sun exposure and limited vegetative cover may also provide nesting habitat for turtles.

Scrub Shrub Upland: Areas along the perimeter fence and in the transitional surface have scrub-shrub vegetation which can be dense and, in some cases, extends close (within 15 feet) to paved surfaces. In total, 3.86 acres of this community type is scattered around the Airport. Almost the entire length of the southern transitional surface is vegetated with woody vegetation ranging from a few feet to over 100 feet in width.

This community is in varying degrees of secondary succession to early seral forest stands and can vary widely in shrub density and vegetative assemblage because of factors such as management type, hydrology, soils, proximity to other natural areas, or size. Generally, these habitats are edge ecotones between the maintained grassland habitats and the more mature forested areas. Scrub-shrub communities also contain areas of open sand, grassland, with some small trees. These areas also have a significant presence of invasive shrub species with morrows honeysuckle *(Lonicera morrowii),* Russian olive (*Elaeagnus angustifolia*) and multiflora rose (*Rosa multiflora*) among the dominant shrub. Native species such as grey birch, quaking aspen, and blueberry are also common and provide a much higher value to the local wildlife population than the invasive species. The scrub shrub vegetation is up to 6 feet tall with potential for significant increased growth, interspersed with low shrub growth of 2-3 feet. Groundcover includes woody and herbaceous growth (white oak, highbush blueberry, little bluestem grass (*Schizachyrium scoparium*), cinnamon fern, sweet pepperbush, wintergreen, white pine, inkberry (*Ilex spp*.), goldenrod, sheep laurel (*Kalmia angustifolia*), bush clover (*Lespedeza spp.*), sheep fescue (*Festuca ovina*), black cherry (*Prunus serotina*), starflower (*Trientalis spp.*), dewberry, and clubmoss (*Lycopodiopsida spp.*).

These edge habitats provide relatively high wildlife habitat value and provide dense cover for both forest and field dwelling fauna. Species such as grey catbird, brown thrasher and urban or edge adapted species may also frequent these habitats. These edge ecotones are often used as cover and shelter for more field/open area wildlife and as forage habitat for some forest interior species, making this transitional ecotone relatively high in species richness and diversity.

Upland Forest: There are three primary upland forest cover types at the Airport, pitch pine dominant, deciduous dominant and mixed. Most upland forest stands are even aged and in mid- to late-succession, with only a small percentage in early succession stage. In general, the upland habitat mosaic around the airfield is patchy, occurring as small "islands" and semi-isolated areas of upland in a wider developed mosaic.

Pitch Pine: This forest matrix is dominated by greater than 70 percent cover of mature pitch pine (24-30" dbh, 60-80 feet tall) with significant white pine inclusions with lesser amounts of deciduous trees, mainly oaks. In this community, pitch and white pines form a mature closed canopy with little to no ground cover underneath the pines. Shrub layers vary with some areas having dense lowbush blueberry, huckleberry and greenbrier. The topography in these areas is generally flat or sloping away from the airfield.

This community provides some habitat for mammalian, avian, reptilian, and amphibian species. The major mast producing food within this community is pine with less mast offered by oaks and maples, thereby altering the overall species assemblage. White tailed deer are likely common, with the coniferous overstory more conducive to red squirrel and chipmunk than gray squirrel. Additional common mammalian and avian species that would be expected within this community include great horned owl and raccoon. The dry nature of this community type provides habitat to only a handful of herpetile species (toads, red back salamander, garter snake, red belly snake, brown snake, and in proximity to the vernal pool, yellow spotted salamander, wood frog and spring peeper).

Deciduous: These upland forested areas are similar in most respects to the Mixed Upland areas described below with the only notable difference being a lack of pine species. Overall, pines comprise less than 10% of the canopy in these areas, with species such as red oak, white oak and red maple being the primary constituent in the tree canopy. As a result, the overall canopy height is lower here as the deciduous trees do not top out as tall as the white pines (60-80 foot max vs. 80-100+ for pines). The understory is usually more developed as more light penetrates the canopy in deciduous situations. Wildlife use is similar to that of mixed upland forests.

Mixed Forest: This community has a mixed canopy of red oak, white oak, black oak (*Quercus velutina*), white pine and occasional birch, and red maple. The understory is comprised of upland blueberries, black huckleberry (*Gaylussacia baccata*), sweet pepperbush, green briar and other ericaceous shrubs forming a low shrub layer. The herbaceous layer is generally sparse, with bracken fern (*Pteridium spp.*), wild sarsaparilla (*Aralia nudicaulis*), wintergreen (*Gaultheria procumbens*), Pennsylvania sedge (*Carex pensylvanica*), and, less commonly, pink lady's slipper (*Cypripedium acaule*). Occasional red maples, birches, aspen, and ash contribute to the canopy. This forest cover type is typical of sandy soils in southeastern MA and is present in most upland areas outside the mowed runway safety zones at the Airport.

The abundant mast producing trees (oaks and maple) create ample forage opportunities for mammals and birds. Species such as white-tailed deer, turkey, and grouse may be present to abundant through the larger habitats blocks and potentially present in all available habitats. The forest canopy also creates nesting, feeding, and breeding areas for common songbirds such as blue jay, eastern towhee, American crow, hairy woodpecker, downy woodpecker, pileated woodpecker, black capped chickadee, tufted titmouse, white breasted nuthatch, and song sparrow.

The dry nature of this habitat limits its usefulness to herpetiles. However, species that spend a portion of their lifecycle in uplands and may be encountered on site include wood frog, American toad, spotted salamander and red back salamander. These species likely find cover, shelter, forage, and overwintering locations in these forests, making them a particularly important habitats for species that need a combination of uplands and wetlands for their life cycle.

Vernal Pools*:* As previously mentioned, one isolated ponded area on the Airport property is a Certified Vernal Pool on the current MA NHESP mapping. Additionally, one potential vernal pool is identified off the Airport property to the northwest across George Ryder Road (see Figure 5-8). This certified vernal pool was described in more detail above in section 5.3.12.

Due to the sensitivity of this area, a special VMA and procedures have been established to cut within this area. No work is proposed in or near the off-Airport potential vernal pool.

Landscaped Developed Upland: This community is highly varied and consists of landscaped portions of residential and industrial properties in vicinity of the Airport. Canopy in this community can vary from mixed assemblages of the native communities above, including species such as oaks, cherry, red maple, pitch pine and white pine, to horticultural varieties that are typically used for landscaping such as Norway maple (*Acer platanoides*), crimson maple (*Acer platanoides* cv.), horse chestnut (*Aesculus hippocastanum*), crab apple (*Malus fusca*) and catalpa (*Catalpa speciosa*). The landscaped canopy cover varies widely, ranging from low percentage cover in lawn areas to more typical forested communities that sometimes exist in backyards. The understory of this community is typically limited to landscaped turf lawns, mulched areas, and/or ornamental shrub plantings.

This natural community offers typical backyard habitat similar to other landscaped areas. These habitats are ubiquitous throughout suburban areas. Typical species that utilize these habitats are generalist species that are well suited to human disturbance. Typical mammalian species that would utilize these habitats include grey squirrel, eastern chipmunk, moles, mice, raccoons, striped skunks, northern flying squirrel and opossum. Often loose and/or feral domestic animals (pets) such as cats and dogs are also common and have a significant impact on natural community dynamics. Occasional visitors from the adjacent natural areas would also be expected, including red fox, gray fox, white tailed deer and coyote. However, these more secretive species would not use these areas as their primary habitat. Expected include common feeder birds, both native and naturalized species, such as house sparrow, house finch, common grackle, blue jay, northern cardinal, mourning dove, rock dove, tufted titmouse, and American robin. Herpetiles would be encountered less frequently in these disturbed and manicured areas, with species such as American toad and common garter snake being most common in a suburban/residential setting.

Table 5-3A: Observed and Potential Amphibian Species within VMAs by Community Type

Common Name	*Scientific Name*	Grassland	Shrubland	Upland Forest	Wetland Forest
Spotted Salamander	*Ambystoma maculatum*		✓	✓	✓
Eastern Red-backed Salamander	*Plethodon cinereus*		✓	✓	✓
American Toad	*Bufo americanus*		✓	✓	
Fowler's Toad	*Bufo fowleri*		✓	✓	
Spring Peeper	*Pseudacris crucifer*				✓
Gray Treefrog	*Hyla versicolor*				✓
American Bullfrog	*Rana catesbeiana*				✓
Green Frog	*Rana clamitans*				✓
Pickerel Frog	*Rana palustris*				✓
Wood Frog	*Rana sylvatica*			✓	✓

Table 5-3B: Observed and Potential Mammal Species within VMAs by Community Type					
Common Name	***Scientific Name***	**Grassland**	**Shrubland**	**Upland Forest**	**Wetland Forest**
Opossum	*Didelphus virginiana*		✓	✓	✓
Common Water Shrew	*Sorex palustris*				✓
Northern Short-tailed Shrew	*Blarina brevicauda*				✓
Star-nosed Mole	*Condylura cristata*				✓
Little Brown Bat	*Myotis lucifugus*				✓
Big Brown Bat	*Eptesicus fuscus*			✓	✓
Eastern Cottontail	*Sylvilagus floridanus*		✓		
Eastern Chipmunk	*Tamias striatus*			✓	
Woodchuck	*Marmota monax*	✓			
Eastern Gray Squirrel	*Sciurus carolinensis*			✓	
Red Squirrel	*Tamiasciurus hudsonicus*			✓	
Northern Flying Squirrel	*Glaucomys sabrinus*			✓	
Southern Flying Squirrel	*Glaucomys volans*			✓	
Beaver	*Castor canadensis*				✓
White-footed Mouse	*Peromyscus leucopus*	✓	✓		
Deer Mouse	*Peromyscus maniculatus*	✓	✓		
Southern Red-backed Vole	*Clethrionomys gapperi*		✓	✓	
Meadow Vole	*Microtus pennsylvanicus*				
Muskrat	*Ondatra zibethicus*				✓
Meadow Jumping Mouse	*Zapus hudsonius*	✓			
Coyote	*Canis latrans*		✓	✓	✓
Red Fox	*Vulpes vulpes*	✓	✓		
Common Gray Fox	*Urocyon cinereoargenteus*		✓	✓	
Common Raccoon	*Procyon lotor*		✓	✓	✓
Long-tailed Weasel	*Mustela frenata*		✓		✓
Striped Skunk	*Mephitis mephitis*		✓	✓	
White-tailed Deer	*Odocoileus virginianus*		✓	✓	✓

Table 5-3C: Observed and Potential Avifauna Species within VMAs by Community Type					
Common Name	***Scientific Name***	**Grassland**	**Shrubland**	**Forest (Upland and Wetland)**	**Shore**
Great Blue Heron	*Ardea herodias*			✓	
Canada Goose	*Branta canadensis*			✓	
Mallard	*Anas platyrhynchos*			✓	
Cooper's Hawk	*Accipiter cooperii*		✓		
Red-tailed Hawk	*Buteo jamaicensis*	✓	✓	✓	
American Kestrel	*Falco sparverius*	✓			
Ring-necked Pheasant	*Phasianus colchicus*		✓		
Northern Bobwhite	*Colinus virginianus*	✓	✓		
Killdeer	*Charadrius vociferus*	✓			
Spotted Sandpiper	*Actitis macularia*	✓			
American Woodcock	*Scolopax minor*		✓	✓	
Mourning Dove	*Zenaida macroura*	✓			
Chimney Swift	*Chaetura pelagica*	✓			
Downy Woodpecker	*Picoides pubescens*			✓	
Hairy Woodpecker	*Picoides villosus*			✓	
Least Flycatcher	*Empidonax minimus*		✓	✓	
Eastern Phoebe	*Sayornis phoebe*		✓	✓	
Eastern Kingbird	*Tyrannus tyrannus*	✓			
Red-eyed Vireo	*Vireo olivaceus*		✓	✓	
Blue Jay	*Cyanocitta cristata*		✓	✓	
American Crow	*Corvus brachyrhynchos*	✓	✓	✓	
Black-capped Chickadee	*Poecile atricapillus*		✓	✓	
Tufted Titmouse	*Baeolophus bicolor*		✓	✓	
Carolina Wren	*Thryothorus ludovicianus*			✓	
House Wren	*Troglodytes aedon*		✓		
Blue-gray Gnatcatcher	*Polioptila caerulea*		✓		
Eastern Bluebird	*Sialia sialis*	✓			
Veery	*Catharus fuscescens*		✓	✓	
American Robin	*Turdus migratorius*	✓			
Gray Catbird	*Dumetella carolinensis*			✓	
Northern Mockingbird	*Mimus polyglottos*		✓		
Brown Thrasher	*Toxostoma rufum*		✓		
European Starling	*Sturnus vulgaris*	✓	✓	✓	

Eastern Towhee	*Pipilo erythrophthalmus*		✓		
Chipping Sparrow	*Spizella passerina*	✓			
Field Sparrow	*Spizella pusilla*	✓			
Vesper Sparrow	*Pooecetes gramineus*	✓			
Fox Sparrow	*Passerella iliaca*		✓		
Song Sparrow	*Melospiza melodia*		✓	✓	
Dark-eyed Junco	*Junco hyemalis*		✓	✓	
Northern Cardinal	*Cardinalis cardinalis*		✓	✓	
Red-winged Blackbird	*Agelaius phoeniceus*	✓			
Eastern Meadowlark	*Sturnella magna*	✓			
Common Grackle	*Quiscalus quiscula*	✓			
Brown-headed Cowbird	*Molothrus ater*	✓			
American Goldfinch	*Carduelis tristis*	✓			
House Sparrow	*Passer domesticus*	✓			
American Oystercatcher	*Haematopus palliates*				✓
Belted Kingfisher	*Megaceryle alcyon*				✓
Black-crowned Night-Heron	*Nycticorax nynticora*				✓
Brant	*Branta bernicla*				✓
Common Merganser	*Mergus merganser*				✓
Common Loon	*Gavia immer*				✓
Common Tern	*Sterna hirundo*				✓
Double-crested Cormorant	*Phalacrocorax auritus*				✓
Great Black-backed Gull	*Larus marinus*				✓
Great Egret	*Ardea alba*				✓
Herring Gull	*Larus argentatus*				✓
Laughing Gull	*Leucophaeus atricilla*				✓
Least Tern	*Sternula antillarum*				✓
Northern Flicker	*Colaptes auratus*			✓	
Red Knot	*Calidris canutus*				✓
Ring-billed Gull	*Larus delawarensis*				✓
Ruby-throated Hummingbird	*Archilochus colubris*			✓	
Ruddy Turnstone	*Arenaria interpres*				✓
Rusty Blackbird	*Euphagus carolinus*			✓	
Sanderling	*Calidris alba*				✓
Semipalmated Plover	*Charadrius semipalmatus*				✓

Shearwater	*Rynchops niger*				✓
Tree Swallow	*Tachycineta bicolor*	✓			
Willet	*Tringa semipalmata*				✓

Table 5-3D: Observed and Potential Reptile Species within VMAs by Community Type

Common Name	*Scientific Name*	Grassland	Shrubland	Upland Forest	Wetland Forest
Snapping Turtle	*Chelydra serpentina*				✓
Painted Turtle	*Chrysemys picta*				✓
Eastern Racer	*Coluber constrictor*		✓	✓	
Spotted Turtle	*Clemmys guttata*				✓
Ring-necked Snake	*Diadophis punctatus*		✓	✓	
Northern Watersnake	*Nerodia sipedon*				✓
DeKay's Brownsnake	*Storeria dekayi*		✓	✓	
Red-bellied Snake	*Storeria occipitomaculata*		✓	✓	
Eastern Ribbonsnake	*Thamnophis sauritus*		✓	✓	
Common Gartersnake	*Thamnophis sirtalis*		✓	✓	

5.3.14 Rare or Protected Species

In compliance with FAA regulations (Order 5050.4a) and the Fish and Wildlife Coordination Act (16 U.S.C 661-667d) FAA-funded projects must consider state and local wildlife regulations. A review of the current (August 2017) Massachusetts Natural Heritage and Endangered Species Program Mapping of the airport and surrounding area indicates that portions of the VMAs on the southeast side of the Airport are within Priority Habitats for Rare Species. No Estimated Habitats for Rare Species are found on site (Figure 5-8). Additionally, one Certified Vernal Pool which was discussed in Section 5.3.8 is located on the Airport property and as discussed in Section 5.3.3 there is also an ACEC located near the Airport.

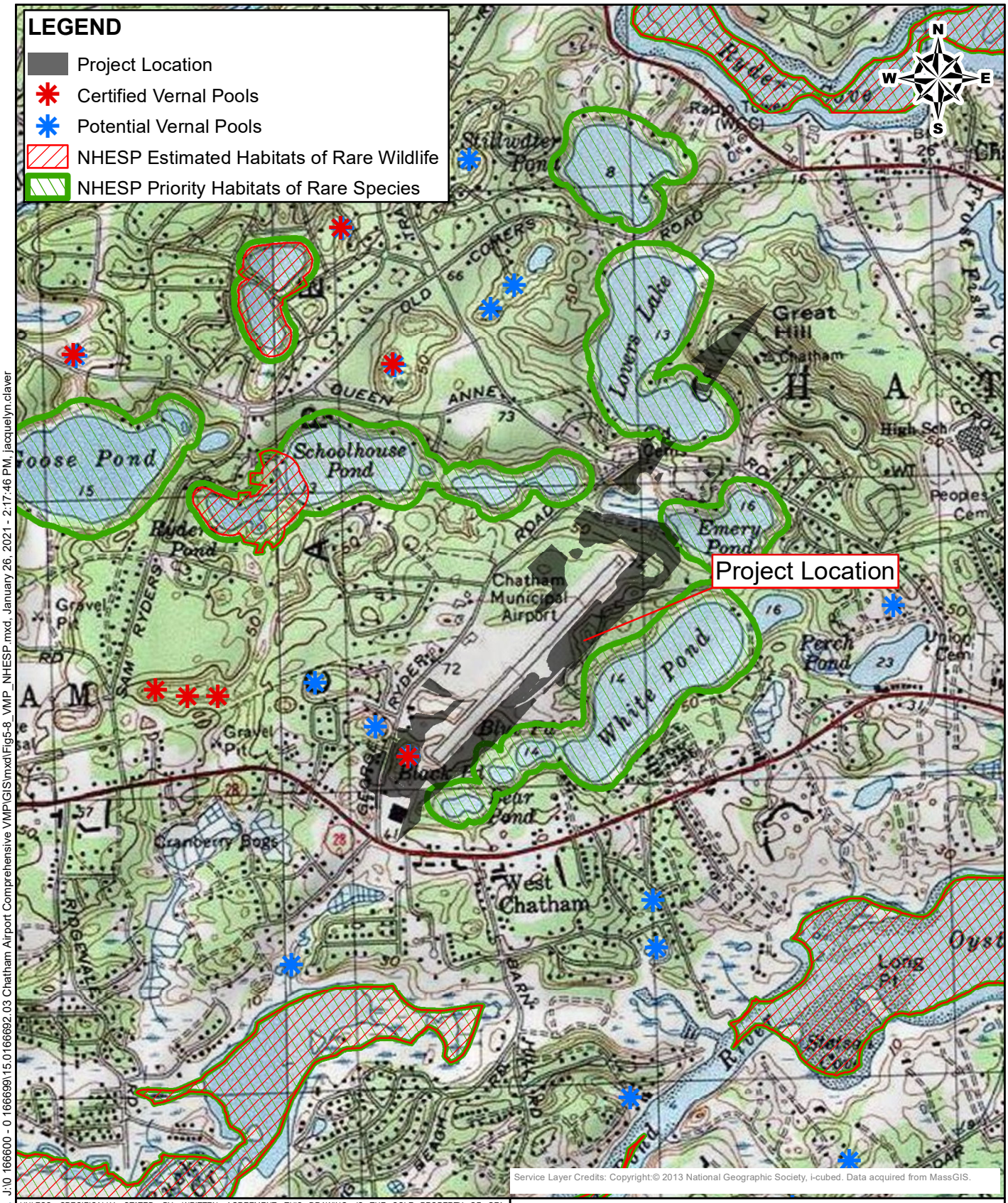
Based on a review of the Information for Planning and Consultation (IPaC) database hosted by US Fish & Wildlife Service (USFWS), the project area may have northern long-eared bat (NLEB) (*Myotis septentrionalis)*. The Massachusetts NHESP NLEB map was reviewed and the project area is outside the protected areas around winter hibernacula and no occupied maternity roost trees are mapped in the vicinity of the Airport. Should the Airport pursue tree removal activities between June 1 and July 31, additional surveys maybe required to confirm absence of maternal roost trees.

5.3.15 Wetland Restriction Orders

There are no Wetland Restriction Orders (WROs) in the areas identified for vegetation removal at the Airport. Thus, WROs do not present a constraint to the implementation of the VMP.

5.3.16 Wild and Scenic Rivers

Based on review of Mass GIS datalayers, there are no State or locally designated “Scenic Rivers” as defined by MGL Ch. 21, Sec17b in the project area. Consequently, this issue does not present a constraint to the implementation of the VMP.



0 750 1,500 3,000

SCALE IN FEET

CHATHAM AIRPORT VMP
CHATHAM, MA

NHESP MAP

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
GALE ASSOCIATES INC
163 LIBBEY PARKWAY
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIG 5-8
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 1,500 ft	
DATE: 03/03/2021	PROJECT NO: 15.0166692.03	REVISION NO:	

5.4 DESCRIPTION OF VEGETATION MANAGEMENT REMOVAL METHODS

5.4.1 General Physical Removal Methods

The 1993 GEIR outlines several vegetation removal methods and categorizes them based upon their potential environmental impacts. The removal methods recommended are a function of the vegetation type, environmental constraints, and access conditions in a particular VMA and are consistent with the GEIR, with some modifications proposed to address specific site conditions and best protect the environment. In addition, the wetlands regulations, Pleasant Bay ACEC, and vernal pools impose some methodological constraints. Physical removal methods are the preferred management technique as they completely remove the penetrations from the airspace. The methods section (Section 5.4.2) and the figures identify where techniques will occur.

Table 5-4 describes the relationship between the methodology names used in this VMP and those used in the GEIR. A comparison of the VMP and the GEIR indicates that the "Drop and Lop" and "Fell and Lop" are essentially the same methodologies. This VMP uses "Mechanical" to refer to the mechanized methodology. This VMP uses the term "hand cutting" for removal performed by chain saw. Regardless, although the names are different, all tree removal methodologies involve the cutting, dropping, or felling of trees and then the reduction in size of the remaining slash by chipping, mowing or lopping. Logs are either left in place and cut in 1-4 sections or are removed. The specific technique used to cut-up the slash is a function of the tree size, the soil conditions, and the future use of the VMA.

Table 5-4: Names of Tree Removal Methods

Method Name in VMP	Method Name in GEIR
Logging Removal	Mechanized Felling
Mowing	Mechanized Felling
Stump Treatment	Cut-Surface Treatment

5.4.2 Description of Tree Removal Methods at the Airport

Vegetation management will be accomplished by several relatively consistent methodologies, although each technique is somewhat adapted to the unique conditions present at the Airport. All vegetation management falls into two broad categories: mowing or tree removal. These basic methods are discussed below. Specific techniques assigned to the Vegetation Management Areas (VMAs) are discussed in Section 5.5.

Mowing: Management of grass or existing shrub and low growth areas is accomplished by the following:

1. **Monthly Mowing (MM)**: Frequent mowing throughout the growing season in the runway safety areas adjacent to the runway and taxiway (actual frequency may vary depending upon rate of regrowth);

2. **Annual Mowing (AM)**: Typically, one late-season mowing of the grasslands outside the immediate runway safety areas, further from the active portions of the airfield, which minimizes potential wildlife disturbance. Some areas that are further from the runway i.e. the 10-30' height zone, the mowing may occur less frequently – every 1-3 years. In those areas, a flail mower or other rough mowing may be used to cut woodier habitat.

3. **Rough Mowing (RM)**: Mowing with a flail mower or Brontosaurus type of machinery which can mow shrubs and small saplings and occasional immature trees (typically < 5" diameter) within the areas peripheral to the airport grasslands, typically performed on a 3-5 year frequency.

In the vernal pool and immediate vicinity, mowing is not recommended. Mowing is not specified for any of the short term VMAs; however, it will be employed for long-term management.

Tree Removal: Tree removal is by one of the following methods:

1. **Logging Removal (LR):** Removal via mechanical equipment such as feller-bunchers, forwarders and skidders.
2. **Landscape Removal (LS):** Detailed tree removal, conducted with protective measures of structures and preservation of other landscape features. By its methodology, all LS removal is selective.


Removal of White Pines at Orange Municipal Airport

Technique Modifiers: The technique for each VMA may include one or more of modifier to describe the proposed management more specifically:

1. **Selective (s):** Canopy removal is limited to individual trees which exceed the local VMA height criteria. In the taller height zones at the Airport, selective cutting usually targets the tall pines that are the primary penetrating trees, particularly in the outer management zones. The exception to this is in areas closer to the airfield, where the VMA height criteria may also necessitate the removal of shorter, commonly deciduous species.
2. **Stump (t):** Treatment of remaining stumps with herbicides and/or removal by grinding or other methods to prepare the VMA for a long-term mowing management strategy.
3. **Leave Shrubs (h):** During tree removal, the shrub layer will be left as intact as feasible and will be allowed to regenerate. These VMAs contain species which, at maturity, are unlikely to penetrate the airspace.
4. **Vernal Pool (v):** Special management zone around the vernal pool which may include selectively leaving cut material and/or a tailored sequence of removal over several years to reduce the full effect of the loss of shading.

5.4.3 Selection of Vegetation Management Methodologies at Chatham Airport


VMP Log Staging Area, Westfield-Barnes Municipal

Tree removal methodology in the VMAs depends on the land cover condition, the suitability of the method for each condition, and land ownership. At the Airport, two basic conditions apply where tree removal is needed:

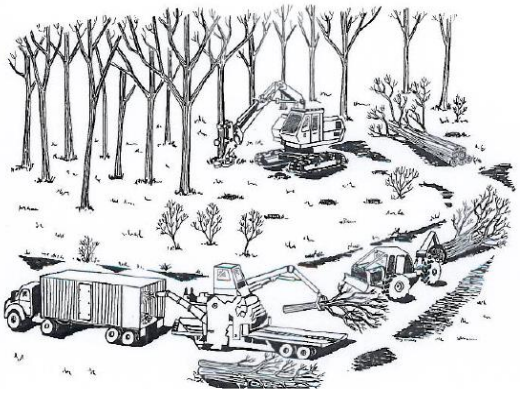
1. Uplands with stable sandy soil conditions that would typically accommodate rubber-tire logging equipment in under normal site conditions; and
2. Vernal Pool and immediate area with predominantly stable surface soils that would support low or moderate pressure tracked or rubber tire logging equipment for much of the year.

On Airport property, the most efficient mechanized removal is recommended because the soil conditions will readily support most logging equipment without excessive need for restoration of the soils following operations. Therefore, in uplands, typically **Logging Removal** is recommended. Specific equipment selection is largely left to the discretion of the contractor; however, contracts will include specifications regarding soil conditions and erosion and sedimentation control.

Within the vernal pool and immediately surrounding areas, mechanized logging is limited to feller-bunchers or forwarders, with loading to defined staging areas outside of wetlands, where logs can be directly removed on defined pathways or the entire tree chipped into waiting trucks. For example, in areas where it is desirable not to leave any slash (i.e., tree limbs,

etc.), chipping of the entire tree after removal by a feller-buncher unit may be preferred, if ground conditions and access are amenable to the use of this method. In areas around the vernal pool, some felled trees and/or slash may be left to minimize mechanical disturbance and topography change. No slash piles over two feet tall will be left.

Logging Removal (LR) and Rough Mowing (RM) can be loosely grouped with mechanized felling as Tier 3 or moderate impact vegetation removal method. In recent vegetation removal at other airports, however, mechanical felling with adequate controls resulted in minimal soil or wetland impact, when activities are limited based upon soil conditions in the project specifications. The use of selective logging allows for the removal of only those trees that currently penetrate or threaten to penetrate PZs. This results in less impact to the understory while eliminating the obstructing vegetation.



Chip-harvesting system with feller-buncher, skidder, whole-tree chipper and chip truck (source: U.S. Forest Service)

Logging Equipment includes the feller-buncher, forwarder, and skidder. A chipper and chip truck may also be used if the contractor elects to remove the trees as chips. The following is a brief description of the various pieces of equipment.

- A **feller-buncher** is a type of harvester. It is a motorized vehicle with an attachment that can rapidly cut and gather several trees before felling them. A feller buncher consists of a standard tracked heavy equipment base with a tree-grabbing device furnished with a circular saw or a shear—a pinching device designed to cut small trees at the base. The machine then places the cut tree in a stack suitable for a skidder or forwarder, or other means of transport (yarding) for further processing (e.g., delimbing, bucking, loading, or chipping). There are also wheeled feller-bunchers with no articulated arm. Instead, this type of vehicle drives close and grabs the tree.

Feller Buncher Operating at Orange Airport VMP

- A **skidder** is any type of heavy vehicle used for pulling cut trees out of a forest in a process called "skidding", in which the logs are transported from the cutting site to a landing. On a cable skidder, the cable is reeled out and attached to a pull of cut timber, and then the winch pulls the load toward the skidder. The winch or grapple holds the trees while the skidder drags them to a landing area. Alternately, some skidders have a hydraulic grapple bucket instead of a winch, and the bucket attached to the skidder by a boom grabs and lifts the timber.

Skidder in use at Unknown Location

- A **forwarder** is a forestry vehicle that carries felled logs from the stump to a roadside landing. Unlike a skidder, a forwarder carries logs clear of the ground, which can reduce soil impacts but tends to limit the size of the logs it can move. Forwarders are typically employed together with harvesters in land-clearing operations.

Forwarder Operating at Orange Municipal Airport VMP

Landscaped Removal (LS) is recommended in residentially or commercially landscaped areas where individual trees are penetrating or threatening to penetrate the PZs. The equipment may be limited to chain saws and hand work, with dropping of the tree in sections by rope. Larger equipment may be used as the residential conditions safely allow.

5.4.4 Integrated Vegetation Management

Integrated Vegetation Management (IVM) is a holistic, conceptual approach, which examines the full range of short- and long-term measures necessary to efficiently manage vegetation in an environmentally sensitive manner. An IVM approach addresses the unique sensitivities of effected wetland and upland areas. The concept of IVM was developed after the completion of the 1993 GEIR, although the individual components used to create a comprehensive vegetation management program were individually discussed within the GEIR. The GEIR was primarily developed to address the impacts of airport vegetation management within wetlands. However, because an IVM approach is more comprehensive, it necessarily addresses the entirety of vegetative complexes surrounding an airport, and primarily takes a long-term management viewpoint, minimizing short-term, reactive/emergency vegetation management.

Pitch Pine Removal at Turners Falls Municipal Airport

IVM combines various mechanical removal techniques, mechanical and/or chemical follow-up treatments, and the encouragement of natural processes to create "meta-stable vegetative communities" that are compatible with the protected airspace. In developing the VMP, an IVM approach naturally evolves as the unique geographic, physical, and biological aspects are considered in the context of creating an overall plan in an appropriately integrated, complementary program to enhance long term effectiveness in vegetation control, cost effectiveness, and minimization of environmental impacts.

Central to the concept of IVM, is the development of the "meta-stable vegetative zones" based upon encouraging species-groups of vegetation with growth habits compatible with the PZ. Generally, further from the runways taller vegetation can be permitted without causing safety concerns. The VMP identifies vegetation management zones or areas within which species that would become penetrations are discouraged by management such as selective cutting and herbicide use. As the remaining species which will not grow to penetration height become dominant, they competitively exclude the undesirable species, helping to maintain the zone and minimize future maintenance. By minimizing future maintenance activities, future wetland intrusion and operational costs are also minimized. Zonation, by its nature, encourages diversity in the vegetative mix and thereby enhances the opportunity for a greater diversity of wildlife habitat.

Integrated Vegetation Management combines sequential use of mechanical, chemical, and biological treatments. The typical approach is to mechanically remove the penetrating trees/shrubs, chemically treat fast growing re-sprouting stumps and/or invasive species and encourage the natural development of desirable species which suppress undesirable plants through shading and other biological means. Once the compatible vegetative structure is established, periodic herbicide treatment programs may be needed every two to five years to maintain the plant height zones and prevent succession to vegetative communities with taller species. The typical zones surrounding the airfield are as follows:

Zone 1: Areas closest to the runway which includes the primary surface, safety, and in-field areas. It is typically mown several times each year.

Zone 1A: Areas between the primary surface and safety areas and the shrub or forest edge. Non-woody species (i.e., grasses and herbaceous plants), three feet tall or shorter are permitted. This zone typically encompasses annual mowing and monthly mowing management areas.

Zone 2: Areas further from the primary and approach surface composed of low growing bushes ($\leq$ 10 feet). This zone is typically called the short shrub zone and managed to remove all but short shrubs.

Zone 3: Areas of tall growing shrubs and small trees (30 to 50 ft). This zone is called the tall shrub and/or short tree zone, with most shrubs allowed and smaller trees that will not reach penetration height.

Zone 4: Areas of tall trees with a maximum height of 90 feet. This zone is typically called the tall tree zone, where most trees can grow to maturity, only removing the tallest trees, typically white pine.

For the Airport, the IVM approach is reflected within Table 5-6 primarily under the Long-Term Plan and management approach. The zonation concepts are reflected within the individual Long-Term VMAs. For select locations, where the desired vegetative community is shrublands, short-term application of herbicides is recommended to control regrowth patterns as described below. The proposed areas of herbicide use are presented within the YOP.

For long-term management at the Airport, tree height management zones are shown in 30 foot height zones. However, in some of the transitional zones, the 7:1 slope creates such a narrow area for the 10-30 foot zone that it may not require different maintenance than the 3-10 foot zone. The Part 77 surfaces, somewhat adjusted relative to the ground contours, are shown on Sheet 2 with the long term maintenance areas (see Section 5.5.3).

5.5 SHORT-TERM & LONG-TERM VMP

5.5.1 Overview

Table 5-5 and Appendix 1 present the Short-Term VMP for the Airport. Likewise, Table 5-6 and Appendix 2 present the Long-Term VMP. The Short-Term Plan focuses on major areas of tree removal where the woodlands are relatively mature and have not been managed, whereas the Long-Term Plan focuses on a scheduled maintenance approach to the whole airport and VMAs once the Short-Term Plan has been implemented and the area requires maintenance. However, the Short-Term Plan will not be implemented all at once, and therefore, the implementation of both plans is anticipated to overlap to some extent. The anticipated general sequence is as follows:

1. Implementation of Short-Term VMP on-airport or where access permissions exist (anticipated start 2022);
2. Implementation of remaining on-airport and easement portions of Short-Term VMP;
3. Ongoing annual or other maintenance of areas treated in steps 1 and 2 in accordance with Long-Term VMP;
4. Prioritization and seeking of easement acquisition in critical non-airport lands;
5. Implementation of Short-Term VMP in new easement areas; and
6. Implementation of Long-Term VMP in new easement areas.

A more detailed YOP for the VMP is presented for the next 5 years in Section 6

5.5.2 Short-Term Plan

Techniques in VMAs: Operational considerations for VMP techniques are both general and site specific. Given the variable conditions at the Airport, the Short-Term VMP resulted in 40 VMAs, 23 of which are on Airport property and are categorized as Logging Removal (LR) with modifiers. In areas identified as LRs, a portion of the canopy will be left in place as a portion of the trees do not pose a near-term penetration risk. Under both LR and LRs, standard logging is performed, and cut trees are removed, where possible. Limited slash may be left with specifications (e.g., < 2 ft height above grade), but typically, slash is removed and chipped. Herbicide treatment of stumps should be done in LR areas where long-term height zones are <40 ft, to minimize the growth of stump suckers which can regrow at a rate of several feet per year and rapidly regain penetration height. A sub-category for Stump Removal (typically by grinding; “t”) is specified where the long-term management technique will be annual mowing. The area will be initially cleared using mechanized equipment such as a Brontosaurus or flail mowing. In addition to grinding stumps flush to the ground, other obstructions (e.g., rocks) that would inhibit routine maintenance by conventional rotary mower equipment (e.g., brush hog) in use by the Airport

may need to be removed. Understory shrubs are not removed, and though they may be damaged during operations, they tend to recover within one growing season, responding to the increased light availability.

Special treatment is required within and adjacent to the vernal pool. Therefore, while this area is identified as LR, applicable VMAs include the modifier "v". This work will be phased over multiple years to limit the severity of tree removal within any given year and minimize shade loss while allowing for the regrowth of lower vegetation. This treatment will be coordinated with the Chatham Conservation Commission as part of the permitting under the Wetlands Protection Act.

Off Airport Areas: The off-airport areas (2 VMAs with easements and 15 without) are categorized as Landscape Removal (LS) with modifiers. In LS areas, it is necessary to minimize aesthetic impacts to residential and commercial properties, and take care during removal to avoid utilities, protect nearby structures, remove tree materials, and restore damaged portions of lawns and other landscaping features. Under LS, individual trees may be removed section by section using climbers, bucket trucks or other means. Brush will be chipped, logs removed, and stumps pulled, followed by regrading of the soil, and seeding/mulching as necessary. Work under LS is likely to be uniquely crafted to meet the landowners' requirements to the extent required under the easements or other permissions yet to be obtained.

Table 5-5: Short-Term Vegetation Management Techniques

RW	Treatment Type	On-Airport		Off-Airport, Easement		Off-Airport, No Easement		Future Maintenance
		VMA	Area (ac)	VMA	Area (ac)	VMA	Area (ac)	
Runway 6	Logging Removal (LR)	6A-LRsv-1	2.21	--	--	--	--	Vernal Pool Management
		6B-LRt-1 6C-LRt-1	7.54	--	--	--	--	Annual Mowing
		6D-LRh-1	0.22	--	--	--	--	Annual Mowing and/or Selective Logging Removal
		6H-LRs-1	0.47	--	--	--	--	Selective Logging Removal
		6E-LRsh-1 6F-LRsh-1 6G-LRsh-1 6H-LRsh-1 6K-LRsh-1 6M-LRsh-1	5.21	6L-LSsh-2	2.86	--	--	Selective Logging Removal
	Landscape Removal (LS)	--	--	--	--	6I-LSt-3 6J-LSt-3	2.41	Landscape Removal
		--	--	--	--	6N-LSst-3	0.62	Landscape Removal
	Total		15.65		2.86		3.03	
Runway-24	Logging Removal (LR)	24A-LRt-1 24B-LRt-1	9.41					Annual Mowing
		24C-LRh-1 24E-LRh-1 24F-LRh-1	7.58					Selective Logging Removal
		24G-LRs-1	4.03					Selective Logging Removal
	Landscape Removal (LS)					24H-LSst-3 24J-LSst-3 24K-LSst-3	8.77	Landscape Removal
				24I-LSsh-2	4.21		8.77	Landscape Removal
	Total		21.02		4.21		11.8	
	Grand Total	55.81						

Note: VMA's are grouped by type, for example, there may be more than one 32-LR-1, yet only one title is displayed for total area (ac). Modifiers include: ***(s)*** *selective for penetrations;* ***(t)*** *Stump Treatment;* ***(h)*** *leave shrubs in place* ***(v)*** *cutting in Vernal and Buffer.*

Utilization of Herbicides: Herbicides to control regrowth of vegetative obstructions and invasive species have been used in the past and are still considered for the Airport as follow-up treatments after initial major tree cutting as part of the IVM approach. The limited use of herbicides has been recommended for the first few years following the initial heavy cutting of woody growth, especially on tree stumps and roots. Mowing can be used to control regrowth in some areas, but herbicides are used to suppress rapid regrowth of suckers from stumps of cut trees, which often exceed 3-5 feet of new growth per year. The rapid regrowth of these species needs to be addressed to maintain the vegetation within the treatment zone. The rapid regrowth from the stumps occurs due to the large root mass of the still viable stump. By herbicide treating the stump regrowth, the entire stump can be killed, limiting the potential for future maintenance. Over time, the shrubs will tend to grow thick enough to shade out the tall tree seedlings. The herbicides are most often applied directly by hand, via treatment of the cut stumps or by direct spraying of the leafy foliage of the target plant.

The use of herbicides in or near wetlands can be performed in an environmentally sensitive manner, and such use is strictly regulated by the MA Department of Food and Agriculture (DFA). Airport VMPs follow the DFA guidelines, and are specifically reviewed by the DFA. All herbicides in MA must be registered and approved for a specific use by the U.S. EPA and the DFA. In addition, herbicide use in or near wetland resource areas requires additional levels of regulatory review. The DFA's VMP Advisory Panel has determined that herbicides, when applied under the guidance of an IVM program and other conditions, have less impact on wetlands than mechanical only techniques (Environmental Consultants, Inc. 1989).

In Massachusetts, the Rights of Way Management Regulations apply (333 CMR 11.00), which dictate special procedures or limitations on the frequency of application allowed within specified distances to "sensitive areas" such as public and private drinking water supplies, standing or flowing water, agricultural and inhabited areas. Additional permitting would be required for use in water, but this is not needed at KCQX to control vegetative penetrations. Other typical application guidelines include:

- A qualified, DFA-licensed applicator must apply the herbicide.
- Vegetation management crews must exercise care to ensure that low-growing desirable species and other non-target organisms are not unreasonably affected by the application of herbicides.
- Herbicides must be handled and applied only in accordance with labeled instructions.
- Herbicides must not be applied during the following adverse weather conditions: high wind, dense fog, moderate to heavy rainfall, high temperatures and low humidity for volatile herbicides, deep snow preventing adequate coverage of target plants.
- At least 21 days in advance of herbicide application, the DFA, the Town/City, the Board of Health, and Conservation Commission shall be notified of the appropriate date of the application.
- No foliar application of herbicides is used to control vegetation over 12 feet tall except for side trimming.

Experience with herbicide use at airports has proven that the controlled use of the appropriate herbicide usually is a viable method for vegetation management in PZs. While various formulations of herbicides are used at different airports, glyphosate is commonly used (brand name, Roundup® or Accord®), as well as imazapry formulations (e.g., Arsenal®). Glyphosate works by inhibiting photosynthesis. At Beverly and Orange Airports, water and wells were tested for glyphosate before and after herbicide use. In all cases, no herbicide was observed present. Glyphosate is typically applied directly to stumps or leaves by hand spraying with a backpack sprayer to limit the amount of herbicide used or reaching non-target vegetation. Glyphosate that reaches the ground will stay in the soil and rapidly biodegrade.

In 2018, the Chatham Board of Selectmen voted to have Town staff voluntarily discontinue the use of Glyphosate on town-owned properties by all Town departments. Given this, Glyphosate, while it may be used at the Airport; is discouraged. Should Glyphosate treatment be used, it should be contractually restricted through the explicit inclusion of best management practices and mitigating conditions.

5.5.3 Long-Term Plan

Maintenance of Long-Term VMAs: Table 5-6 identifies the Long-Term maintenance to occur in the various VMAs (see Appendix 2). Monthly Mowing (MM) is identified in the primary surfaces of the Airport as part of the Long-Term plan, which is already ongoing. Under Annual Mowing (AM). Mechanized equipment will be used to "mow" all vegetation less than 3" in diameter, using a large rotary tow-behind mower, or side arm mower. This approach is often used in areas where the height zones are low and trees, saplings, and taller shrubs would not be allowed.

Within the long-term plan, there is a special management zone for the vernal pool on airport property. Within this area, only trees that are actual or potential (within 10') penetrations will be removed, leaving shorter trees and shrubs intact. Methods of removal will vary and will likely be subject to an Order of Conditions issued by the Chatham Conservation Commission. Methods may include manual removal (climbers) or drop and lop methodology with leaving some cut trees for habitat purposes after cutting. Topping may also be used to remove the part of a tree that is the penetration while leaving lower portion for overstory cover of the ground and to shade the pool.

Long-Term maintenance tree removal will be within discrete height management zones, using conventional mechanized logging (LR) and landscape removal (LS) techniques on VMAs. Operational specifications will address variable microscale site conditions that may exist within the VMAs.

Table 5-6: Long Term Vegetation Management Techniques

Treatment Types	Treatment Sub-Category	Area (ac)			Total Acreage
		On-Airport	Easement	Off-Airport	
Monthly Mow (MM)	-	38.17	-	-	38.17
Annual Mow (AM)	-	14.91	-	-	14.91
Logging Removal (LR##)	LR10	1.57	-	-	1.57
	LR20	9.37	0.14	-	9.51
	LR30	1.65	0.54	-	2.19
	LR40	9.12	0.39	-	9.51
	LR60	2.24	-	-	2.24
	LR80	5.70	-	-	5.70
Landscape Removal (LS##)	LS10	-	-	0.70	0.70
	LS20	-	1.87	1.09	2.96
	LS40	-	2.34	5.24	7.58
	LS60	-	-	4.22	4.22
	LS80	-	-	11.65	11.65
	LS120	-	-	3.10	3.10
Vernal Pool (v)	-	1.88	-	-	1.88
Total	**-**				**115.88**

Invasive Species Management: Invasive species management has not been a focus at the Airport because invasive species are not overly common. Currently, there is some growth of invasive species within the annual mow area. These may require additional cutting or herbicide treatment to effectively manage the growth

5.6 IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS

The removal of trees unavoidably alters the vegetative assemblage, with the intended objective of maintaining the vegetation within permissible height zones. Initially, woodlands are converted to grasslands, shrublands, or immature woodlands. As a result, the most significant habitat change from management activities will be alteration to the canopy.

Effects on Wetlands and Habitat: Based on site conditions and experience with VMP implementation in Massachusetts over the past two decades, the greatest potential environmental effect of this VMP is alteration of habitat. These changes

can have collateral effects on hydrology and invasive species, among other concerns, and measures have been taken in the development of the VMP to minimize short-term and long-term impacts to the extent practicable and compatible with achieving the removal of penetrations into protected airspace. At the Airport, one particular concern is impacts to vernal pool and associated upland habitat. To address this, specific VMAs have been developed in and around this sensitive area to minimize impacts. Any alteration of habitat will favor some wildlife species over others. While removal of canopy trees will result in loss of habitat for some forest-interior species, the encouragement of herbaceous ground cover and understory shrub vegetation will provide favorable habitat for other wildlife species.

One VMA is associated with the upland area within 100 feet of the on-Airport vernal pool. No other VMAs are associated with wetlands. The single vernal pool VMA is 2.21 acres and no change in topography, hydrology, or net loss in vegetated area is anticipated; however, the vegetation will be converted from a taller plant community to a shorter one. Shorter growing tree species and shrubs can provide equal soil stabilization, water quality protection, and improved air quality.

Effects on Hydrology: Concerns always exist relative to effects on local hydrology from canopy removal. It is well understood in forestry science that tree canopies intercept rainfall and have some storage capacity on the limbs, trunk and foliage (during the growing season) that can attenuate short term runoff. Excess runoff with damage from erosion has been noted in areas clear cut by aggressive forestry practices. However, based upon years of vegetative monitoring at multiple MA airports, there have been no obviously evident changes in local hydrology as may be evidenced by increased stream scour; erosion and sedimentation; or diminished or increased flood boundaries associated with streams or pools, including vernal pools (Vegetation Management at Airports, 2004). Therefore, to the extent that such changes occurred, they appear to have been absorbed by the local terrain without obvious adverse environmental impacts.

There are perhaps several logical reasons why such hydrologic changes are unlikely to be observed at the Airport, even though some theoretical difference might be expected. First, the Airport is located on a large, naturally flat expanse of terrain in a sandplain-outwash area. As such, much rainfall is retained in the microtopographic “puddles” and is infiltrated into groundwater without ever reaching the local streams. Therefore, it is highly likely that the natural landscape will absorb the rainfall that normally would have been caught temporarily within the canopy of the removed trees.

Regrowth of the shrub layers after initial VMP trees removal is extremely rapid such that dense coverage by low growth shrubs and d herbaceous vegetation is achieved within one to two growing seasons (Vegetation Management at Airports, 2004). Following the initial physical removal of the tree canopy, the regrowth of the shrub layer occurs once the light reaches the former forest floor. This provides a dense, stem rich vegetative layer to intercept rainfall as well as dense, closely woven root structures to help stabilize the soils. In typical forest canopies, the canopy is at a uniform height such that the dense foliage does not carry into the lower forest strata. Therefore, once the dense shrub layer has become established, it tends to provide a near equivalent ability to temporarily intercept rainfall as does the existing “thin” canopy layer that was removed. Staged, multi-year cutting methodologies employed within the vernal pool areas would further minimize potential for hydrologic changes within this sensitive habitat.

The GENF (2007) for the Statewide VMP Program suggested that potential hydrological changes at airports might be greater if most or all of the following criteria for the VMP cutting area consisted of:

- a mature and contiguous woodland with continuous uninterrupted canopy;
- >20 acres within single sub-watershed;
- a relatively steep watershed (>10% slopes);
- slopes formed in low permeability soils (e.g., glacial till, glacio-lacustrine);
- drainage patterns primarily within small steep gradient, intermittent streams;
- streams are formed in erodible soils (e.g., outwash, pro-glacial outwash; noncompact glacial tills, or alluvial soils); and
- the VMP required total canopy removal.

While some of the above conditions are met by the Airport and significant areas of forest require removal under this VMP, the criteria of >10% slopes, poor soils, drainage patterns are not met, which likely provides significant mitigation of possible changes to hydrology, especially given the flat, pit and mound microtopography that typifies much of the areas. There is no reason to expect that the VMP practices will pose a significant risk of increased hydrology and associated impacts due to excess runoff.

Invasive Species: The removal of the tree canopy under a VMP can possibly create conditions that favor the expansion of invasive species into the exposed unoccupied niche, especially if such species are already living in the area. The VMP program will address these concerns, to prevent dominance in the vegetative regrowth by *Phragmites* or other invasive species. Follow-up work under the YOPs typically includes semi-annual or annual mowing of regrowth areas with the selective use of herbicides.

Permitted Impacts: The MA Wetlands Protection Act (WPA) makes allowances for vegetation management in wetlands under "Limited Project Status" (310 CMR 10.53) for several different types of projects, including airport VMPs for existing airfields. Actions taken within 350-feet of the vernal pool will require permitting under the WPA prior to VMA actions.

6.0 PROJECT IDENTIFICATION AND PRIORITIZATION

6.1 OVERVIEW

The progression of the VMP for the Airport is guided by successive, 5-year duration YOPs, which identify and prioritize vegetation management activities. Because this is the Airport's first VMP, the YOP will be for the years 2022-2027. The VMP and associated YOPs can be reassessed and updated as needed to incorporate vegetation management required to maintain protected airspace as additional off-airport cutting becomes necessary in the future.

Project prioritization is driven by both the location and extent of obstructions and the reasonable projection of the timing of implementation of various tasks under the VMP. The VMP activities needed for the on-airport or permissible areas are scheduled to begin in 2022. However, about 21% (11.81 acres) of the airspace obstructions are located outside airport-owned property and outside of current avigation easements and are expected to occur over the next decade as funding dictates (Table 6-1).

Consequently, the YOP is structured to focus first upon areas of obstructions that are located on airport-owned property or within existing avigation easements. Vegetation removal in other areas is also necessary but is shifted to the later years of the YOP to allow additional time to examine other alternatives (such as obstruction lighting in areas furthest from the airfield), acquire easements, or obtain permission to perform vegetation management in these areas. The YOP is a planning tool for VMP activities over the 5-year period. However, the YOP does not preclude vegetation clearing on an as-needed basis to address immediate safety concerns.

Table 6-1: Summary of Removal Methods and Acreage Affected

Removal Method	Upland (ac)	Wetland (ac)	Total (ac)
On-Airport Property			
Logging, Leave Shrubs (LRh)	**7.79**	**0**	**7.79**
Logging, Stump Treatment (LRt)	**16.95**	**0**	**16.95**
Selective Logging (LRs)	**4.50**	**0**	**4.50**
Selective Logging, Leave Shrubs (LRsh)	**5.21**	**0**	**5.21**
Selective Logging, Vernal Pool (LRsv)	**0**	**2.21**	**2.21**

Sub-Total	**34.45**	**2.21**	**36.66**
Within Easements			
Selective Landscape, Leave Shrubs (LSsh)	**7.07**	**0**	**7.07**
Sub-Total	**7.07**	**0**	**7.07**
Off-Airport Property			
Selective Landscape, Stump Treatment (LSst)	**9.38**	**0**	**9.38**
Landscape, Stump Treatment (LSt)	**2.43**	**0**	**2.38**
Sub-Total	**11.81**	**0**	**11.81**
Grand Total	**53.33**	**2.21**	**55.54**
On Airport = 66%, Easements = 13%, Off-Airport = 21%			

6.2 YEARLY OPERATIONAL PLANS

The YOP for the next 5 years is summarized in Table 6-2 and more specifically delineated in Tables 6-3 through 6-7 for each year to include the specific VMAs involved. Generally, the YOP is developed on the following principals and goals:

- The Monthly Mowing (MM) of the safety areas, and the Annual Mowing (AM) areas are cut each year.
- Logging removal of trees, according to the height zones and methods of the various VMAs in the Short Term Plan starts in 2023, and periodically thereafter to bring the airport into full VMP compliance. In stump treatment areas, following logging, the stumps will be ground to grade. The following year, herbicide treatments will be applied only to stumps which generate rapid growth and are in areas where this growth would result in frequent and intrusive mechanical maintenance. YOP years 1 through 3 will focus on areas within the Airport boundary fence.
- Easements and/or clearing permissions for off-airport parcels in Chatham have not yet been sought, and no permits exist to cut these areas. It is assumed that some acquisition will be completed within the 5-year YOP with initial implementation in Year 5 or extending into the next 5-year YOP Update.

Table 6-2: Summary of Proposed Five Year Yearly Operational Plan (YOP)

Year	Description of Area	Treatment Approach
1	Existing cleared airport areas	• **Monthly Mowing (MM) of In-Field and Safety Areas.** • **Annual Mowing (AM) of Non-Directional beacon area.** • Begin easement acquisitions. • Permitting or short-term VMP Implementation
2	Infield, and Safety Areas, Airport owned property on Runway 6 approach within boundary fence, including vernal pool area	• **Monthly Mowing (MM) of In-Field and Safety Areas.** • **Annual Mowing (AM) of peripheral areas fringing MM areas.** • Initial cutting of Vernal Pool "v" areas (Phase 1). • VMP Implementation on airport owned properties on Runway 6 approach. • Stump treatment (herbicide spray and/or stump grinding) as described in VMP. • Seek additional avigation easements.
3	Infield, and Safety Areas, All Airport owned property on Runway 24, Vernal Pool Area	• **Monthly Mowing (MM) of In-Field and Safety Areas.** • **Annual Mowing (AM) of peripheral areas fringing MM areas.** • Herbicide treatment of stumps in "t" areas cut in Year 2 to allow MM. • Annual Mowing of areas cut in Year 2 as described in Long Term Plan. • VMP implementation on airport owned properties on Runway 24 approach. • Easement acquisition of other off-airport parcels.

4	Infield, and Safety Areas, Easements, Vernal Pool Area	• **Monthly Mowing (MM) of In-Field and Safety Areas.** • **Annual Mowing (AM) of peripheral areas fringing MM areas, this now includes mowable areas created in Years 2 and 3.** • Herbicide treatment of stumps in "t" areas cut in Year 3 to allow MM. • Assessment of Vernal Pool Areas (v areas), and additional (Phase 2) cutting. • VMP implementation on off-Airport properties, as available. • Continue off-airport easement acquisition process.
5	Infield, and Safety Areas, Easements, Vernal Pool Area	• **Monthly Mowing (MM) of In-Field and Safety Areas.** • **Annual Mowing (AM) of peripheral areas fringing MM areas.** • VMP Implementation of any new off-airport easement obtained in Year 4. • Preparation and submission of YOP Update to Conservation Commission.

6.2.1 Year 1—Easement Acquisitions and Annual Mowing Operations

Table 6-3: Yearly Operation Plan – Year 1					
Treatment Type	**On-Airport**		**Off-Airport**		**Activity & Future Maintenance Notes**
	VMA	**Area (ac)**	**VMA**	**Area (ac)**	
Monthly Mowing	MM	38.17			Monthly
Annual Mowing	AM	1			Annual
Easement Acquisitions				11.81	

Based upon the 2018 obstruction analysis, the work to be performed in Year 1 will include the routine airport maintenance that is currently conducted, in addition to easement acquisition and permitting of the short term VMP implementation. The routine work on airport property totals 38.17 acres of monthly mowing of the existing grassland area (airfield) and approximately 1 acre of annual mowing in the grassland area around the nondirectional beacon at Runway 24 end.

6.2.2 Year 2—Easement Acquisitions, Annual Mowing Operations, and Short Term VMP Implementation on RW 6 Approach within Airport Fence

Table 6-4: Yearly Operation Plan – Year 2*					
Treatment Type	**On-Airport**		**Off-Airport**		**Activity & Future Maintenance Notes**
	VMA	**Area (ac)**	**VMA**	**Area (ac)**	
Monthly Mowing	MM	38.17			Monthly
Annual Mowing	AM	1			Annual
Logging**	6A-LRsv-1	0.63			Logging with specialized treatment (stump, vernal pool, shrub) as identified.
	6B-LRt-1	0.78			
	6C-LRt-1	2.96			
	6F-LR-sh-1	0.20			
	6G-LRsh-1	0.4			
Easement Acquisitions				11.81	

*work initiated in Year 2 may be completed in early Year 3.
**only portions of VMAs within the Airport boundary fence will be addressed in Year 2, except for the vernal pool area.

In addition to the existing annual mowing routines (AM and MM), the short term VMP implementation will commence for portions of on-Airport VMAs on the Runway 6 approach which are within the airport fence (labeled 6X-XX-1 on the short

term VMP) and within the vernal pool VMA, 6A-LRsv-1. Other portions of the Runway 6 VMAs outside of the fence are not included in Year 2.

Within the vernal pool VMA, approximately 50% of the penetrations or potential penetrations will be removed during Year 2. The trees selected for removal will be relatively equally spaced around the pool. Additional tree removal will not occur until Year 4 or 5 of the YOP. Once a portion of the trees are removed, the additional light penetration will spur shrub growth. This shrub growth will provide necessary shade to the vernal pool without reaching the penetration height.

As part of the Year 2 work, stump treatment will commence in areas depicted, this will require cutting stumps flush to allow the airport to mow in the future, and potentially late season follow-up herbicide treatment for stump regrowth. Typically, a localized herbicide foliar treatment provides good effectiveness for killing the stumps and preventing rapid regrowth. Many of the areas in the runway approach can be rough mowed, and accompanied with stump treatment, can be maintained via annual mowing going forward. Permitting is likely to be initiated in Year 1 for the initial cutting of the vernal pool VMA. If received, prior to Year 2, this work may be included in the Year 2 YOP. During this year, additional easements will be sought for cutting in Years 4 and 5. All VMAs managed in Year 2 will be monitored for regrowth and conformance with the standards established in the VMP and authorizing permits.

6.2.3 Year 3—Easement Acquisitions, Annual Mowing Operations, Follow-up Management of Tree Removal Areas, and Short Term VMP Implementation on RW 24 Approach within Airport Fence

Table 6-5: Yearly Operation Plan – Year 3*

Treatment Type	On-Airport		Off-Airport		Activity & Future Maintenance Notes
	VMA	Area (ac)	VMA	Area (ac)	
Monthly Mowing	MM	38.17			Monthly
Annual Mowing	AM	1			Annual
Stump Herbicide Treatment	6B-LRt-1	0.78			Herbicide treatment of stumps to allow future mowing
	6C-LRt-1	2.96			
Logging**	24A-LRt-1	2.88			Logging with specialized treatment (stump, vernal pool, shrub) as identified.
	24B-LRt-1	4.01			
	24C-LRh-1	2.89			
	24E-LRh-1	0.37			
	24F-LRh-1	0.66			
Easement Acquisitions				11.81	

*work initiated in Year 3 may be completed in early Year 4.
**only portions of VMAs within the Airport boundary fence will be addressed in Year 3.

In addition to the annual mowing routines and follow-up treatment, if necessary, of the Year 2 VMA cuttings, new cuttings will be initiated for portions of on-Airport VMAs on the Runway 24 approach which are within the airport fence (labeled 24X-XX-1). Portions of the Runway 24 VMAs outside of the fence are not included in Year 3.

Follow-up cutting of some trees in the vernal pool may be required and will be subject to monitoring and approval from the Conservation Commission. Follow-up treatment of this area may not occur until Year 4. If herbicide treatment of the stump treatment areas did not occur in late season Year 2 YOP activities, it is proposed to occur in Year 3 to reduce future stump sprouts and convert these areas to Annual Mow maintenance. All VMAs managed in Year 2 will be monitored for regrowth and conformance with the standards established in the VMP and authorizing permits. Easements and permits will also be sought for short term VMP implementation off Airport.

6.2.4 Year 4—Easement Acquisitions, Annual Mowing Operations, Follow-up Management of Tree Removal areas, Short Term VMP Implementation on Runway 6 Approach Off-Airport

Table 6-6: Yearly Operation Plan – Year 4*					
Treatment Type	**On-Airport**		**Off-Airport****		**Activity & Future Maintenance Notes**
	VMA	**Area (ac)**	**VMA**	**Area (ac)**	
Monthly Mowing	MM	38.17			Monthly
Annual Mowing	AM	4.74			Annual (includes converted Year 2 areas)
Stump Herbicide Treatment	24A-LRt-1	2.88			Herbicide treatment of the stumps to allow future mowing
	24B-LRt-1	4.01			
Logging	6A-LRsv-1	1.60			Logging on Airport property outside the boundary fence or off-Airport where easements have been acquired
	6B-LRt-1	0.73			
	6C-LRt-1	3.07			
	6D-LRh-1	0.22			
	6E-LRsh-1	0.38			
	6F-LRsh-1	1.70			
	6G-LRsh-1	1.71			
	6H-LRsh-1	0.95			
	6K-LRsh-1	0.41			
	6M-LRsh-1	0.11			
Landscape Removal			6I-LSt-3	0.68	Tree removal where easements have been acquired
			6J-LSt-3	1.67	
			6L-LSsh-2	2.86	
			6N-LSst-3	0.62	
Easement Acquisitions				<11.81	Seek additional easements as needed

*work initiated in Year 4 may be completed in early Year 5.
**areas may be within areas of permission or may require easement acquisition and permitting.

In addition to the previous maintenance and annual mowing routines, portions of areas logged in Year 2 and subsequently treated to remove stumps will begin being mowed annually as shown on the Long Term Management Plan (**Appendix B**). If herbicide treatment of the stump treatment areas on the Runway 24 Approach did not occur in late season Year 3 YOP activities, it is proposed to occur in Year 4 to reduce future stump sprouts and convert these areas to Annual Mow maintenance.

In addition to monitoring and continuing to treat on-Airport VMAs within the fence, in Year 4 logging and landscape removal will begin on Runway 6 VMAs located off-Airport and portions of on-Airport VMAs outside the boundary fence. Only off-Airport property where easements and permits (if applicable) have been obtained will be managed. During this year, additional easements will be sought for any remaining off-airport property with penetrations needing removal under the short term VMP, permits will be sought for removal of these penetrations if required.

Remaining penetrations or potential penetrations within the vernal pool VMA will be removed during Year 4. During removal, care will be taken to avoid the shrub layer. If necessary, only upper portions of trees may be removed to continue providing shade while protecting the approach surface. Further details will be documented in the appropriate permit and

in consultation with the Chatham Conservation Commission. All VMAs managed in Year 2 and 3 will be observed for regrowth and conformance with the standards established in the VMP and authorizing permits.

6.2.5 Year 5—Annual Mowing Operations, Follow-up Management of Tree Removal Areas, Short Term VMP Implementation on Runway 24 Approach Off-Airport

Table 6-7: Yearly Operation Plan – Year 5[1]

Treatment Type	On-Airport		Off-Airport[2]		Activity & Future Maintenance Notes
	VMA	Area (ac)	VMA	Area (ac)[3]	
Monthly Mowing	MM	38.17			Monthly
Annual Mowing	AM	11.63			Annual (includes converted Year 2 and 3 areas)
Stump Herbicide Treatment	6B-LRt-1	0.73	6I-LSt-3	0.68	Herbicide treatment of the stumps cut in Year 4
	6C-LRt-1	3.07	6J-LSt-3	1.64	
Logging	24A-LRt-1	2.55			Logging on Airport property outside the boundary fence and off-Airport where easements have been acquired
	24E-LRh-1	2.16			
	24F-LRh-1	1.49			
	24G-LRs-1	4.03			
Landscape Removal			24H-LSst-3	0.45	Tree removal where easements have been acquired
			24I-LSsh-2	4.21	
			24J-LSst-3	3.98	
			24K-LSst-3	4.35	

[1]work initiated in Year 5 may be completed in early Year 6.
[2] areas may be within areas of permission or may require easement acquisition and permitting.
[3] Areas depend on what remains after cutting during Year 4 is completed, which includes total acreages of potential clearing. Year 5 will include areas not addressed in Year 4.

In addition to the previous maintenance and annual mowing routines, portions of areas logged in Year 3 and subsequently treated to remove stumps will begin being mowed annually as shown on the Long Term Management Plan (**Appendix B**). If herbicide treatment of the stump treatment areas on the Runway 6 approach outside the Airport fence did not occur in late Year 4 YOP activities, it is proposed to occur in Year 5 to reduce future stump sprouts and convert these areas to Annual Mow maintenance.

During Year 5, in addition to monitoring and continuing to treat previously-addressed VMAs, logging and landscape removal will begin on Runway 24 VMAs located off-Airport and portions of on-Airport VMAs outside the boundary fence. Only off-Airport property where easements and permits (if applicable) have been obtained will be managed. During this year, additional easements will be sought for any remaining off-airport property with penetrations needing removal under the short term VMP. All VMAs managed in Years 3 and 4 will be observed for regrowth and conformance with the standards established in the VMP and authorizing permits.

6.3 PRELIMINARY COST ESTIMATE

The costs associated with the implementation of the VMP at Chatham Municipal Airport can be broken down into four categories: design and permitting, mechanical clearing costs, herbicide treatment, and environmental and construction monitoring. These costs are planning estimates only and should be reviewed and refined prior to the implementation of

each YOP. The yearly YOP breakdown is dependent on funding. If sufficient funding is available, work from the next consecutive year may be completed early.

Based upon past bid prices for vegetation removal at other public use airports in Massachusetts, preliminary costs were estimated for logging, stump treatment, and landscape removal techniques. These estimates only reflect removal effort and do not include permitting, design, or construction administration and oversight. Environmental constraints, site conditions and regulatory restrictions can lead to significantly higher costs depending upon the site. Table 6-8 summarizes the acreages for short-term vegetation management with the cost estimates of clearing type per acre. The costs have been adjusted based on the areas to account for potential mobilization costs, (i.e., a smaller area may have a higher cost per acre since the mobilization cost is relatively constant). Table 6-9 summarizes the cost associated with the YOPs.

Table 6-8: Short-Term Maintenance of Vegetation on Airport Property Costs

Year	Maintenance Item	Cost Estimate per Acre[1]	On Airport (ac)	Off Airport (ac)	Total (ac)
2022	Annual Mow	-	1	-	1
	Monthly Mow	-	38.17	-	38.17
2023	Annual Mowing	-	1	-	1
	Monthly Mowing	-	38.17	-	38.17
	Logging	$4,500/ac	4.34	-	4.34
	Vernal Pool Tree Removal	$9,000/ac	0.63	-	0.63
2024	Annual Mowing	-	1	-	1
	Monthly Mowing	-	38.17	-	38.17
	Herbicide Treatment of Stumps	$1,500/ac	3.74	-	3.74
	Logging	$4,500/ac	10.81	-	10.81
2025	Annual Mowing	-	4.74	-	4.74
	Monthly Mowing	-	38.17	-	38.17
	Herbicide Treatment of Stumps	$1,500/ac	6.89		6.89
	Logging	$5,000/ac	9.17	0.11	9.28
	Landscape Tree Removal	$5,100/ac	-	5.83	5.83
	Vernal Pool Tree Removal	$9,000/ac	1.60	-	1.60
2026	Annual Mowing	-	11.63	-	11.63
	Monthly Mowing	-	38.17	-	38.17
	Herbicide Treatment of Stumps	$1,500/ac	3.8	2.32	6.12
	Logging	$5,000/ac	10.23	-	10.23
	Landscape Tree Removal	$5,100/ac	-	12.99	12.99

[1] These are estimates and should not be used to scope projects.

Table 6-9" Approximate Cost Estimates for Yearly Operational Plan Implementation[1]

Year	Logging Removal	Landscape Removal	Stump Treatment	Vernal Pool Tree Removal	Yearly Totals
Year 1	-	-	-	-	-
Year 2	$19,530	-	-	$5,670	$25,200
Year 3	$48,645	-	$5,610	-	$54,255
Year 4	$46,400	$29,733	$10,335	$14,400	$100,868
Year 5	$51,150	$66,249	$9,180	-	$126,579
Total	$165,725	$95,982	$25,125	$20,070	$306,902

[1] Costs associated with obtaining additional easements and associated mitigation measures are not included. Annual per acre costs from Year 1 to Year 5 are not adjusted for inflation.

Additional construction administration costs will occur throughout the duration of the VMP. These costs will vary depending upon the project duration and the complexity of the removal activities and include project and construction administration, bidding, and the presence of an environmental monitor and/or resident engineer on site during the construction process.

6.4 REGULATORY CONSIDERATIONS

Compliance with FAA and State regulations requires the implementation of the VMP to maintain protected airspace free from obstructions. To comply with these safety regulations, 43.73 acres within current Airport-owned or easement property must continue to be managed. In addition, 11.81 acres outside of Airport-owned property has vegetative penetrations into PZs and will require management.

The following discussion of required regulatory considerations specifically addresses vegetation management activities and permitting approvals required for work that will occur on Airport-owned property. Activities off Airport will require similar regulatory consideration but require the collection of additional field information and separate filing for review and approval.

6.4.1 MA Wetlands Protection Act

The Wetlands Protection Act (WPA) regulations (310 CMR 10.00) administer the Massachusetts Wetlands Protection Act (M.G.L. c. 131, §40), which controls VMP activities in and near wetlands. Portions of the vegetation management activities proposed at the Airport are regulated under the Limited Project provisions of the WPA. No WPA permitting for VMP activities has occurred at the Airport to date.

Under the WPA, the Limited Project provision of the regulations is designed to provide the issuing authority with the discretion to allow certain work to proceed although the work may not meet the performance standards set forth in the regulations. In addition to airport vegetation removal projects, examples of other activities which have limited project provisions under the WPA include maintenance of beaches and boat launching ramps, the development of public water supply wells or wellfields, the closure of landfills, and work on land used primarily for raising cranberries. Without the Limited Project provision, airport vegetation management activities conducted by the MassDOT Aeronautics Division would not be subject to regulation by local conservation commissions, but instead would be regulated by the MADEP under the Variance process. The Limited Project provision empowers local conservation commissions with the ability to impose conditions on vegetation management activities in wetlands at public use airports within their communities.

An airport vegetation removal project may be included in the Limited Project provision (310 CMR 10.53(3)(n)) if it meets the following criteria:

- the project is undertaken in order to comply with Federal or State regulations, advisories or orders regarding navigable or other airspace which must remain free of obstruction;
- the airport is managed by the Massachusetts Port Authority or subject to State certification by MassDOT Aeronautics;
- the need for compliance with State and Federal regulations, advisories or orders regarding navigable or other airspace which must remain free of obstruction is certified by MassDOT Aeronautics;
- the project does not include the construction of new airport facilities or the expansion or relocation of

existing airport uses;

- Notices of Intent (NOIs) filed for the project contain a variety of information including the following:
  - delineation of the vegetation requiring removal
  - delineation of affected resource areas
  - identification of proposed removal methods and analysis of alternatives
  - quantification of likely impacts to wildlife habitat and water quality
  - evaluation of mitigation measures
  - presentation of a 5-year vegetation management plan;
  - when a project requires NOI filing in more than one municipality, the NOI filed in each municipality must describe total impacts to resource areas in the entire project area;
- copies of the NOI for the project must also be filed with the Massachusetts Department of Food and Agriculture, the Massachusetts Historical Commission, the Massachusetts Department of Environmental Management, and the Massachusetts Department of Environmental Protection; and,
- the project shall be designed, constructed implemented, operated, and maintained to avoid or minimize impacts to resource areas and to meet a variety of standards relative to issues such as temporary alterations of soils and topography, hydrology, the implementation of best management practices, working conditions, and the disposal of vegetation.

Based upon this VMP, we anticipate that the Airport would qualify for Limited Project Status.

In total, the short-term VMAS comprise 55.54± acres, of which 36.66 acres is on Airport property, 7.07 acres± is within easement areas, and 11.81± acres have no easement or agreement permitting the Airport to manage vegetation. The only delineated wetland within the VMA is the vernal pool. The VMA comprising the vernal pool and its associated 100-foot buffer zone is within Airport property and comprises 2.21± acres.

As part of this VMP, wetland resources off airport property have only been approximated within the proposed VMAs. Should easements be acquired, wetland delineation and a permit application to the Chatham Conservation Commissions will be a necessary first step in new vegetation management.

6.4.2 Massachusetts Natural Heritage and Endangered Species Program (NHESP) Approval

Activities that can affect State-listed rare species are regulated under the MA Endangered Species Act (MESA; M.G.L.c. 131A) and regulations (321 CMR 10.00). There are identified areas of rare or endangered species on the southeast side of the Airport, within proposed VMAs.

6.4.3 Massachusetts Department of Food and Agriculture (DFA) Right-of-Way Compliance

Herbicide application in Massachusetts is regulated by the DFA, which has established procedural and safety guidelines for herbicide applicators and application guidelines to limit impacts to natural resources. Although no formal permit or approval from DFA is required, the Airport will comply with DFA rules and regulations regarding the use and application of herbicides.

6.4.4 Massachusetts Historical Commission (MHC) Review

The disturbance of soils within or adjacent to historic or archaeological resources requires approval by the MHC. Based upon preliminary research, historical, architectural, archaeological, or cultural resources should not be affected by the VMP provided there is no stump removal or grubbing that would disturb soil. Stump grinding to existing grade provides a

method which allows conversion of the land to a mow-able condition without disturbance of soil or raising historical and archaeological concerns.

6.4.5 Permit from the Army Corps of Engineers under Section 404 of the Clean Water Act and Attendant Section 401 Water Quality Certification

Vegetation removal of the type typically done at public use airports does not involve fill or surface disturbance in wetlands. The VMP implementation would be considered a General Permit 8 under the Section 404/401 program as it is implemented in Massachusetts and does not require any individual filing with the Corps. However, the Corps requires the following to avoid submission of an individual 404 permit for VMP work:

- no mechanized moving of soil;
- no stumping of trees in wetlands;
- no building of roads in wetlands;
- keeping heavy ends of trees off the ground when winching trees out of wetlands; and
- Limiting work to outside the vernal pool boundary.

The recommended removal methods will accommodate the requirements prescribed by the Corps. Consequently, it is not anticipated that a formal filing with the Corps will be required.

6.5 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES ASSOCIATED WITH YEARLY OPERATIONAL PLAN IMPLEMENTATION

As described in Section 5, the Airport VMP for on-airport lands will directly affect the vernal pool and its associated buffer zone (2.21 acres±). There are additional, more typical concerns associated with soil erosion, water quality, and wildlife habitat in general. The following section contains a discussion of the potential impacts and mitigation measures to soils, vegetation, wildlife habitat, and water quality that may occur from implementation of the VMP. Protection of these parameters is of primary importance. If properly implemented, mitigation measures may avoid long-term impacts to these environmental parameters within the protected resources.

6.5.1 Wetland Mitigation

Wetland Alteration: Vegetation removal methods will impact the wetland resources through the change in canopy conservation, the alterations will not result in the *loss* of wetland area. As a requirement of typical wetland permits for VMP implementation, the project environmental scientist typically works directly with the contractor as part of the permit conditions to help minimize habitat disturbance.

Soils Disturbance: The selected methods of vegetation removal, including the timing of removal and limited use of machinery, are designed to provide a high level of protection of the soils and a correspondingly low potential for sedimentation into wetland resources. Two aspects of this VMP may have the potential to cause soil erosion: the use of heavy machinery, and the exposure of soils in some VMAs to direct precipitation by the removal of the canopy and shrub layers. The proposed mitigation of these potential erosion impacts shall include a combination of construction methodology, construction specifications, erosion control barriers, construction timing, monitoring, and some revegetation. In addition, heavy equipment will not be used within the vernal pool.

Within the vernal pool, work is limited to hand work method, except where feller-buncher equipment can “reach” into the wetlands from the adjoining uplands to cut and remove individual trees without damage to the wetlands. As previously

discussed, slash and logs to some extent can enhance wetland wildlife habitat characteristics, but in excess can be viewed as a temporary impact. Therefore, the choice between the different methods is often at the discretion of the regulatory agent and wetland scientist based upon perspective and/or site-specific conditions.

The construction specifications, which will be included in the work contract, will direct the contractor to repair soils disturbed by machinery by restoring each area to grade, and then covering the area with seed and/or mulch. On slopes, an erosion control barrier will be included in the mitigation as directed by the on-site inspector. Other specifications will include staging areas, log removal methods, slash maintenance and a detail of areas to be avoided with machinery. There will be a general soil erosion specification authorizing the on-site inspector to direct the contractor to repair damaged areas on a case-by-case basis.

The placement of erosion control barriers will be determined by the on-site inspector on an as-needed basis. It is difficult to assess exactly which areas will need the barriers due to certain unknowns including the exact track the clearing machines will use, the reaction of the soils to the weight of the machines, and which slopes will need to be traversed by machines. Due to these unknowns, an item in the bid documents will state that the use and placement of erosion control barriers will be directed by the on-site inspector and shall include all areas which may be subject to either direct precipitation and/or surface flow during severe storm events. A detail of the correct installation of haybale and silt fence barriers, as well as depicted locations of erosion and sedimentation controls along defined haul roads and staging areas, will be included in the contract plans and documents. Based on previous vegetation removal projects conducted by the MassDOT Aeronautics Division, in many areas erosion control measures are often unnecessary because little soil is disturbed, as is typical for standard forestry work.

Construction timing is perhaps the most important tool in controlling the disturbance of soils during the implementation of the VMP. The removal of vegetation when the soil is frozen, relatively dry, or otherwise stable will significantly reduce the potential for widespread soil disturbance. The bid documents and/or the Order of Conditions and Variance will emphasize that suitable soil conditions are required for vegetation removal in wetland areas.

The monitoring of the project by an engineer/environmental scientist who is responsible for the correct implementation of the plan and the Orders of Conditions is an important feature of the project. This individual (or team) will be authorized to request the contractor to repair soils, install erosion control measures, use specific access routes, avoid sensitive areas, and comply with the construction specifications and applicable permits.

Revegetation: Revegetation is an additional mitigation measure that can be used to ensure the control of erosion due to the project activities. The GEIR includes several forms of revegetation ranging from seeding to planting of specific low-growing shrubs that are not likely to penetrate protected air space. Because the clearing method to be implemented on the Airport is logging, revegetation of wetland areas will be largely unnecessary since this technique leaves the existing understory intact. The natural regrowth of trees is usually more vigorous than seed growth. Therefore, the VMP proposes no specific revegetation activities, but does recommend control of invasive species to limit their incursion and competition with the regrowth of native, endemic species.

6.5.2 Wildlife Habitat Mitigation

Habitat Alteration: Because the management of certain VMAs will result in a significant change in the plant community, the GEIR has placed particular emphasis on the potential effect of vegetation management on wildlife habitat. There is a direct correlation between plant community structure (species diversity, density, size, and interspersion) and the use of an area as habitat by most wildlife species. Food sources, such as red maple seeds may be eliminated, and replaced by a higher density of shrub forage due to increased light penetration and subsequent higher shrub density. Where the upper

shrub layer is to be removed, the forage base may change from seeds and berries to insects. Nesting sites will also be impacted as canopy nesting habitat will be reduced or eliminated. Shrub and ground nesters may find an increase in suitable habitat.

The tree clearing operations proposed under the VMP have some potential positive effects on wildlife. Maintained early successional areas (old field communities) have become scarce in recent years, resulting in a documented decrease in certain wildlife species. Many of these species are shrubland specialists, which are becoming increasingly uncommon and rare. The change in habitat afforded by this project will result in an increase in this habitat type, at the expense of habitat that is relatively common in the area (forested upland). For those VMAs where a significant change in the plant community structure is to occur, similar habitat exists immediately adjacent to the VMA. If these adjacent areas are already at the carrying capacity for the individual species, the impact will be a decrease in the number of individuals, as opposed to the loss of the species from the area. Overall, a change in habitat types will occur due to the project. A positive effect of this change is an increase in habitat types that are less common in the area.

Vernal Pools: Because of the sensitivity of vernal pool and their supporting upland habitats, a special VMA subcategory has been established to add additional protections to this resource from tree removal activities. The biggest concern in removal of vegetation around the vernal pool is direct impact to the pool and upland habitats from the physical removal process. During the permitting process, mitigation measures are typically stipulated in the tree removal methodologies in these VMAs to lessen both direct and secondary impacts. A potentially important secondary impact from tree removal in these areas is the change in light regime to the pool below. To mitigate this, a phased approach to the tree removal in and around the vernal pool habitat can be implemented with an initial cutting that removes the tallest trees but leaves several trees of lesser height to provide shade cover and time between phases to allow for the understory to respond with increased growth and provide shade to the pool. Final removal of vegetative penetrations of the height zones can be performed later after lower growth has increased and can provide shade, thus lessening the change of an excessive abrupt change in the light regime for the pool.

Water Quality: To protect other water resources (e.g., ponds, streams, etc.), sedimentation and erosion controls will be placed upgradient of these resource areas if erosion or sedimentation is likely to occur. These controls trap sediment before it enters the resource area.

Glyphosate herbicides for foliar treatment have been proposed for use limited solely to treatment of stump sprouts during some years of the YOP and only in those areas where rapid regrowth from stumps would be problematic for vegetation maintenance. Glyphosate is not included on the Groundwater Protection List, which is a list of pesticide active ingredients that could potentially impact groundwater due to their chemical characteristics and toxicological profile (http://www.mass.gov/eea/agencies/agr/pesticides/groundwater-protection-list.html accessed 2021). Since glyphosate herbicides do not persist in the environment, instead they adhere to soil particles, they do not contaminate surface water through run-off or groundwater supplies through infiltration. The specified herbicides have low toxicity to wildlife and are biodegradable. There will be no herbicide use within 100 feet of a dwelling, in accordance with Massachusetts state laws and regulations. The Town of Chatham Board of Selectmen passed a voluntary ban on the use of glyphosate on Town-owned property in 2018. The Airport should consider alternative vegetation management techniques and herbicide compounds prior to specifying glyphosate application. If glyphosate is the selected herbicide, contract specifications should include best management practices.

6.6 PUBLIC PARTICIPATION PLAN

A Public Participation Plan is available as part of the VMP development and permitting with public meetings associated with wetland permitting and monthly Airport Commission meetings.

Public Review of VMP: The Draft VMP will be made available for public review and comment in Chatham. A notice of the report availability will be announced in *The Environmental Monitor* and a newspaper that services the Chatham area.

Public Meetings: The VMP will require new permitting under the WPA and associated with that process is at least one public meeting where the project's potential wetland impacts are discussed. Comments on the VMP throughout this public process will be considered in the development of the Final VMP.

7.0 RECOMMENDATION AND CONCLUSIONS

7.1 RECOMMENDATIONS

The VMP and YOPs guide the progress and implementation of vegetation removal at the Airport. Additional recommendations relevant to implementation were identified:

- A continuing long-term commitment to vegetation management is required. The scheduled removal activities minimize the need for repeated large-scale removal projects by allowing more frequent, small-scale activities and/or maintenance to maintain the PZ free from obstructions. If the small-scale routine maintenance is not performed, the need for more frequent, large-scale clearing projects will eventually occur. Airport operational budgeting should continue to include allocation of funds for vegetation management maintenance as possible. Should additional equipment be necessary, i.e., for areas of rough mowing, continued efforts to obtain equipment through grants may be needed.
- More than 22% of the obstructions are outside either airport-owned property or property with current avigation easements. The Airport should endeavor to obtain permission to remove vegetative obstructions on these properties. Where permission is not granted, the Airport should pursue avigation easements to enhance safe operation of the Airport.
- The cutting proposed within the vernal pool VMA will require the filing of a Notice of Intent (NOI) with the Chatham Conservation Commission (Commission). The Commission will have the opportunity to provide input and specify permit conditions during the permitting process. The VMP and the NOI specify a phased tree removal approach in the area around the vernal pool to limit light penetrations which could lead to increased water temperatures within the pool.

7.2 CONCLUSIONS

This VMP includes both a comprehensive approach to long-term management of the vegetation near the Airport and a more specific five-year implementation strategy, prioritizing the removal of vegetation that currently penetrates protected airspace and preventing future penetrations. The identification of the PZs and an obstruction analysis were completed in 2018 by Gale. Based upon the obstruction analysis, a total of 55.49± acres require action. Of this, 43.73± acres are located on-airport property or under an easement, and 11.81± acres are off-airport where no avigation easement is held. At this time, vegetation management for areas outside of airport-owned property or current avigation easements is proposed where property owners grant permission. The process of obtaining easements will be undertaken as part of the VMPs, YOPs and airport master planning process. As a comprehensive plan, the VMP considers both on- and off-airport clearing.

Environmental constraints include the vernal pool within the Airport, and additional protected areas which may project a Buffer Zone onto VMAs. These elements were identified in the planning stage and accounted for in the formulation of the VMAs and the selection of removal methodologies. These environmental concerns will need to be addressed in

coordination with the Chatham Conservation Commission and MA Department of Environmental Protection through the obtainment of an Order of Conditions. Land ownership can also be a major potential constraint associated with vegetation management outside of airport-owned property. Master planning activities addressing the status and need for additional avigation easements will largely define the extent and scope of vegetation management in areas outside of Airport property.

8.0 VEGETATION MANAGEMENT PLAN PREPARER INFORMATION

The team assembled for this project consisted of:

- Gale, Inc. (Gale) and
- GZA GeoEnvironmental, Inc. (GZA).

Gale, Inc: Gale Associates Inc., with its expertise in aviation engineering and planning, was the prime consultant, responsible for overall project organization and management of the Chatham Municipal Airport Vegetation Management Plan. Gale provided aviation engineering services for the preparation of the Vegetation Management Plan, relative to the Part 77 surface analyses and document development.

GZA GeoEnvironmental, Inc.: GZA GeoEnvironmental, Inc. (GZA) performed the environmental science and civil/engineering support services required for the VMP preparation, including wetland delineation (State and Federal), assessment, impact mitigation, vegetation management, permitting, biological surveying, and AutoCAD/GIS plan development. GZA's areas of expertise include botany, wildlife ecology, soil science, hydrology, and civil engineering.

9.0 AIRSPACE OBSTRUCTION CERTIFICATION

Certification Page

10.0 BIBLIOGRAPHY

Draft Generic Environmental Impact Report for Tree Clearing in Wetlands at Public Use Airports (EOEA # 8978). 1993. Massachusetts Aeronautics Commission and the Massachusetts Port Authority. March 1993.

Environmental Data Resources, Inc Report, 2021. Prepared for GZA GeoEnvironmental, Inc. by Environmental Data Resources, Inc. January 2021.

Final Generic Environmental Impact Report for Tree Clearing in Wetlands at Public Use Airports (EOEA # 8978). 1993. Massachusetts Aeronautics Commission and the Massachusetts Port Authority. August 1993.

GEIR Update/Expanded Generic Environmental Notification Form (EOEA #12092). 1999. Massachusetts Aeronautics Commission, Massachusetts Port Authority, and the Department of Environmental Protection. November 1999.

GEIR Update/Expanded Generic Environmental Notification Form (EOEA #13866). 2006. Massachusetts Aeronautics Commission, Massachusetts Port Authority, and the Department of Environmental Protection. June 2006.

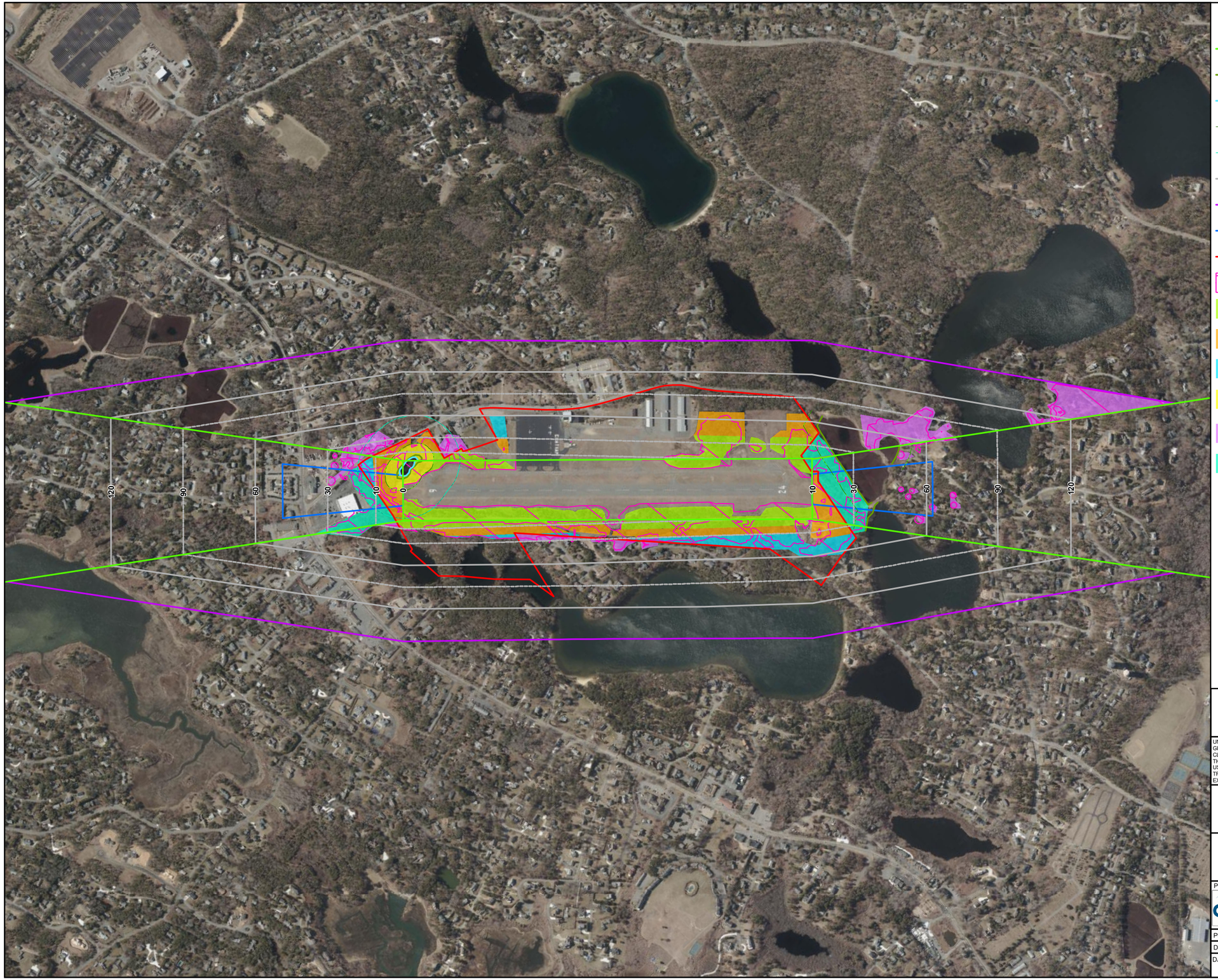
MEPA Status Report(s) Years 2000 through 2004, Statewide Vegetation Management Program. 2001. Prepared for the Massachusetts Aeronautics Commission by Baystate Environmental Consultants (GZA GeoEnvironmental Inc.). March 2001. February 2002. March 2003. February 2004.

MEPA Status Report 2004, Statewide Vegetation Management Program. 2004. Prepared for the Massachusetts Aeronautics Commission by Baystate Environmental Consultants (GZA GeoEnvironmental Inc.). December 2004.

Vegetation Management at Airports: A Guidance Document to Conservation Commissions. 2004. Massachusetts Aeronautics Commission, Massachusetts Port Authority, the Federal Aviation Administration, the Department of Environmental Protection, and Baystate Environmental Consultants, Inc. (GZA GeoEnvironmental Inc.).

APPENDIX 1

SHORT TERM PLAN



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- VERNAL POOL
- 100 FT BUFFER
- 350 VP BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY
- EXISTING SURFACE OBSTRUCTIONS
- ON-AIRPORT TREE AND STUMP REMOVAL.
- ON-AIRPORT TREE REMOVAL, LEAVE STUMPS AND SHRUBS.
- ON-AIRPORT SELECTIVE TREE REMOVAL.
- ON-AIRPORT SELECTIVE TREE REMOVAL (VERNAL POOL ZONE).
- OFF AIRPORT LANDSCAPE TREE REMOVAL OF PENETRATIONS AND NEAR PENETRATIONS.
- OFF AIRPORT SELECTIVE TREE REMOVAL.

NOTES:

1. BASE MAP SOURCE: MASSACHUSETTS 2019 USGS COLOR ORTHO IMAGERY.

800 400 0 800
Feet

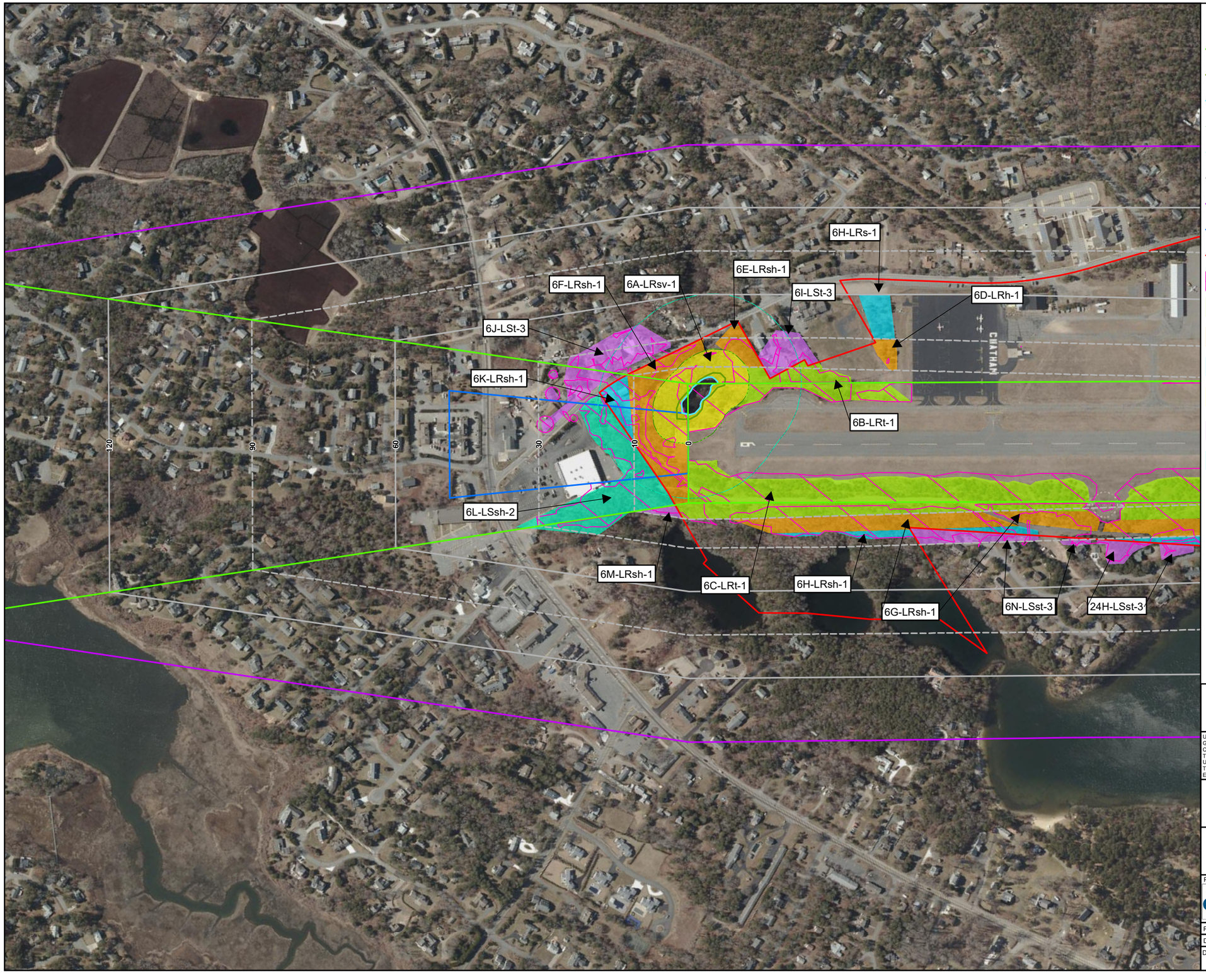
CHATHAM AIRPORT VMP
CHATHAM, MA

SHORT TERM VMP PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
GALE ASSOCIATES INC
163 LIBBEY PARKWAY
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 1
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 800 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- VERNAL POOL
- 100 FT BUFFER
- 350 VP BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY
- EXISTING SURFACE OBSTRUCTIONS
- ON-AIRPORT TREE AND STUMP REMOVAL.
- ON-AIRPORT TREE REMOVAL, LEAVE STUMPS AND SHRUBS.
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- ON-AIRPORT SELECTIVE TREE REMOVAL (VERNAL POOL ZONE).
- OFF AIRPORT LANDSCAPE TREE REMOVAL OF PENETRATIONS AND NEAR PENETRATIONS.
- OFF AIRPORT SELECTIVE TREE REMOVAL.

CODE

LR: LOGGING REMOVAL
LS: LANDSCAPED REMOVAL
r: REMOVE LOGS / FELLED TREES
s: SELECTIVE REMOVAL
t: REMOVE STUMPS

h: LEAVE SHRUBS
v: VERNAL POOL
1: AIRPORT
2: OFF AIRPORT (EASEMENT)
3: OFF AIRPORT (NO EASEMENT)

NOTES:

1. BASE MAP SOURCE: MASSACHUSETTS 2019 USGS COLOR ORTHO IMAGERY.

400 200 0 400 Feet

CHATHAM AIRPORT VMP
CHATHAM, MA

SHORT TERM VMP PLAN

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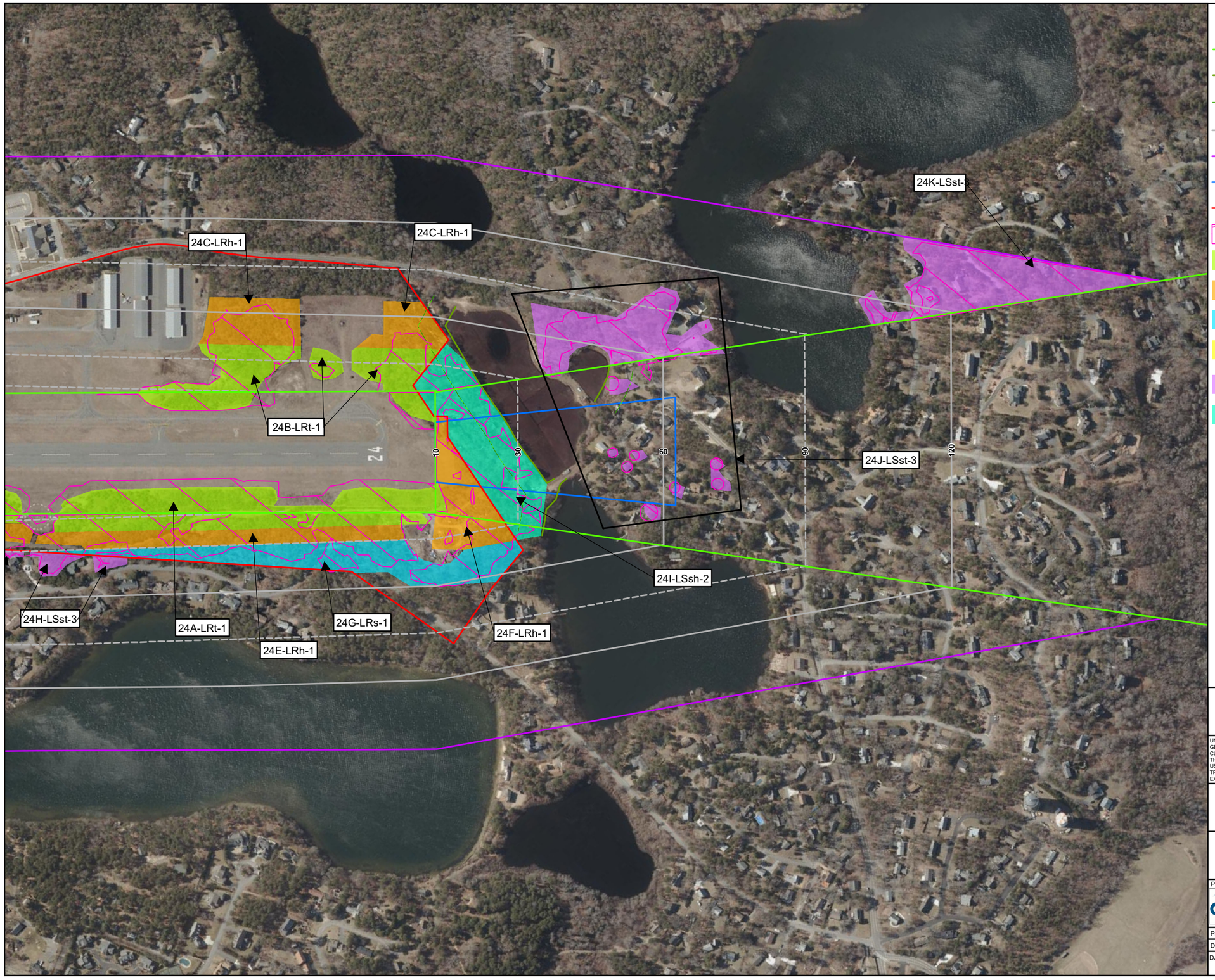
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 400 ft	2
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- 100 FT BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY
- EXISTING SURFACE OBSTRUCTIONS
- ON-AIRPORT TREE AND STUMP REMOVAL.
- ON-AIRPORT TREE REMOVAL, LEAVE STUMPS AND SHRUBS.
- ON-AIRPORT SELECTIVE TREE REMOVAL.
- ON-AIRPORT SELECTIVE TREE REMOVAL (VERNAL POOL ZONE).
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3: OFF AIRPORT (NO EASEMENT)

NOTES:

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400 200 0 400 Feet

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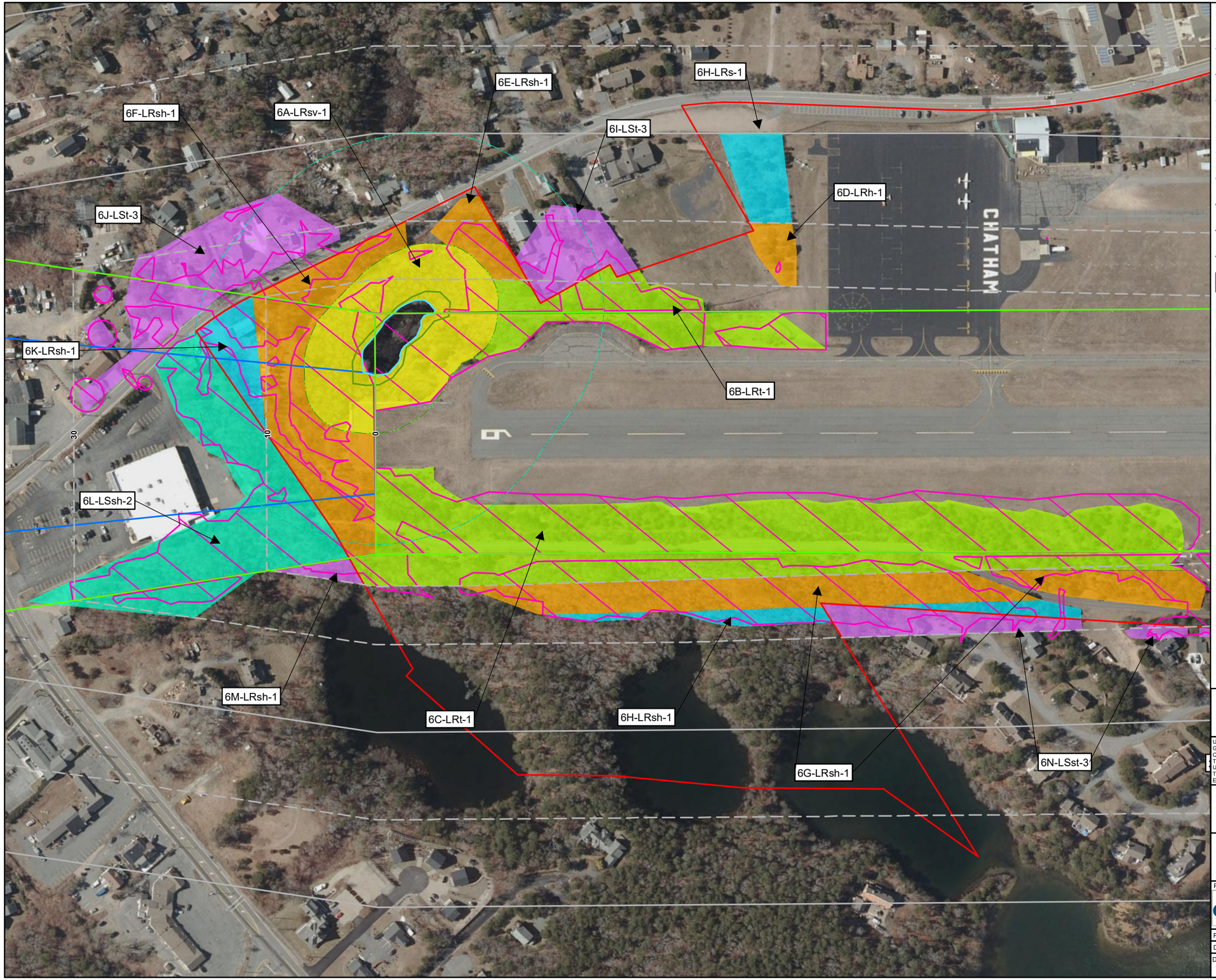
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 3
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 400 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- VERNAL POOL
- 100 FT BUFFER
- 350 VP BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY
- EXISTING SURFACE OBSTRUCTIONS
- ON-AIRPORT TREE AND STUMP REMOVAL.
- ON-AIRPORT TREE REMOVAL, LEAVE STUMPS AND SHRUBS.
- ON-AIRPORT SELECTIVE TREE REMOVAL.
- ON-AIRPORT SELECTIVE TREE REMOVAL (VERNAL POOL ZONE).
- OFF AIRPORT LANDSCAPE TREE REMOVAL OF PENETRATIONS AND NEAR PENETRATIONS.
- OFF AIRPORT SELECTIVE TREE REMOVAL.

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3: OFF AIRPORT (NO EASEMENT)

NOTES:

1. BASE MAP SOURCE: MASSACHUSETTS 2019 USGS COLOR ORTHO IMAGERY.

200 100 0 200 Feet

CHATHAM AIRPORT VMP
CHATHAM, MA

SHORT TERM VMP PLAN

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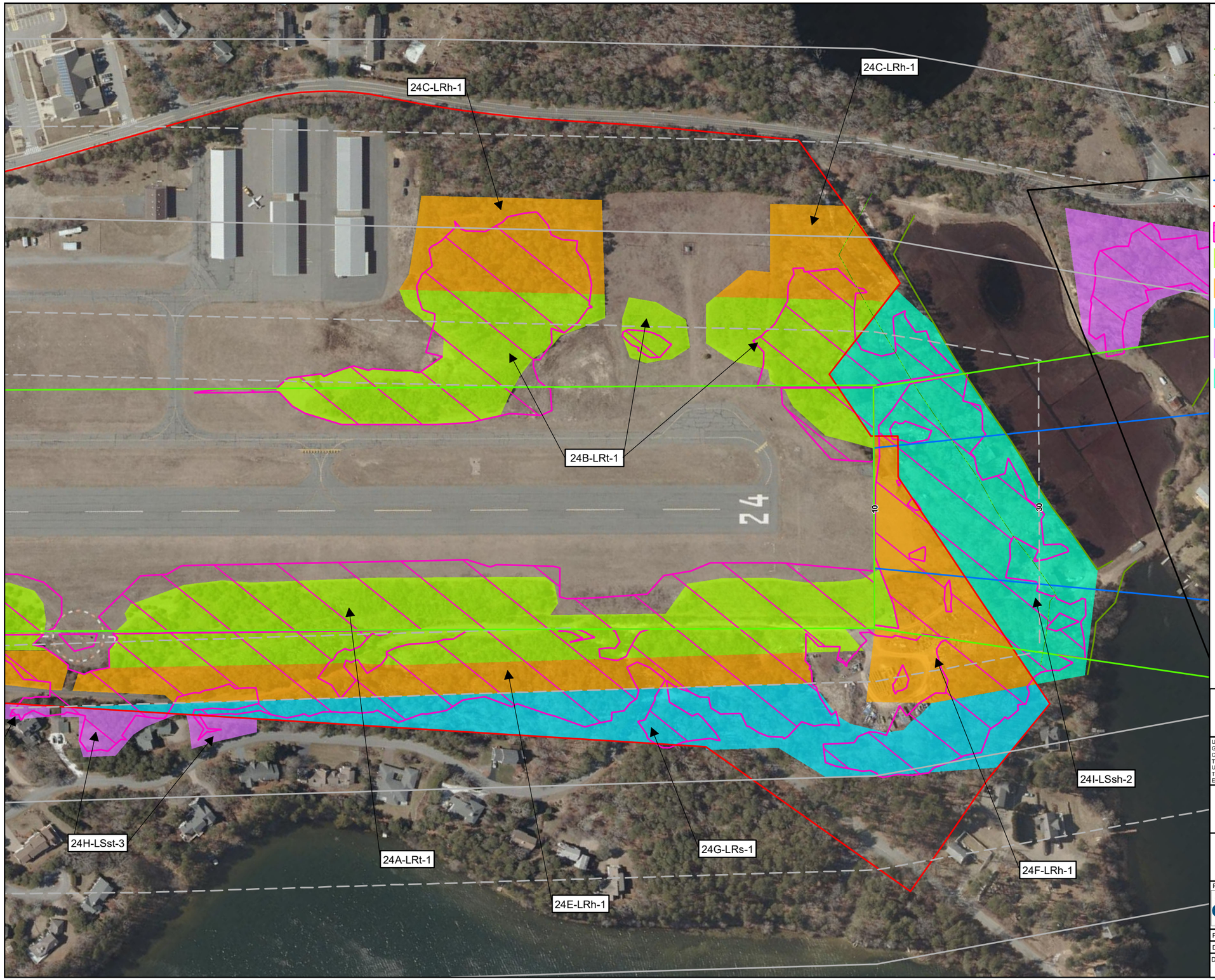
PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 4
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 200 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- 100 FT BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY
- EXISTING SURFACE OBSTRUCTIONS
- ON-AIRPORT TREE AND STUMP REMOVAL.
- ON-AIRPORT TREE REMOVAL, LEAVE STUMPS AND SHRUBS.
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3: OFF AIRPORT (NO EASEMENT)

NOTES:

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200 100 0 200 Feet

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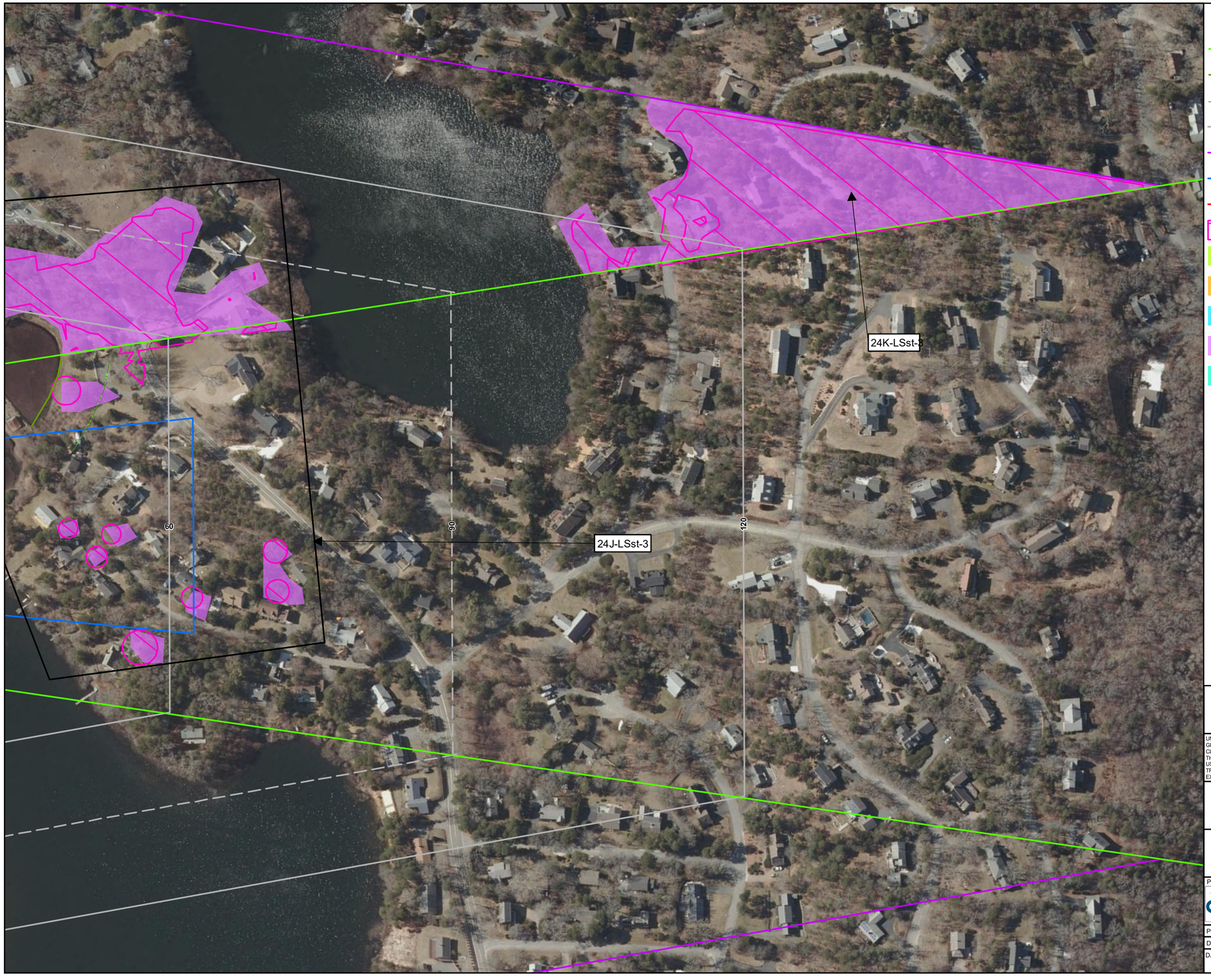
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 200 ft	5
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- 100 FT BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY
- EXISTING SURFACE OBSTRUCTIONS
- ON-AIRPORT TREE AND STUMP REMOVAL.
- ON-AIRPORT TREE REMOVAL, LEAVE STUMPS AND SHRUBS.
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NOTES:

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200 100 0 200 Feet

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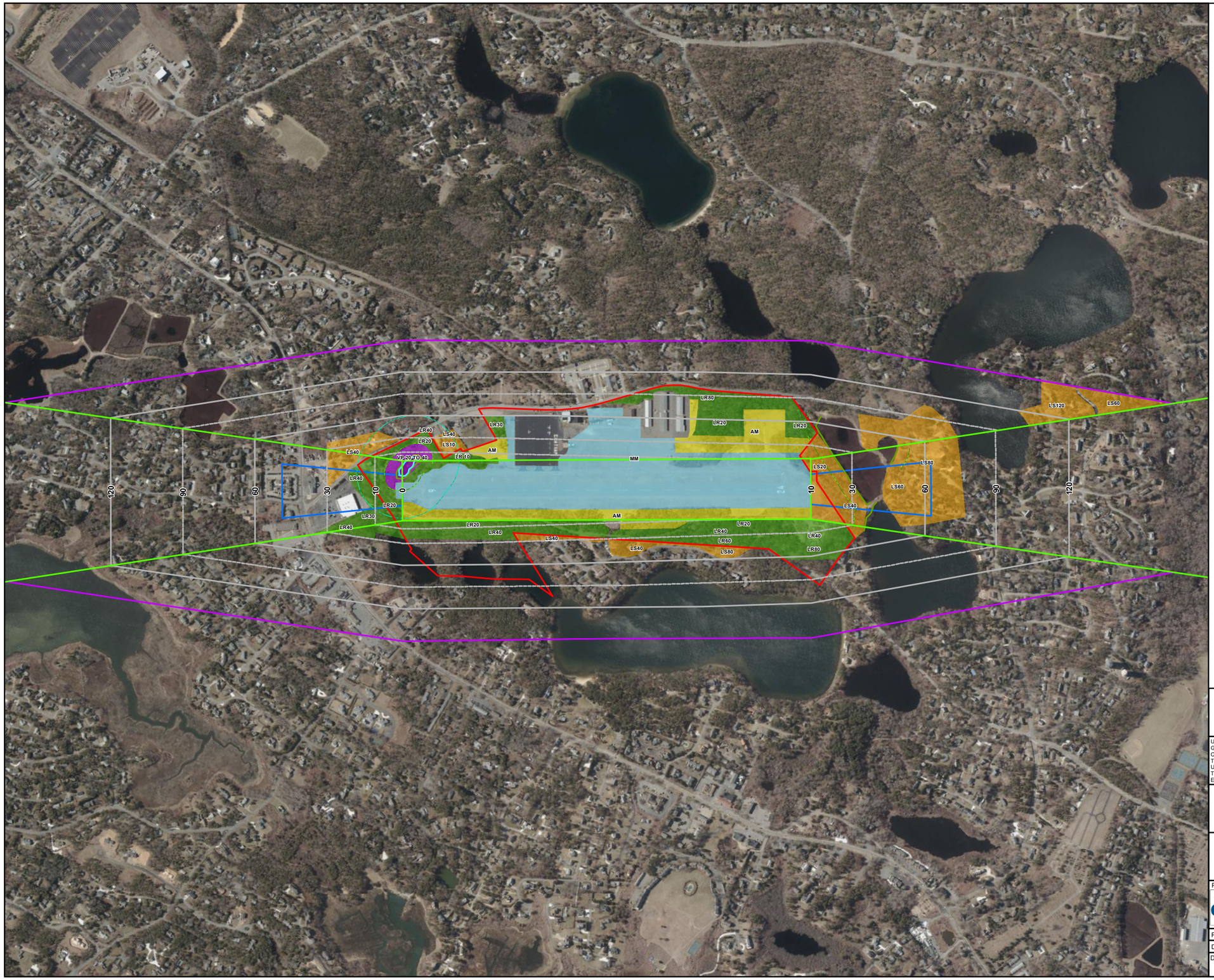
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 6
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 200 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	

APPENDIX 2

LONG TERM MANAGEMENT PLAN



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- VERNAL POOL
- 100 FT BUFFER
- 350 VP BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY

MAINTENANCE AREAS

- MM: Monthly Mowing
- AM: Annual Mowing
- VP: Special Vernal Pool Management Zone
- LS20: Landscape Removal - Tree Height
- LR20: Logging Removal - Tree Height

HEIGHT ZONES:

10: Remove all vegetation over 10' (short shrub zone)
20: Remove all vegetation over 20' (tall shrub zone)
30: Remove all vegetation over 30' (short tree zone)
40: Remove all trees over 40' (medium tree zone)
60: Remove all trees over 60' (medium tree zone)
80: Remove all trees over 80' (tall tree zone)

NOTES:

1. BASE MAP SOURCE: MASSACHUSETTS 2019 USGS COLOR ORTHO IMAGERY.

800 400 0 800
Feet

CHATHAM AIRPORT VMP
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LONG TERM VMP PLAN

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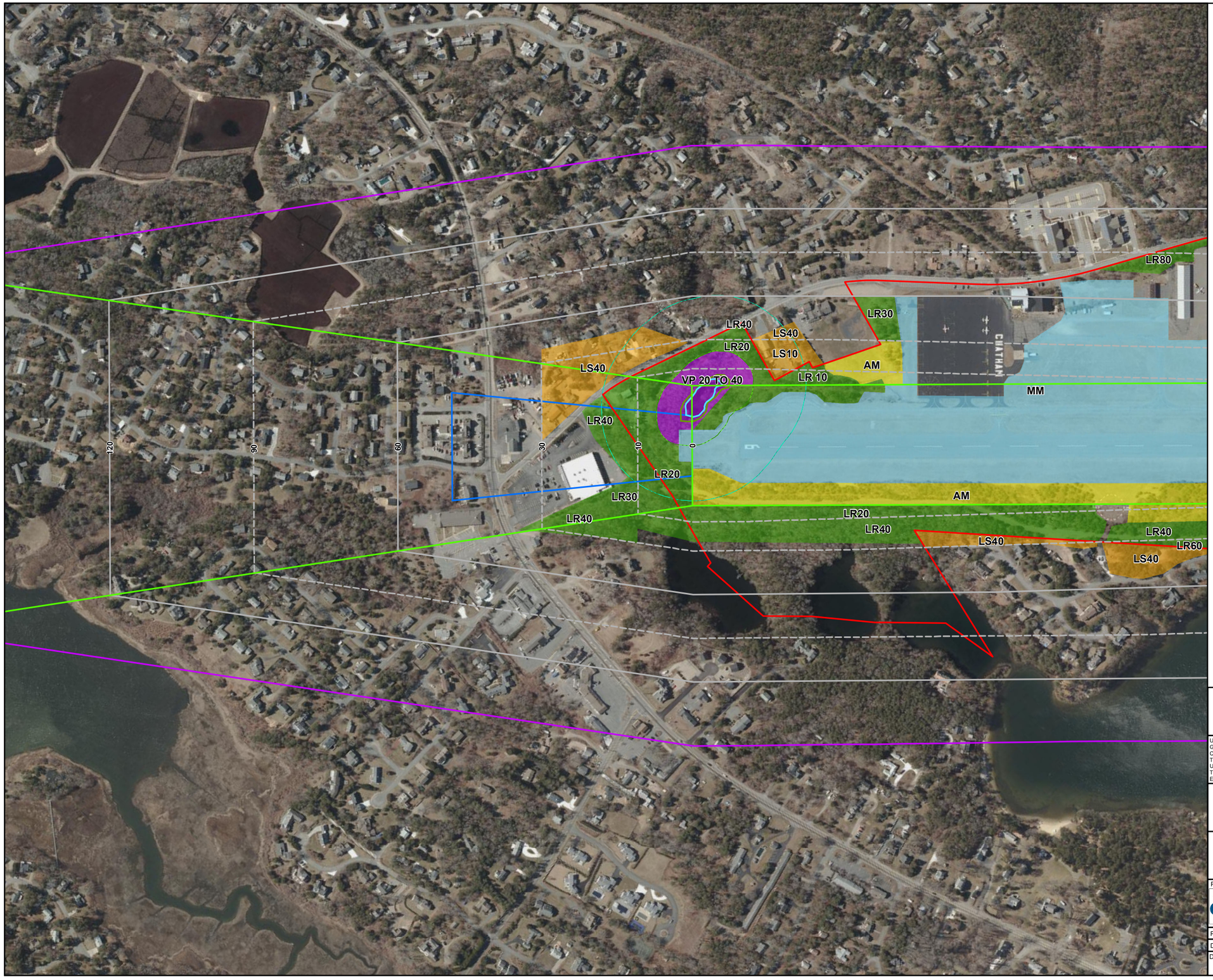
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 1
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 800 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- VERNAL POOL
- 100 FT BUFFER
- 350 VP BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY

MAINTENANCE AREAS

- MM: Monthly Mowing
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- VP: Special Vernal Pool Management Zone
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HEIGHT ZONES:

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80: Remove all trees over 80' (tall tree zone)

NOTES:

1. BASE MAP SOURCE: MASSACHUSETTS 2019 USGS COLOR ORTHO IMAGERY.

400 200 0 400 Feet

CHATHAM AIRPORT VMP
CHATHAM, MA

LONG TERM VMP PLAN

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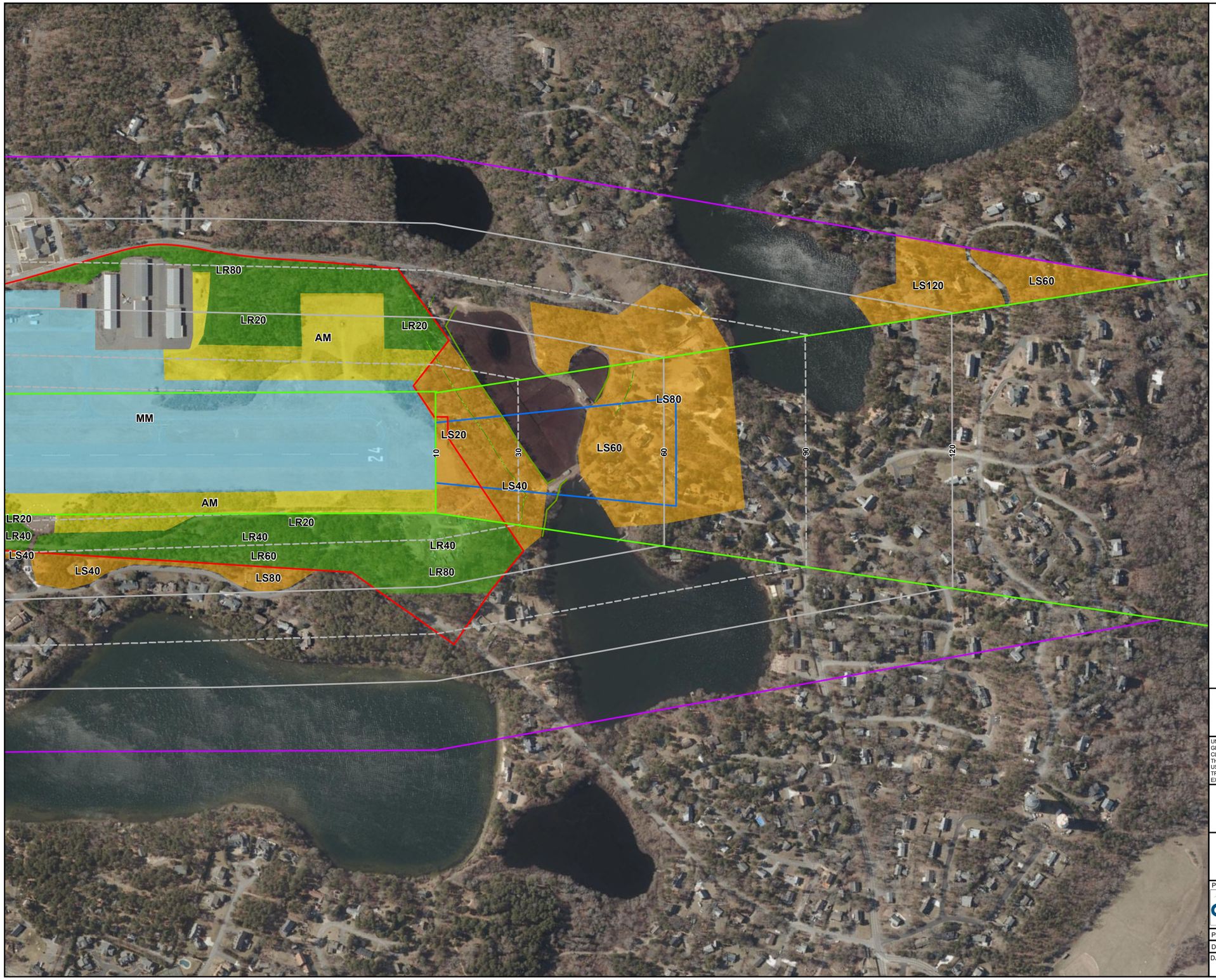
163 LIBBEY PARKWAY
WEYMOUTH, MA 02189

PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 2
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 400 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- 100 FT BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY

MAINTENANCE AREAS

- MM: Monthly Mowing
- AM: Annual Mowing
- VP: Special Vernal Pool Management Zone
- LS20: Landscape Removal - Tree Height
- LR20: Logging Removal - Tree Height

HEIGHT ZONES:

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NOTES:

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400 200 0 400 Feet

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PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 3
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 400 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	

LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- VERNAL POOL
- 100 FT BUFFER
- 350 VP BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY

MAINTENANCE AREAS

- MM: Monthly Mowing
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- LS20: Landscape Removal - Tree Height
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HEIGHT ZONES:

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NOTES:

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200 100 0 200 Feet

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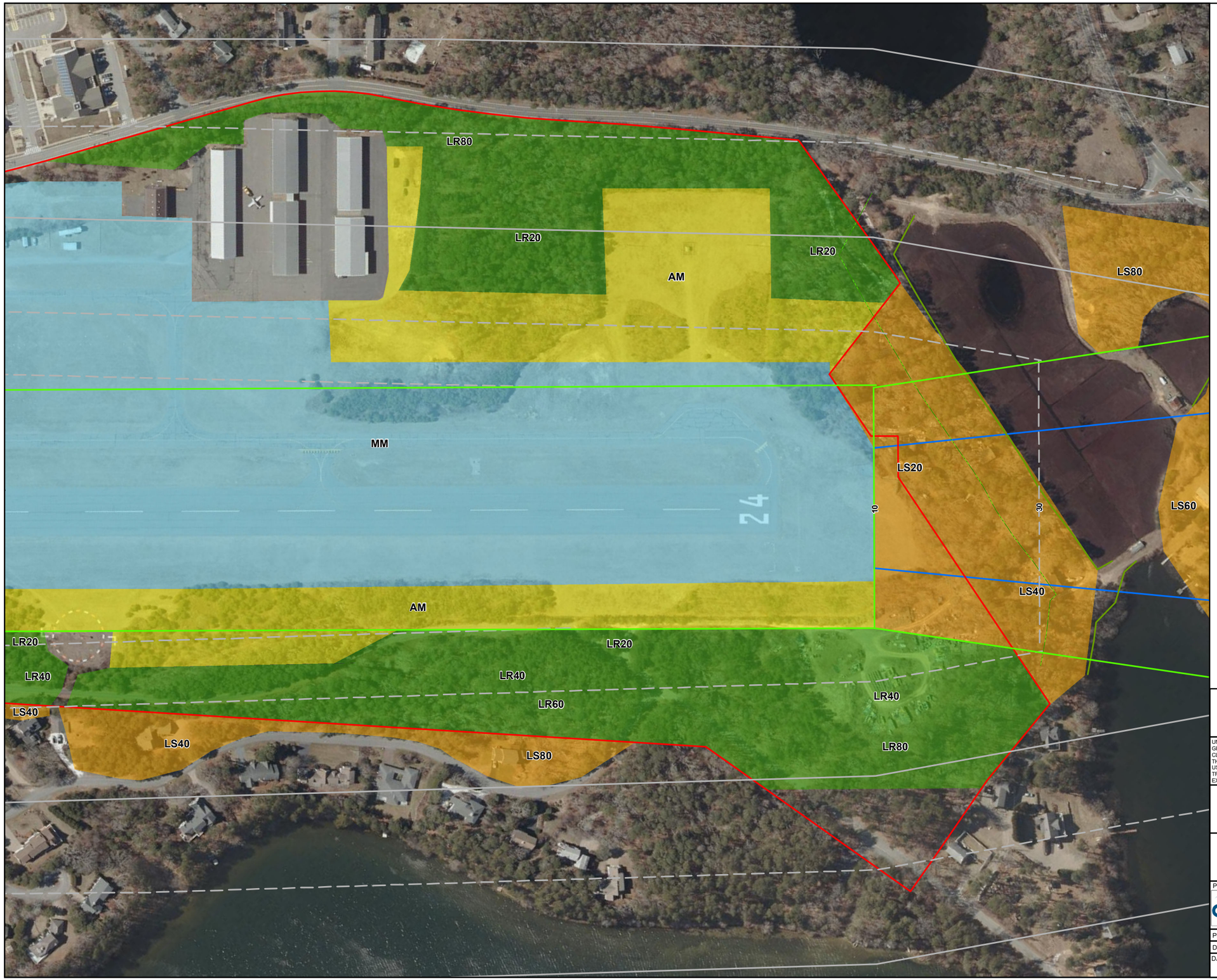
PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 4
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 200 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- 100 FT BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY

MAINTENANCE AREAS

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- AM: Annual Mowing
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HEIGHT ZONES:

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200 100 0 200 Feet

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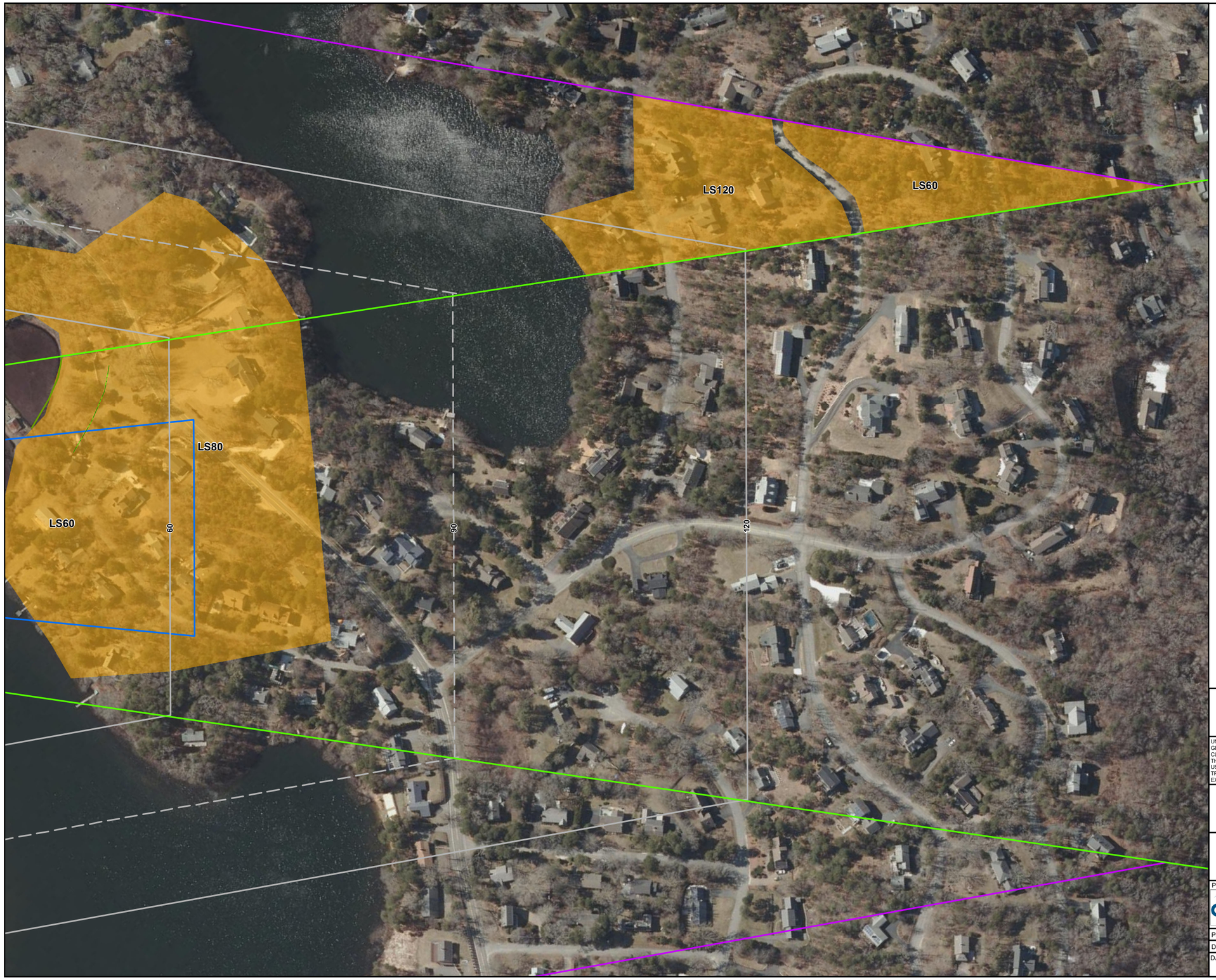
PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 5
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 200 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	



LEGEND

- APPROACH SURFACE
- WETLAND BOUNDARY
- 100 FT BUFFER
- SURFACE TOPO
- TRANSITIONAL SURFACE
- RUNWAY PROTECTION ZONE
- AIRPORT PROPERTY

MAINTENANCE AREAS

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- LS20: Landscape Removal - Tree Height
- LR20: Logging Removal - Tree Height

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NOTES:

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200 100 0 200 Feet

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PROJ MGR: SDR	REVIEWED BY: GPD	CHECKED BY: SLL	FIGURE 6
DESIGNED BY: JRC	DRAWN BY: JRC	SCALE: 1 in = 200 ft	
DATE: 04/12/2021	PROJECT NO: 15.0166692.03	REVISION NO: -	

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