FINAL ENVIRONMENTAL ASSESSMENT
VERMONT ARMY NATIONAL GUARD, ETHAN ALLEN FIRING RANGE
LIGHT DEMO RANGE
November, 2019

Prepared for:
Vermont Army National Guard
State of Vermont Military Department
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ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the potential environmental, socioeconomic, and cultural effects of establishing a Light Demo Range (LDR) at the Ethan Allen Firing Range (EAFR) in Chittenden County, Vermont. As required by the National Environmental Policy Act of 1969 (NEPA; 42 United States Code 4321 *et seq*.), the Council on Environmental Quality Regulations Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500-1508), and 32 CFR Part 651 (Environmental Analysis of Army Actions, Final Rule), the potential effects of the Proposed Action and Alternatives are analyzed. This EA will facilitate the decision process regarding the Proposed Action and its alternatives, and is organized as follows:

EXECUTIVE SUMMARY: Describes the Proposed Action; summarizes environmental, cultural, and socioeconomic consequences; and compares potential effects associated with the considered alternatives.

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Proponent: Vermont Army National Guard, Ethan Allen Firing Range
FY Funding: 2020
Funding source: SRM and Troop Labor
Project Number: 521336

G Correspondence
H VTARNG Statewide Operational Noise Management Plan

Proponent: Vermont Army National Guard, Ethan Allen Firing Range
FY Funding: 2020
Funding source: SRM and Troop Labor
Project Number: 521336

FINAL ENVIRONMENTAL ASSESSMENT
VERMONT ARMY NATIONAL GUARD, ETHAN ALLEN FIRING RANGE
LIGHT DEMO RANGE
May, 2019

LEAD AGENCY:	National Guard Bureau
COOPERATING AGENCIES:	None
TITLE OF PROPOSED ACTION:	Environmental Assessment, Vermont Army National Guard, Ethan Allen Firing Range (EAFR): Light Demo Range
AFFECTED JURISDICTIONS:	Town of Bolton, Town of Jericho, Town of Underhill, Chittenden County
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PROPONENT:	Vermont Army National Guard

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DOCUMENT DESIGNATION: Preliminary Final Environmental Assessment

Abstract: This Environmental Assessment (EA) evaluates the construction elements and operation of the Light Demolition Range (referred to as the Light Demo Range or LDR) for the Vermont Army National Guard (VTARNG) and multiple military units and law enforcement agencies all around the New England area at the Ethan Allen Firing Range (EAFR) in Jericho, Chittenden County, Vermont. VTARNG has identified this training facility as necessary for its training regimen. This EA analyzes the implementation of this project (termed the Proposed Action), as well as the No Action Alternative. Significant impact to land use, air resources, noise levels, geology, soils, natural resources, cultural resources, socioeconomics, infrastructure, or hazardous material, as detailed herein, would not be anticipated with the implementation of the Proposed Action.

Proponent: Vermont Army National Guard, Ethan Allen Firing Range
FY Funding: 2020
Funding source: SRM and Troop Labor
Project Number: 521336

Executive Summary

This Environmental Assessment (EA) has been prepared under the direction of the Vermont Army National Guard (VTARNG) in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] 4321 et seq.), Council on Environmental Quality (CEQ) regulations implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [C.F.R.] Parts 1500 – 1508), 32 C.F.R. Part 651 (Environmental Analysis of Army Actions; Final Rule, 29 March 2002), and as prescribed in the 2011 Army National Guard (ARNG) NEPA Handbook (Army National Guard, 2011). This EA assesses the potential of the expansion to the existing demolition range and formal operation of a Light Demo Range (LDR) located adjacent to Range 5-3 and directly south of Observation Point 1 (OP 1) in the Ethan Allen Firing Range (EAFR). The No Action Alternative is an examination of the effects should the proposed activity not take place.

The EAFR is a National Guard installation located on 11,219 acres of federal property licensed to the State of Vermont Military Department (SVMD). It is located in the northwestern region of the State of Vermont, on Lee River Road, three miles from the Village of Jericho. The property encompasses parts of the towns of Bolton, Jericho, and Underhill, in Chittenden County. The general vicinity of the EAFR is approximately 20 miles east of Burlington, Vermont. The EAFR is home to the Army Mountain Warfare School (AMWS), 3rd Battalion 172nd Infantry, 86th Infantry Brigade Combat Team, and the Training Site Detachment.

The EAFR is the major training facility which supports not only the Vermont National Guard but multiple military units and law enforcement agencies all around the New England area. There is one area where the use of demolitions and explosives is authorized that supports training of Combat Engineers, Infantry, the Vermont Army Guard's 124th Regional Training Institute, and both military and law enforcement Explosive Ordnance Disposal (EOD) Technicians. Due to the limited size and layout, the demolition area does not allow units to conduct pre-mobilization training, Mission Essential Task training, or Military Occupational Specialty training. Based on the shortfalls of the current demolition area, the Army Range Requirements Model (ARRM) has identified 19 training days that military units cannot accomplish. Therefore, units need to travel to Fort Drum, New York or further in order to complete this training. The proposed LDR is a live fire demolition and explosive facility designed by to meet U.S. Army specifications for an LDR as set forth in Army Training Circular (TC) 25-8, *Training Ranges*. The LDR is a multi-station facility that would allow units to train on the use and employment of explosives in various applications such as timber cutting, steel cutting, and obstacle reduction. Nested in the center portion of the northwest quadrant of the EAFR, the preferred location for the LDR would use the natural mountainous landscape to establish each station. Each station has specific mission tasks that can be applied in either rural or urban settings. The LDR would not only keep Vermont Army Guard units training in Vermont but would attract military units and Law Enforcement Agencies that are required to use demolitions and explosives to the area, assisting in vitalizing Vermont's economy.

This project is needed for the support of, and the ability to meet changes in mission at, the VTARNG. This facility is proposed in order to increase the level of training of VTARNG personnel. This project has been sited based upon VTARNG's environmental screening process and military requirements for safety and protection at firing ranges. At the time that the LDR was contemplated, VTARNG completed the environmental review, a screening process that considered environmental habitats, noise, and cultural resource criteria. The VTARNG evaluated several sites within the EAFR for the potential location of the LDR and it was found that the Proposed Action Site is the only location that met the required criteria outlined below:

1. Range must have varying topography and allow for view lines to and from the range areas from the proposed missile proof shelter stations.
2. Range must be located near adjacent ranges within the central portion of the range to provide a buffer to adjacent land uses.
3. Range must be located outside of adjacent cones of fire previously depicted within the range.
4. Range must not impact other functioning ranges.
5. Range must minimize potential environmental impacts to environmentally sensitive areas, existing natural botanical areas, and wildlife areas. Range must be located to avoid excessive travel times and

costs associated with driving to another installation for training days and opportunities.

6. Range must be located to avoid excessive travel times and costs associated with driving to another installation for training days and opportunities.

Several alternatives were reviewed to include a No Action Alternative. This review included four alternatives as follows:

Alternative 1 (Proposed Action and Preferred Alternative): expand the existing demolition range and formal operation of a LDR located adjacent to Range 5-3 and directly south of OP 1 in the EAFR.

Alternative 2: locate the LDR closer to the center portion of the northwest quadrant of the EAFR. Where this would make the range more remote and would increase the standoff distance to infrastructure, the problem became de-conflicting the surface danger zone for the Demolition Range and other live fire ranges. In essence, the Demolition Range was access challenged due to the locations of other ranges.

Alternative 3: locate the LDR to the south side of the installation. This alternative was dismissed because it moved the Demolition Range closer to the edge of the installation boundary and it was in a more open area which raised the concern of not being able to contain the potential noise created from the blasts.

Alternative 4: No Action Alternative. This alternative was not a viable solution to fix the shortfalls in training days and opportunities. The No Action Alternative does not meet Army TC 25-8 LDR specifications. The No Action Alternative continues to significantly reduce the readiness of units which reflects on the ability of the unit to respond to the needs of the States and Nation. The Vermont Army Guard wants to train as much as possible in the State of Vermont, thereby reducing the costs of travel, the loss of valuable training time taken by driving to another installation and limit the time soldiers spend away from their families and employers.

Uses within the EAFR are carefully orchestrated between VTARNG's two primary functions: its military mission and its environmental stewardship. VTARNG's Integrated Natural Resource Management Plan (INRMP) documents the process by which VTARNG has inventoried the EAFR's resources and identified management programs both in general and for specific areas with the EAFR.

After consideration of all factors, the Proposed Action site location was selected as the location for the LDR. Military objectives, including distance from population centers and adherence to safety precautions, were met at this location. The area was identified as being able to accommodate the proposed facilities while minimizing impacts to the wetlands, contains no previously identified historic sites, and no known areas of site contamination were identified. Conceptual plans are included in Appendix A.

This EA analysis focuses on land use and noise, biological resources, and cultural resources. The Proposed Action has been reviewed with regard to the need for environmental permits and authorizations. Minor environmental authorizations and notifications would be required and would be addressed prior to start of construction for this project. This EA describes the potential direct, indirect, and cumulative effects of implementing the Proposed Action or the No Action Alternative, as well as best management practices (BMPs) that would minimize the level of identified impacts. The VTARNG considers BMPs integral to implementation, and they are not considered separate from the Proposed Action. Mitigation measures are defined as project-specific requirements (not routinely implemented by the VTARNG) necessary to reduce identified potentially significant adverse environmental impacts to less-than-significant levels. Throughout the screening and environmental assessment for this Proposed Action, careful design has allowed the Proposed Action to avoid any sensitive resources and consideration was given to BMPs that would avoid or minimize environmental impacts. VTARNG will implement the BMPs identified herein as commitments made as part of any Army decision-making on this Proposed Action.

The Preferred Action Alternative and No Action Alternative would result in the impacts identified throughout **Section 4** and summarized in **Table ES-1**.

Table ES-1: Alternative Comparison Matrix		
Technical Resource Area	**Preferred Action Alternative**	**No Action Alternative**
Land Use and Aesthetics	Long-term, less-than-significant adverse land use impacts would be anticipated and would be managed with the implementation of BMPs.	No impact attributable to VTARNG action.
Air Quality	Short-term and long-term, less-than significant adverse impacts to the existing air-quality environment would be anticipated in the vicinity of the Proposed Action area. Impacts would include (1) short-term air emissions during clearing and construction activities and (2) long-term air emissions from training operations (fugitive dust, weapons firing, and vehicular engine emissions).	No impact attributable to VTARNG action. Ongoing operations' emissions would continue.
Noise	Short-term and long-term, less-than-significant adverse impacts to the local noise environment would be anticipated and would be managed with the implementation of BMPs. Impacts would include short-term increased noise levels as a result of land clearance and construction activities and long-term increased noise levels as a result of proposed training.	No impact attributable to VTARNG action. Ongoing noise associated with current training operations would continue.
Geology, Topography, and Soils	Short-term and long-term, less-than-significant adverse impacts to topography and soils would be anticipated and would be managed with the implementation of BMPs. No effects to the geology would be proposed or anticipated.	No impact attributable to VTARNG action.
Water Resources	Short-term and long-term less-than-significant adverse impacts to water resources would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements.	No impact attributable to VTARNG action.
Biological Resources	Short-term and long-term less-than-significant adverse impacts to plant communities would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements. A short-term, less-than-significant adverse impact to wetlands would be anticipated during construction of the Proposed Action. The Proposed Action would not adversely impact any significant wetland functions and would avoid and minimize impacts to wetlands to the greatest extent practicable. The project could be constructed in accordance with the wetland permitting requirements and conditions of the Army Corps. Short-term and long-term less-than-significant adverse and positive impacts to wildlife communities would be anticipated. Adverse impacts would be managed through the implementation of standard BMPs, in addition to adherence to regulatory requirements.	No impact attributable to VTARNG action.
Cultural Resources	No effects to cultural resources would be anticipated as a result of the Proposed Action.	No impact attributable to VTARNG action.

Socioeconomics (including Environmental Justice, and Protection of Children)	No effects to socioeconomics would be anticipated as a result of the Proposed Action.	Less-than-significant adverse impact due to loss of local revenue from visiting trainees. Less-than-significant adverse impact due to continued loss of training time due to travel to remote sites.
Infrastructure	Short-term and long-term, less-than-significant adverse impacts to infrastructure would be anticipated to occur. Impacts would include (1) short-term impacts on infrastructure due to increased vehicle traffic associated with the construction of the Proposed Action and (2) long-term impacts on infrastructure due to increased vehicular traffic associated with increased training. These vehicular traffic impacts are anticipated to be negligible.	No impact attributable to VTARNG action.
Hazardous and Toxic Materials/Wastes	Short-term and long-term less-than-significant adverse impacts due to minor land conversion activities (short-term) and maintenance and training operations (long-term) would be anticipated. Less-than-significant adverse impacts would be managed through the implementation of BMPs and ongoing regulatory compliance.	No impact attributable to VTARNG action.

This EA presents in detail the following summary of impacts and BMPs:

Land Use, Aesthetics, and Noise: Under the Proposed Action, short-term and long-term, less-than-significant adverse impacts to the local noise environment would be anticipated and would be managed with the implementation of BMPs. Impacts would include short-term increased noise levels as a result of land clearance and construction activities and long-term increased noise levels as a result of proposed training. The majority of land uses bordering the EAFR are conservation land use, agricultural land use, and rural residential land use. The screening process for the Proposed Action included locating the facility away from population centers. Recent noise complaints in the EAFR vicinity can be considered an area of concern. However, the VTARNG have prepared a Final Statewide Operational Noise Management Plan (SONMP) for the EAFR to address these concerns and to provide BMPs for both military and civilian actions. The recent noise complaints have been studied by the VTARNG as part of the SONMP. The construction of the Proposed Action would be anticipated to cause a minor increase in the noise contours beyond the 2013 drawn baseline conditions (the last full noise assessment on the range). These noise increases are mostly due to increased training numbers (actual soldiers on the range) unrelated to the construction of the Proposed Action and an increase of fired howitzer rounds during the 2012 - 2014 timeframe. These increases are due to deployment cycles, and associated training needs due to these deployments, and were not considered as part of the Proposed Action for this Environmental Analysis. The increased noise caused by other factors on the range may be considered in a future environmental and noise analysis. The full Operational Noise Assessment is included in Appendix B. Noise-related BMPs incorporated into the design to manage land use impacts in the vicinity of EAFR include directing weapons firing toward the interior of the range. EAFR has taken several steps to reduce the amount of noise generated by training operations. These actions include the prohibition of firing during specific times of the day, generally between the hours of 2200 and 0730. VTARNG continues its Operational Noise Management Program to reduce the potential of incompatible land uses around its facilities that could severely impact its mission; it continues to be a good neighbor to the surrounding communities. Municipal governments are encouraged to support public disclosure of all Noise Zones in addition to any other information that may convey how military training operations may affect the noise environment. VTARNG will continue to build its noise management program to:

1. Reduce potential incompatible land uses around training facilities,
2. Prevent detrimental effects on the mission, and
3. Carry on its good-neighbor relationship with surrounding communities.

The public is informed in advance of all VTARNG training activities via press release. The EAFR provides notices of non-routine training events (e.g., artillery firing) and the routine upcoming two-month firing schedule (small caliber) to the surrounding communities. The Towns of Jericho and Underhill post the notices on the Town websites.

Air Quality: Anticipated impacts from the Proposed Action would include short-term and long-term, less-than-significant adverse impacts to the air-quality in the vicinity of the Proposed Action area. Impacts would include (1) short-term air emissions during clearing and construction activities and (2) long-term air emissions from training operations (fugitive dust, weapons firing, and vehicular engine emissions). Impacts from the Proposed Action would not be considered as contributing to a violation of any state or federal air quality standard or regulation.

Geology, Topography, and Soils: Under the Proposed Action, both short-term and long-term, less-than-significant adverse impacts to topography and soils would be anticipated and would be managed with the implementation of BMPs. No impacts to the geology would be proposed or anticipated. No unique geological features or mineral-bearing resources exist in the area. Clearing for the Proposed Action would be minimal and clearing limits would be limited to the proposed roadways, range areas, obstacle limit areas and view/observation lines. The siting of the Proposed Action was carefully selected to maximize the use of the steep topography and the proposed site grading while the layout has been designed to minimize clearing. Soil impacts would be limited to range areas and the construction of the roadways. The following standard BMPs would be used during and after construction to minimize potential impacts from erosion and runoff: silt fence, erosion matting, stoned lined ditches, and check dams.

Water Resources: Under the Proposed Action, both short-term and long-term less-than-significant adverse impacts to water resources would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements. Water resources in the vicinity of the Proposed Action consist of Lee River, which is located approximately 1,000 feet to the south of the Proposed Action. The Proposed Action is not located within the 100-year floodplain and is not expected to impact any water resources. A Construction Stormwater Erosion Prevention and Sediment Control Permit from the VTDEC would be obtained prior to construction by the contractor. Post construction operational stormwater would be managed on-site through project design and inspected in accordance with State of Vermont General Permit 3-9015. This permit would be amended to include this action and would be obtained prior to construction by the contractor. The implementation of standard BMPs during construction projects, such as the use of silt fencing and rapid re-vegetation following site clearing and grading, would minimize potential impacts from erosion and runoff to any nearby surface waters.

Biological Resources: Under the Proposed Action, both short-term and long-term less-than-significant adverse impacts to plant communities would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements. No rare, threatened, or endangered (RTE) plants or natural communities occur in the Proposed Action area. These findings are based on the evaluation of the project area as depicted on the attached plans and findings with the assessment report. (**Appendix C**) The proposed infrastructure would be located within the Northern Hardwood Forest Natural Community, which is very common, and the proposed project area would be situated within the Hemlock Forest and Hemlock-Northern Hardwood Forest, which are both common. Annual vegetative control maintenance to the LDR would include brush hogging. Human presence would be isolated to road and trail networks and range areas within the LDR. To avoid any impact outside of the LDR, as a BMP, foot traffic would not expand beyond existing trails.

A short-term, less-than-significant adverse impact to wetlands would be anticipated during construction of the Proposed Action. The Proposed Action would not adversely impact any significant wetland functions and would

avoid and minimize impacts to wetlands to the greatest extent practicable. There is one southerly–trending wetland band that is located within a low area within the upland area. (**Map W-1 for wetland location**) An existing logging skidder trail crosses this wetland. The proposed access road improvements for the Proposed Action would follow the existing skidder trail. The proposed improvements would stabilize the soils in this area and would reduce the potential for erosion along the existing trail. The Proposed Action has been designed to have minimal wetland impacts, as specified by the terms, conditions, and definitions in the General Permit (GP) issued by the New England District of the United States Army Corps of Engineers (Corps). The Project is designed to qualify for authorization as a Category 1 project under the GP and would be constructed in full compliance with the terms and conditions of the GP.

Under the Proposed Action, both short-term and long-term less-than-significant adverse and positive impacts to wildlife communities would be anticipated. Adverse impacts would be managed through the implementation of standard BMPs, in addition to adherence to regulatory requirements. The creation and operation of the LDR, and proposed activities occurring on the range, would not have any significant impact on RTE species of Vermont. Although the creation of the LDR would result in long-term, less-than-significant effects on birds, there are not any significant impacts on birds or bird habitats within or near the proposed action. The complete Wildlife and Wildlife Habitat Impact study is included in **Appendix D**. As the northern long-eared bat (NLEB) is listed under the federal Endangered Species Act (ESA), VTARNG has contacted the United States Fish and Wildlife Service (USFWS) and has provided them with the bat survey information. Both acoustic and mist-netting surveys were completed in efforts to determine the presence of the NLEB and any roost trees that may be in the project area. Acoustic surveys were conducted in early June 2015 and included 9 detector nights in roughly a 60-acre habitat area of interest (HAOI), and an additional 200-meter buffer for a total area of 120 acres. There were 619 acoustic files recorded during the survey. Mist netting was conducted in the first week of July 2015 at the same HAOI as the acoustic surveys. No NELBs were trapped in this effort. In conclusion, the VTARNG has determined that construction of the LDR at the EAFR would not likely have an adverse effect on the NLEB. In response to the surveys, the USFWS indicated that by limiting the clearing of trees to the time period between October 1 and April 15, any direct adverse effects to the NLEB could be avoided. They also indicated that indirect adverse effects would not likely occur due to the small amount of forest clearing relative to the available habitat in the immediate surrounding area. The response letter from the USFWS and the Acoustic and Netting surveys are included in Appendix E.

Cultural Resources: There would be no impacts to cultural resources as a result of implementation of the Proposed Action. The National Historic Preservation Act (NHPA) of 1966, Protection of Historic and Cultural Properties, requires federal agencies to consider potential impacts to "significant" cultural resources. An Archaeological Resource Assessment (ARA) (Report #852:2014) was conducted by the University of Vermont Consulting Archaeology Program (UVM CAP) in accordance with Section 106 of the National Historic Preservation Act (1966), as amended. This survey found no significant historic archaeological resources within the Proposed Action area; in addition, it is unlikely that the proposed improvements and/or activities in the LDR area would impact significant precontact Native American archaeological resources. Therefore, no further work concerning historic resources would be required for this project area. The ARA is included in **Appendix F**.

Socioeconomics: There would be no impacts to socioeconomics as a result of implementation of the Proposed Action. No long-term effect on population, employment, income, or housing would be expected, though minor short-term positive effects to the local economy would be anticipated from the construction activity.

Environmental Justice: There would be no environmental justice impacts associated with implementation of the Proposed Action, in accordance with EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Implementation of these projects would also have no disproportionately negative effect on children, in accordance with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks.

Infrastructure: Under the Proposed Action, short-term and long-term, less-than-significant adverse impacts to infrastructure would be anticipated to occur. Impacts would include (1) short-term impacts on infrastructure due

to increased vehicle traffic associated with the construction of the Proposed Action and (2) long-term impacts on infrastructure due to increased vehicular traffic associated with increased training. These vehicular traffic impacts are anticipated to be negligible. There would be a minimal amount of new utility infrastructure as part of the Proposed Action. Utilities would be extended into the LDR from the existing infrastructure within the EAFR. The utilities for the LDR would be limited to underground power which would be brought in from the 6-6 Range facilities.

Hazardous and Toxic Materials/Wastes: Short-term and long-term, less-than-significant adverse impacts associated with Proposed Action would be anticipated due to minor land conversion activities (short-term) and maintenance and training operations (long-term). Less-than-significant adverse impacts would be managed through the implementation of BMPs and ongoing regulatory compliance. The Proposed Action site is not located in areas where VTARNG's Environmental Condition of Property Category record has indicated that the previous release, disposal, and/or migration of hazardous substances has occurred. As identified in the Environmental Baseline Survey for the EAFR, the Proposed Action would not impact any known hazardous waste site in the area. The Proposed Action would be operated in a manner that would not create any hazardous waste conditions.

There will be one 30-day comment period for the Final EA and Finding of No Significant Impact (FONSI), according to the Standard Timeline in the 2011 ARNG NEPA Handbook. Public comments received during the EA review process will be incorporated into the Final EA and FONSI. Public involvement is conducted in accordance with Council on Environmental Quality (CEQ) requirements (40 C.F.R. Part 1506.6 and 32 C.F.R. §651.47) and the 2011 ARNG NEPA Handbook. The agencies, organizations, tribal governments, and individuals who have been contacted through the Letter of Consultation process, and who will be provided with a copy of the EA for review and comment, are provided in **Section 9**.

The Proposed Action would not violate NEPA, its regulations promulgated by the CEQ, ARNG, or any other federal, state, or local environmental regulations. The ARNG and VTARNG affirm their commitment to implement this EA in accordance with NEPA. Implementation of this EA is dependent on funding. The VTARNG and ARNG's Installations and Environment Directorate and Training Directorate would ensure adequate funds are requested in future years' budgets to achieve the goals and objectives set forth in this EA.

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1.0 Purpose and Need for the Proposed Action

1.1 Introduction

The Ethan Allen Firing Range (EAFR) is located within the towns of Jericho, Bolton, and Underhill, Vermont. It is the major training support facility for the Vermont Army National Guard (VTARNG). The project site and vicinity are shown in three figures: **Figure 1** (EAFR General Location Map); **Figure 2** (EAFR Vicinity); and **Figure 3** (EAFR Firing Ranges). The EAFR was established in 1926 on 6,026 acres acquired by the United States government. In 1941, the range was expanded to its present size of 11,219 acres. The range went through numerous management changes, and in 1976, the name of the installation was officially changed to the EAFR. The State of Vermont Military Department commands and supports the National Guard as mandated by state and federal constitutions. The department is also required by state law to provide support to Vermont veterans. The department is administered by the Adjutant General and includes the Vermont Army and Air National Guard as well as a state workforce integrated into these organizations. VTARNG serves as a military force available to the governor in the event of state emergencies that exceed the capability of civil authorities and as an immediately operational federal force for the United States Army in times of national emergency or war.

1.2 Purpose and Need

The EAFR is the major training facility which supports not only the Vermont National Guard but multiple military units and law enforcement agencies all around the New England area. The existing 5-3 Demo Range, where the use of demolitions and explosives is authorized, supports training of Combat Engineers, Infantry, the VTARNG's 124th Regional Training Institute, and both military and law enforcement Explosive Ordnance Disposal (EOD) Technicians. Due to the limited size and layout, the demolition area does not allow units to conduct pre-mobilization training, Mission Essential Task training, or Military Occupational Specialty training. Based on the shortfalls of the current demolition area, the Army Range Requirements Model (ARRM) has identified 19 training days that military units cannot accomplish. Therefore, units need to travel to Fort Drum, New York or further in order to complete this training.

The proposed Light Demo Range (LDR) is a live fire demolition and explosive facility designed to meet U.S. Army specifications for an LDR as set forth in Army Training Circular (TC) 25-8, *Training Ranges.* The facility is a multi-station facility that would allow units to train on the use and employment of explosives in various applications such as timber cutting, steel cutting, and obstacle reduction. Nested in the heart of the EAFR, the LDR would use the natural mountainous landscape to establish each station. Each station has a specific mission task that can be applied in either rural or urban settings. The LDR would not only keep VTARNG units training in Vermont, but would attract military units and Law Enforcement Agencies that are required to use demolitions and explosives to the area, assisting in vitalizing Vermont's economy.

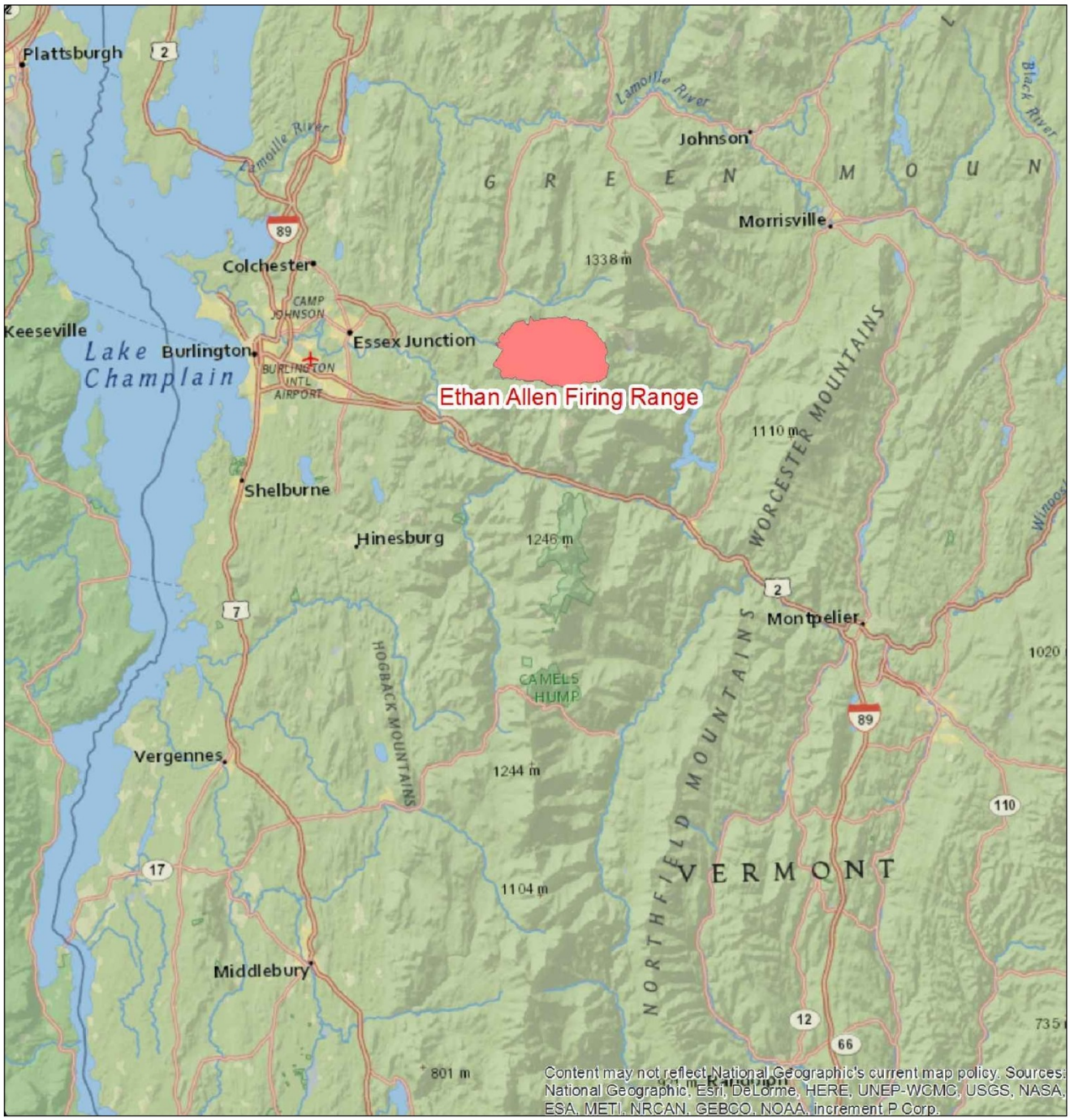

Figure 1 - EAFR General Location Map

0 3 6 12 Miles

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Legend
Ethan Allen Firing Range

Ryan Ochs
State of Vermont Military Department
June 2015

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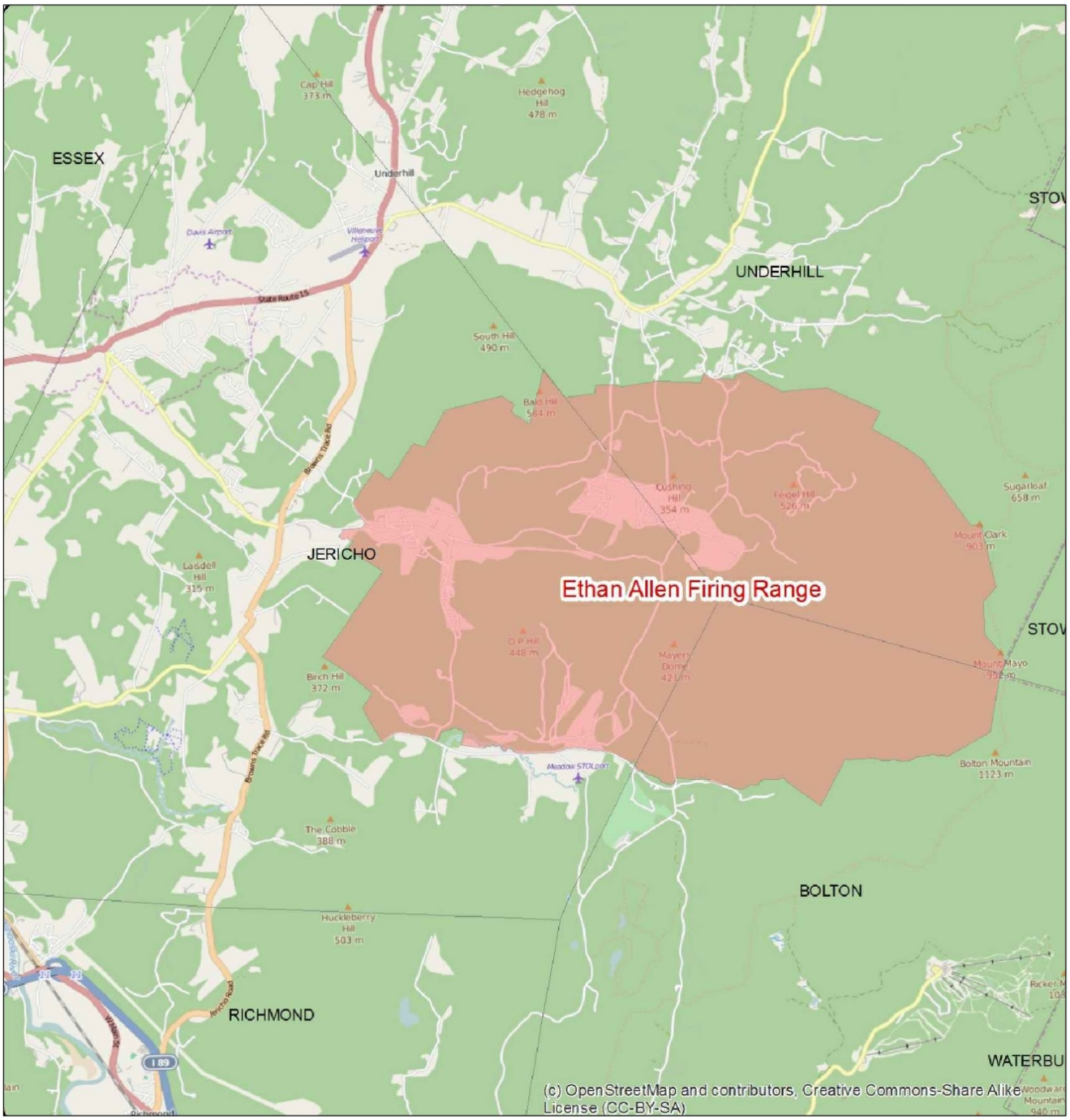

Figure 2 - EAFR Vicinity

0 0.5 1 2 Miles

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Legend
Ethan Allen Firing Range

Ryan Ochs
State of Vermont Military Department
June 2015

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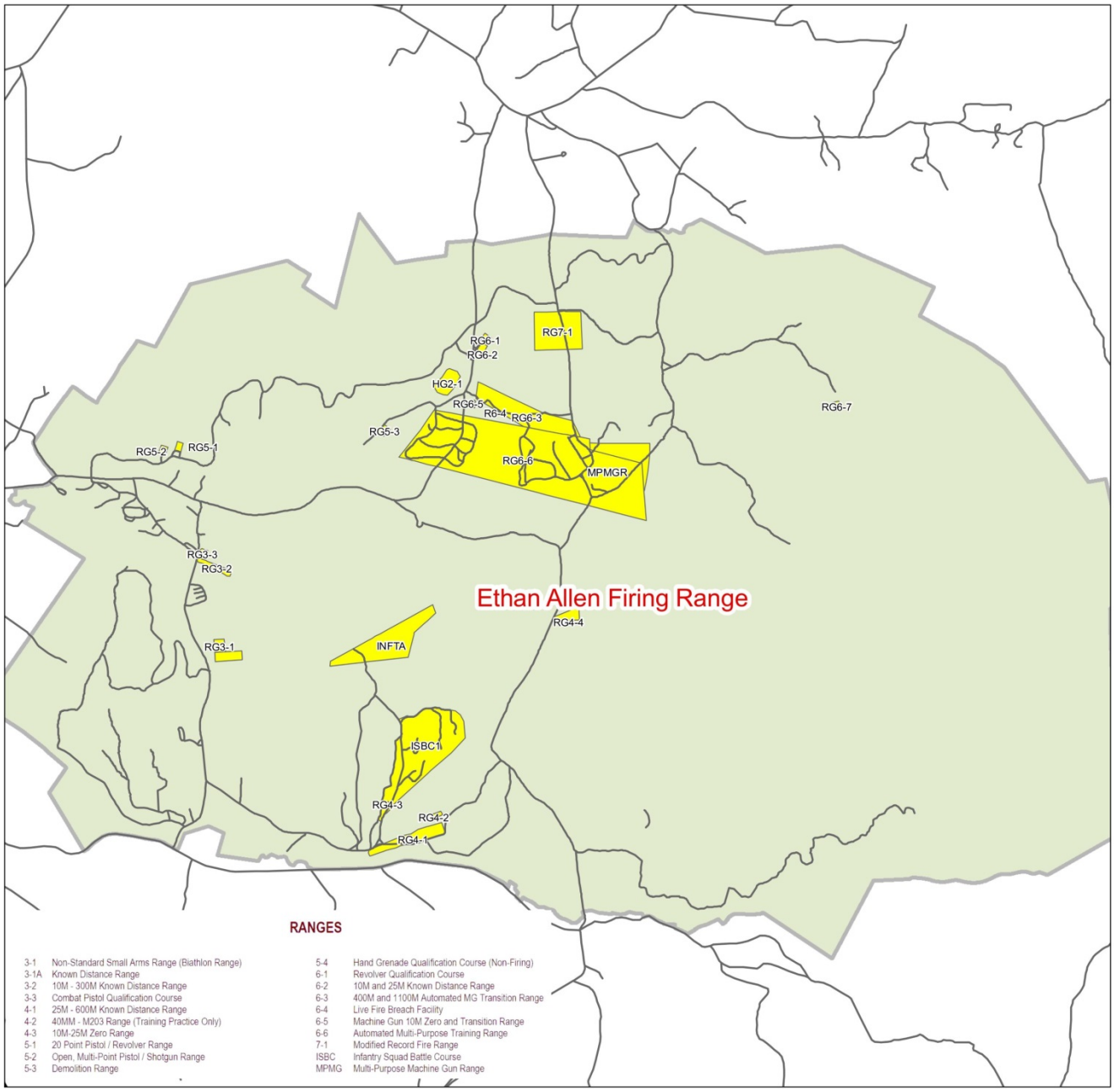

Figure 3 - EAFR Firing Ranges

0 0.25 0.5 1 Miles

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Legend
Firing Ranges

Ryan Ochs
State of Vermont Military Department
January 2018

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1.3 Scope of the EA

This EA has been prepared in compliance with NEPA, 42 U.S.C. 4321 et seq., C.F.R. Parts 1500 – 1508, 32 C.F.R. Part 651 (Environmental Analysis of Army Actions; Final Rule, 29 March 2002), and as prescribed in the 2011 Army National Guard (ARNG) NEPA Handbook, in order to present and assess the potential environmental effects associated with construction and operation of the Proposed Action and alternatives. It provides the public and decision-makers with the baseline information required to understand and evaluate these potential environmental impacts associated with the construction and operation of the LDR.

Several alternatives were reviewed to include a No Action Alternative. This review included four alternatives as follows:

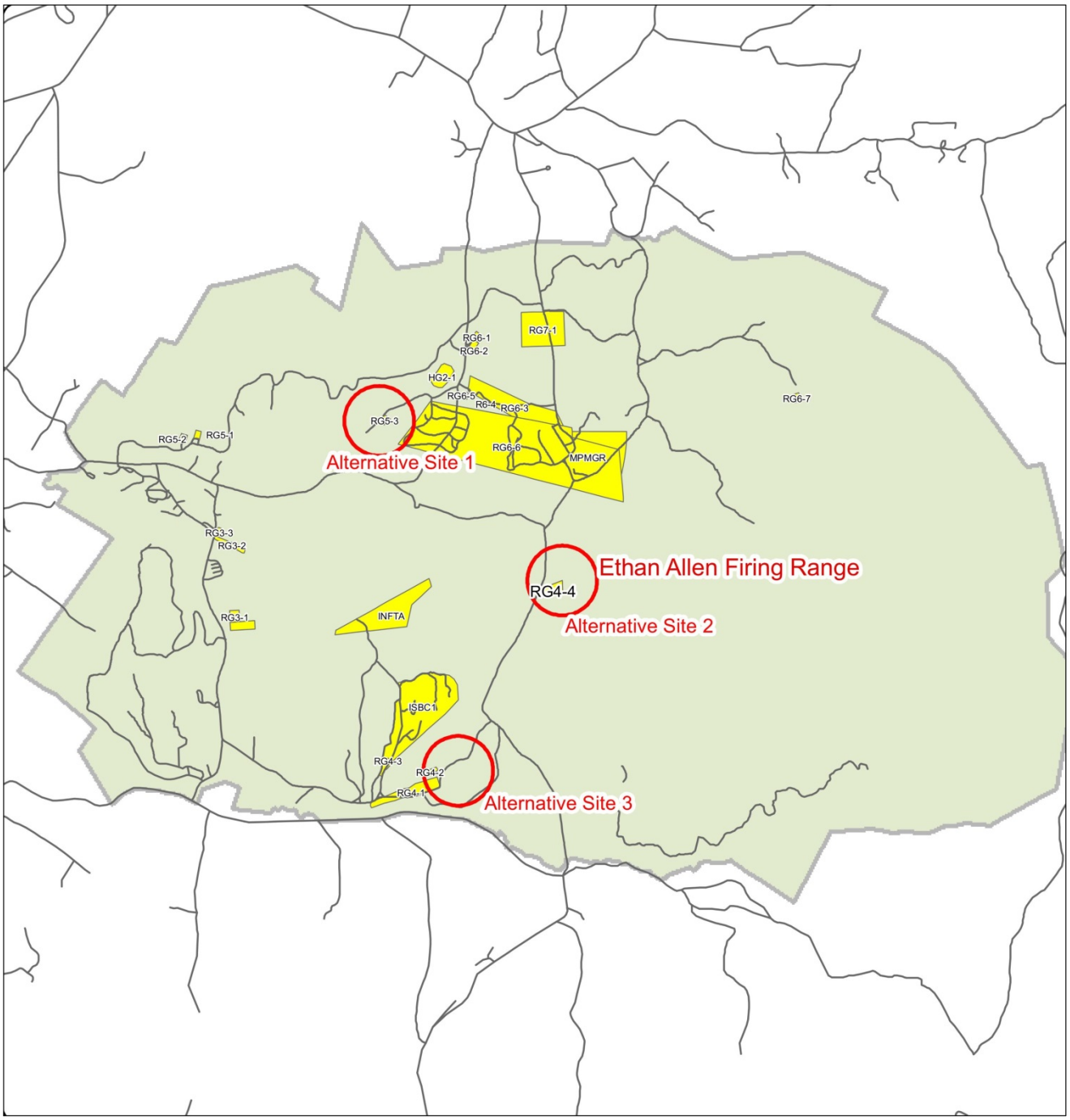
Alternative 1 (Proposed Action and Preferred Alternative): expand the existing demolition range and formal operation of a LDR located adjacent to Range 5-3 and directly south of OP 1 in the EAFR.

Alternative 2: locate the LDR closer to the center portion of the northwest quadrant of the EAFR. Where this would make the range more remote and would increase the standoff distance to infrastructure, the problem became de-conflicting the surface danger zone for the Demolition Range and other live fire ranges. In essence the Demolition Range was access challenged due to the locations of other ranges.

Alternative 3: locate the LDR to the south side of the installation. This alternative was dismissed because it moved the Demolition Range closer to the edge of the installation boundary and the location was within a more open area which raised the concern of not being able to contain the potential noise created from the blasts.

Alternative 4: No Action Alternative. This alternative was not a viable solution to fix the shortfalls in training days and opportunities. The No Action Alternative does not meet Army TC 25-8 LDR specifications. The No Action Alternative continues to significantly reduce the readiness of units which reflects on the ability of the unit to respond to the needs of the states and nation. The Vermont Army Guard wants to train as much as possible in the State of Vermont, thereby reducing the costs of travel, the loss of valuable training time taken by driving to another installation and limit the time soldiers spend away from their families and employers.

After the initial screening of Alternatives 1 - 4, Alternatives 2 and 3 were dismissed from further analysis. Alternatives 1 and 4 have been retaining for further analysis within this EA. Two courses of action are considered under this EA: the Proposed Action and the No Action Alternative. The Proposed Action evaluated in this EA consist of expanding the existing demolition range and formal operation of a LDR located adjacent to Range 5-3 and directly south of OP-1 in the EAFR (**Figure 4**, Alternate Sites). In accordance with CEQ and Army Regulations, analysis of the No Action Alternative is required in all ARNG EAs. The No Action Alternative provides a baseline against which the effects of the Proposed Action are evaluated. In this case, the No Action Alternative would mean that the Proposed Action would not take place.



0 0.25 0.5 1 Miles

N

Figure 4 - Alternate Sites

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Legend
- Alternative Sites
- Firing Ranges

Ryan Ochs
State of Vermont Military Department
January 2018

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1.4 Decision-making

NEPA requires federal agencies to take into consideration the potential environmental consequences of Proposed Actions in their decision-making process. The intent of NEPA is to protect, restore, or enhance the environment through well-informed decisions. CEQ was established under NEPA to implement and oversee federal policy in this process. CEQ subsequently issued Regulations for Implementing the Procedural Provisions of the NEPA (40 C.F.R. Sections 1500-1508). These regulations specify that an EA be prepared to serve as a concise public document providing sufficient evidence and analysis for determining:

- Whether any effects are significant and thus warrant the preparation of an Environmental Impact Statement (EIS), or,
- Whether to prepare a Finding of No Significant Impact (FONSI).

An EA is the type of NEPA analysis most commonly conducted by ARNG for actions that require written consideration of the environmental effects of a proposed action. This EA is prepared on behalf of VTARNG for review and decision-making by the NGB.

Per amendments to 10 U.S.C. §10501, described in DoD Directive 5105.77 (30 October 2015), the NGB is a joint activity of the DoD. NGB serves as a channel of communication and funding between the US Army and state Guard organizations in the 54 US States, Territories, and District. The ARNG is a Directorate within NGB. The ARNG's Installations and Environment Directorate is the directorate within ARNG that is responsible for environmental matters, including compliance with the NEPA. As ARNG is the federal decision-maker concerning this Proposed Action and controls the federal funds that would be used for its implementation, this is a federal Proposed Action. The federal decision-making on the part of the ARNG includes selecting an alternative to implement, and identifying the actions that the government will commit to undertake to minimize environmental effects, as required under the NEPA, CEQ Regulations, and 32 C.F.R. Part 651.

1.5 Public and Agency Involvement

The VTARNG and the NGB invite full public participation in the NEPA process. Consideration of the views and information of all interested persons promotes open communication and enables better decision-making by the VTARNG and the NGB. All persons and organizations having potential interest in the Proposed Action, including minority, low income, disadvantaged, and federally-recognized Native American tribes, are urged to participate in the NEPA environmental analysis process. During the preparation of this EA, in accordance with Executive Order (EO) 12372, Intergovernmental Review of Federal Programs, the VTARNG prepared and distributed Intergovernmental and Interagency Coordination of Environmental Planning (IICEP) letters and Native American Consultation (NAC) letters to the relevant local, state, federal, and tribal agencies to solicit their input regarding any potential concerns that should be addressed in the EA to ensure that an appropriate scope of issues is analyzed in this EA. A list of these agencies is presented in **Section 9.0**, and copies of agency responses are included in **Appendix G**.

Persons interested in receiving copies of the EA or the FNSI may contact:
LTC. Jacob Roy, State of Vermont, Adjutant General's Office, Vermont Army National Guard, State of Vermont Military Department, 789 National Guard Rd., Building #5, Camp Johnson, Colchester, Vermont 05446-3099
COMM - 802-338-3306
EMAIL - jacob.roy@partner.vermont.gov EMAIL - jacob.b.roy.mil@mail.mil

1.6 Related NEPA, Environmental, and Other Documents and Processes

The following documents contain information used in the preparation of this EA:

- *Operational Noise Assessment Proposed Light Demolition Range Camp Ethan Allen Training Site, Vermont* by Army Public Health Center, 7 January 2015.

- *Rare, Threatened & Endangered Plants and Natural Communities Inventory for the Proposed Light Demolition Range – Vermont National Guard – Ethan Allen Firing Range – Jericho, Vermont* by Greenleaf Consulting, Inc., 2015.

- *Impacts to Wildlife and Wildlife Habitat from the Light Demolition Range* by Northern Stewards, LC, June 2015.

- *2015 Bat Acoustic Survey at the Ethan Allen Firing Range Jericho, VT* by Northern Stewards, LC, June 2015.

- *Archaeological Resources Assessment for the 5-3 Demo Range Project Area, Vermont Army National Guard Ethan Allen Firing Training Center, Jericho, Underhill, Bolton, Chittenden County, Vermont* by University of Vermont Consulting Archaeology Program, December 2014.

- *Vermont Army National Guard Statewide Operational Noise Management Plan* by Army Public Health Center, May 2013.

- *Final Operational Range Assessment Program Phase I Qualitative Assessment Report Ethan Allen Firing Range Jericho, Vermont* by EA Engineering, Science, and Technology, Inc., 2008.

- *Final Operational Range Assessments Phase I Qualitative Assessment Addendum Ethan Allen Firing Range, Vermont* by EA Engineering, Science, and Technology, Inc. and Zapata Inc., 2013.

- *Integrated Natural Resources Management Plan, Ethan Allen Firing Range (Revision in progress)* by Vermont Army National Guard, 2001.

- *Environmental Assessment for the Vermont Army National Guard, Ethan Allen Firing Range Projects* by Vermont Army National Guard, 2006.

1.7 Regulatory Framework

In addition to NEPA, other environmental laws are applicable to this analysis. These federal regulations consist of the following:

- Federal agencies are required to determine the conformity of Proposed Actions with respect to State Implementation Plans (SIPs) for attainment of air quality goals.
- The Office of Environmental Impact Review at the Vermont Department of Environmental Conservation (VTDEC) coordinates Vermont's response to environmental impact review documents submitted to the agency regarding proposed state and federal projects.
- The Endangered Species Act is the primary federal legislation regarding biological resources. The Act protects proposed and listed threatened and endangered species, as well as the habitats that support such species.
- The Clean Water Act (CWA) regulates pollutant discharges that could affect aquatic life forms or human health and safety. The CWA and Executive Order (EO) 11990, on the Protection of Wetlands, regulate development activities near streams or wetlands.
- The National Historic Preservation Act (NHPA) established the National Register of Historic Places (NRHP) and the Advisory Council on Historic Preservation (ACHP). The NHPA

requires federal agencies to consider potential impacts to "significant" cultural resources that are listed, nominated for, or eligible for listing on the NRHP; designated a National Historic Landmark; or valued by modern Native Americans for maintaining their traditional culture.

- The Native American Graves Protection and Repatriation Act (25 U.SC. Subsection 3001-3013) requires museums and federal agencies to (1) document certain Native American human remains and cultural items within their collections; (2) notify all Indian Tribes and Native organizations that are or are likely to be affiliated with these holdings; and (3) provide an opportunity for the repatriation of appropriate human remains or cultural items.

This EA also documents compliance with the following:

- Protection of Wetlands
- EO 11988, Floodplains Management
- 36 C.F.R. Section 800, Protection of Historic and Cultural Properties
- EO 13007, Indian Sacred Sites
- EO 13175, Consultation and Coordination with Indian Tribal Government
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EAFR Integrated Natural Resources Management Plan (INRMP), 2001
- VTARNG Statewide Operational Noise Management Plan, 2013

2.0 Description of the Proposed Action and Alternatives

2.1 Introduction

The purpose of the proposed action would be to provide the VTARNG with a LDR consisting of a multi-station facility that would allow units to train on the use and employment of explosives in various applications such as timber cutting, steel cutting, and obstacle reduction. The LDR would utilize the natural mountainous landscape to establish each station. Each station has a specific mission task that can be applied in either rural or urban settings. The LDR would not only keep Vermont Army Guard units training in Vermont, but would attract military units and Law Enforcement Agencies that are required to use demolitions and explosives to the area, assisting in vitalizing Vermont's economy.

2.2 Proposed Action

The Proposed Action by VTARNG is the construction of the LDR within the EAFR in the Town of Jericho, in Chittenden County, Vermont. This project is needed to meet the needs and mission of VTARNG and provide a multi-station facility that would allow units to train on the use and employment of explosives in various applications. This service is not available in this area and requires units to travel to Fort Drum, New York, or further, in order to complete this training. The LDR would not only keep Vermont Army Guard units training in Vermont, but would attract military units and Law Enforcement Agencies that are required to use demolitions and explosives to the area, assisting in vitalizing Vermont's economy.

VTARNG would upgrade an existing gravel roadway from Range 5-3 for access to the proposed LDR. The LDR would utilize the natural mountainous landscape to establish each station. Elevations within the project area range from 820 - 960 feet above mean sea level. The existing access road would be upgraded and approximately 2,200 feet of new roadway would be constructed as an extension of the existing road to access the proposed LDR locations.

The purpose of this action is to provide construction elements in order to create and operate a LDR that would achieve the training requirements necessary to allow units to conduct pre-mobilization training, Mission Essential Task training, or Military Occupational Specialty training. (**Figure 5 – LDR**) A conceptual site plan has been prepared by Civil Engineering Associates and is presented as **Appendix A**. Proposed construction elements consist of the following:

1. **Light Demo Access Road.** The proposed road is an extension of the existing roadway that passes by Range 5-3. The total length of new road, including the three legs is approximately 0.75 miles beyond Range 5-3 including the upgrades to the existing trail. The 5,250 linear feet of gravel road would provide pedestrian and all-terrain vehicle access to the LDR. Sections of the existing roadway would be graded and widened to accommodate the proposed project and allow for access to the components of the LDR. This route was chosen to utilize existing infrastructure and to minimize earth disturbance. The roadway would be utilized year around with limited usage permitted in the winter. Usage of the access road is proposed as follows in **Table 1**.

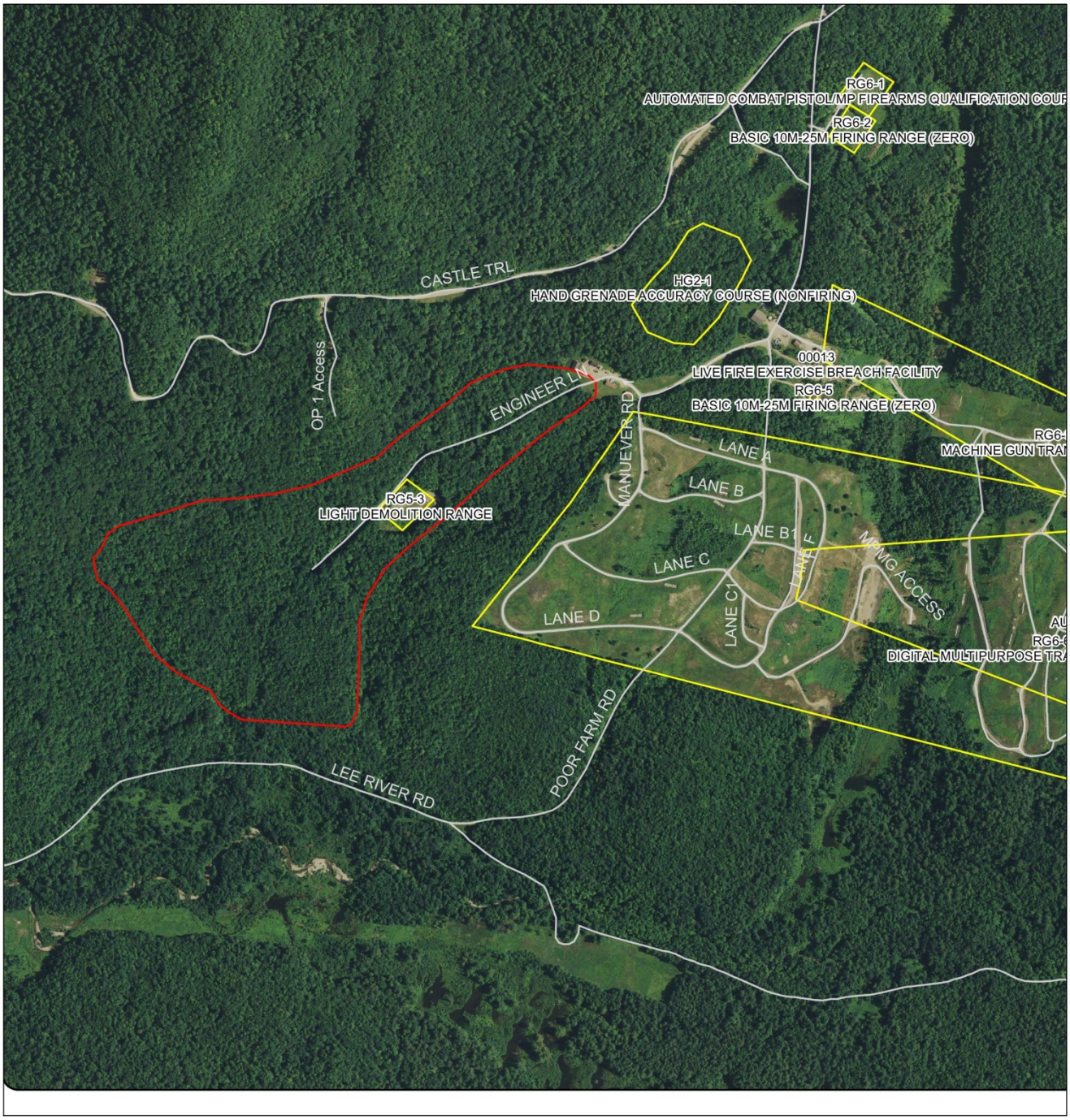
Table 1 Light Demo Access Road Usage by Season				
Platform*	**Winter**	**Spring**	**Summer**	**Fall**
HMWWV	Full	Full	Full	Full
SUSV	Full	Full	Full	Full
ULTV	Limited (tracks)	Full	Full	Full
ATV	Limited (tracks)	Full	Full	Full

*Platform:
HMWWV- High Mobility Multi-Purpose Wheeled Vehicle
SUSV – Small Unit Support Vehicle
ULTV – Ultra Light Tactical Vehicle
ATV – All Terrain Vehicle

Source: VTARNG, 2012

2. **Light Demo Proposed Ammo Breakdown Building.** The Light Demo Ammo Breakdown Building would be 240 square feet and would be used for the training and practice of ammo construction and breakdown of various forms and manufactures of ammo.
3. **Light Demo Proposed Concrete Obstacle Site.** The Concrete Obstacle course would be a 10 by 30 meter area comprised of different concrete structures. Soldiers would use this to train on various applications such as clearing the concrete obstacles and creating obstacles with them.
4. **Light Demo Proposed Timber Cutting Site.** The Timber Cutting would be 10 meters by 35 meters and would contain 8 concrete base supports for placement of logs. Logs would be no larger than 36 centimeters in diameter and no taller than 10 meters. Soldiers would use this to train on various applications such as clearing areas for landing zones and creating obstacles.
5. **Light Demo Proposed Mine Field Site.** The Mine Field Site would be 10 meters by 20 meters in size. The field would contain simulated mines that would be placed on the surface or buried and soldiers would need to clear the mines using explosives.
6. **Light Demo Proposed Steel Cutting Chamber.** The Steel Cutting Chamber would be 684 square feet in size and would have a ledge to mount steel or concreted beams. The steel and concrete beams would vary in type, width and size and soldiers would need to achieve the desired effect on the object. (i.e. cut, bend and/or destroy)
7. **Light Demo Proposed Wire Obstacle Site.** The Wire Obstacle Site would be 7 meters by 20 meters in size where soldiers would need to breach a wire emplaced obstacle.
8. **Light Demo Proposed Road Crater Site.** The Road Crater Site would involve a gravel lane in which soldiers must effectively make the road/trail impassable. The lane would be restored after each use.

Once the eight areas are complete the LDR would be utilized by both VTARNG Units and other units.



0 300 600 1,200 Feet

N

Figure 5 - Light Demo Range

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Legend
- Light Demo Range Area
- Firing Ranges

Ryan Ochs
State of Vermont Military Department
January 2018

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2.3 Alternatives Considered

2.3.1 Alternatives Development (Screening Criteria)

When the LDR was originally contemplated, VTARNG completed an environmental screening process that considered environmental habitats, noise and cultural resource criteria. The VTARNG evaluated several sites with the EAFR for the potential location of the LDR and it was found that the Proposed Action Site is the only location that met the required criteria. As outlined below:

1. Range must have varying topography and allow for view lines to and from the range areas from the proposed missile proof shelter (MPS) stations. MPSs are typically pre-fabricated assemblies that include the following dimensions: 10 feet x 8 feet x 9 feet. They typically feature three 30 inch x 12 inch viewing windows made of ballistic glass.
2. Range must be located near adjacent ranges within the central portion of the range to provide a buffer to adjacent land uses.
3. Range must be located outside of adjacent cones of fire previously depicted within the range.
4. Range must not impact other functioning ranges.
5. Range must minimize potential environmental impacts to environmentally sensitive areas, existing natural botanical areas, and wildlife areas.
6. Range must be located to avoid excessive travel times and costs associated with driving to another installation for training days and opportunities.

Table 2 provides a summary of the alternatives considered and their abilities to meet the screening criteria. **The "X" means that criteria could not be met for that Alternative.**

TABLE 2: SUMMARY OF ALTERNATIVES CONSIDERED

Screening Criteria (see Section 2.3.1)		Alternatives Considered and the Screening Criteria that would *not* be met			
		Alternative 1 (Preferred Action Alternative)	**Alternative 2 (northwest quadrant of EAFR)**	**Alternative 3 (south side of EAFR)**	**Alternative 4 (No Action Alternative)**
1	Range must have varying topography and allow for view lines to and from the range areas from the proposed missile proof shelter stations.				
2	Range must be located near adjacent ranges within the central portion of the range to provide a buffer to adjacent land uses.			X	
3	Range must be located outside of adjacent cones of fire previously depicted within the range.		X		
4	Range must not impact other functioning ranges.		X	X	
5	Range must minimize potential environmental impact to environmentally sensitive areas, existing natural botanical areas, and wildlife areas.			X	
6	Range must be located to avoid excessive travel times and costs				X

	associated with driving to another installation for training days and opportunities.				

2.3.2 Evaluated Alternatives

From this screening criteria analysis, two alternatives were selected for evaluation:

Alternative 1 (Proposed Action and Preferred Alternative): expand the existing demolition range and formal operation of a LDR located adjacent to Range 5-3 and directly south of OP 1 in the EAFR). The Proposed Action evaluated in this EA consist of expanding the existing demolition range and formal operation of a LDR located adjacent to Range 5-3 and directly south of OP-1 in the EAFR. After consideration of all factors, the Proposed Action site is the only option at the EAFR that meets the criteria and environment necessary for the LDR. Military objectives, including distance from population centers and adherence to safety precautions, were met in this location. This area was identified as being able to accommodate the proposed facilities while avoiding natural and wildlife communities, and significant features, while minimizing wetland impacts. This project location contains no previously identified historic sites. No known areas of site contamination were identified in the areas of consideration.

Alternative 4: No Action Alternative. This alternative was not a viable solution to fix the shortfalls in training days and opportunities. The No Action Alternative continues to significantly reduce the readiness of units which reflects the ability of the unit to respond to the needs of the State and Nation. The Vermont Army Guard wants to train as much as possible in the State of Vermont, whereby reducing the costs of travel, the loss of valuable training time taken by driving to another installation, and limit the time soldiers spend away from their families and employers.

In accordance with CEQ and Army Regulations, analysis of the No Action Alternative is required in all ARNG EAs. The No Action Alternative provides a baseline against which the effects of the Proposed Action are evaluated. In this case, the No Action Alternative would mean that the Proposed Action would not take place.

The civil engineering conceptual site plans prepared for the Proposed Action by Civil Engineering Associates, Inc. (CEA) are presented in Appendix A. The plans depict the proposed layout of the proposed construction elements.

Final site selection required environmental field inspection of wetlands, cultural resources, and environmental contamination in order to site the Proposed Action in an environmentally sensitive manner away from known resources.

2.3.3 Alternatives Eliminated from Further Consideration

From the screening criteria process, two alternatives were dismissed from further analysis—Alternatives 2 and 3.

Alternative 2: locate the LDR more into the center of the EAFR. While this location would make the LDR more remote and increase the standoff distance to infrastructure, the problem became de-conflicting the surface danger zone for the LDR and other live fire ranges. In essence, the LDR was access challenged because of other ranges.

Alternative 3: locate the LDR to the south side of the installation. This alternative was dismissed because it moved the LDR closer to the edge of the installation boundary and the location was

within a more open area which raised the concern of not being able to contain the potential noise created from the blasts.

Alternative locations outside the EAFR were not considered, due to the need for mountain terrain and the need to be proximate to the existing ranges. There is currently no alternative location that could provide the buffer to adjacent and outside uses that the EAFR provides and the realism in training required to meet combat training objectives. Alternate methods of meeting this requirement have been explored during VTARNG's project development. This analysis determined that the project as proposed is the only feasible option to meet Army training requirements.

2.3.4 Alternatives' Impact Comparison Matrix

This EA evaluates the potential direct, indirect, and cumulative environmental, cultural, socioeconomic, and physical effects of establishing the LDR at the EAFR. A comparison of anticipated environmental consequences of the Preferred Action Alternative and No Action Alternative is provided in **Table 3**.

Table 3: Alternative Comparison Matrix

Technical Resource Area	Preferred Action Alternative	No Action Alternative
Land Use and Aesthetics	Long-term, less-than-significant adverse land use impacts would be anticipated and would be managed with the implementation of BMPs.	No impact attributable to VTARNG action.
Air Quality	Short-term and long-term, less-than significant adverse impacts to the existing air-quality environment would be anticipated in the vicinity of the Proposed Action area. Impacts would include (1) short-term air emissions during clearing and construction activities and (2) long-term air emissions from training operations (fugitive dust, weapons firing, and vehicular engine emissions).	No impact attributable to VTARNG action. Ongoing operations' emissions would continue.
Noise	Short-term and long-term, less-than-significant adverse impacts to the local noise environment would be anticipated and would be managed with the implementation of BMPs. Impacts would include short-term increased noise levels as a result of land clearance and construction activities and long-term increased noise levels as a result of proposed training.	No impact attributable to VTARNG action. Ongoing noise associated with current training operations would continue.
Geology, Topography, and Soils	Short-term and long-term, less-than-significant adverse impacts to topography and soils would be anticipated and would be managed with the implementation of BMPs. No effects to the geology would be proposed or anticipated.	No impact attributable to VTARNG action.
Water Resources	Short-term and long-term less-than-significant adverse impacts to water resources would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements.	No impact attributable to VTARNG action.
Biological Resources	Short-term and long-term less-than-significant adverse impacts to plant communities would be anticipated and would be managed through	No impact attributable to VTARNG action.

	the implementation of standard BMPs and adherence to regulatory requirements. A short-term, less-than-significant adverse impact to wetlands would be anticipated during construction of the Proposed Action. The Proposed Action would not adversely impact any significant wetland functions, and would avoid and minimize impacts to wetlands to the greatest extent practicable. The project could be constructed in accordance with the wetland permitting requirements and conditions of the Army Corps. Short-term and long-term less-than-significant adverse and positive impacts to wildlife communities would be anticipated. Adverse impacts would be managed through the implementation of standard BMPs, in addition to adherence to regulatory requirements.	
Cultural Resources	No effects to cultural resources would be anticipated as a result of the Proposed Action.	No impact attributable to VTARNG action.
Socioeconomics (including Environmental Justice, and Protection of Children)	No effects to socioeconomics would be anticipated as a result of the Proposed Action.	Less-than-significant adverse impact due to loss of local revenue from visiting trainees. Less-than-significant adverse impact due to continued loss of training time due to travel to remote sites.
Infrastructure	Short-term and long-term, less-than-significant adverse impacts to infrastructure would be anticipated to occur. Impacts would include (1) short-term impacts on infrastructure due to increased vehicle traffic associated with the construction of the Proposed Action and (2) long-term impacts on infrastructure due to increased vehicular traffic associated with increased training. These vehicular traffic impacts are anticipated to be negligible.	No impact attributable to VTARNG action.
Hazardous and Toxic Materials/Wastes	Short-term and long-term less-than-significant adverse impacts due to minor land conversion activities (short-term) and maintenance and training operations (long-term) would be anticipated. Less-than-significant adverse impacts would be managed through the implementation of BMPs and ongoing regulatory compliance.	No impact attributable to VTARNG action.

3.0 Affected Environment

The environmental assessment for this project has concentrated on several key parameters of particular relevance: natural communities and habitats, cultural resources, noise, and land use compatibility. This action consists of upgrades to an existing road (or trail) and several new ranges as part of the proposed LDR. A higher level of analysis, including field predictive modeling and field reconnaissance, was utilized to determine the existing resources and the level of impact for natural communities and habitats, cultural resources, noise, and land use compatibility. This section, **Section 3**, presents the existing resources. The impact analysis is presented in **Section 4**.

3.1 Location Description

The EAFR is located in the northwestern region of the State of Vermont, on the eastern fringe of the Champlain Valley. It is located on Lee River Road, three miles from the Village of Jericho. The property encompasses parts of the towns of Bolton, Jericho, and Underhill, in Chittenden County. The general vicinity of the EAFR is approximately 20 miles east of Burlington, Vermont. The EAFR consists of 11,219 acres of land. The Proposed Action would occupy a maximum of 60 acres within the range. The proposed LDR would be located in the center portion of the northwest quadrant of EAFRLDR, proximate to Range 5-3 and south of OP 1. (**Figure 5**)

Annual temperature extremes range from 90 degrees Fahrenheit (F) in the summer to minus 30 degrees F in the winter. The record high and low temperatures for Huntington, Vermont, the closest weather station with similar conditions to the EAFR, are 101 F and –35 F. Mean temperatures average 69 F in July and 16 F in January. Yearly precipitation totals range from 35 inches at the lower elevations of the range to 60 inches at the higher elevations. A fair amount of the precipitation totals come from snow: annual totals range from 82 inches at the lower elevations to over 100 inches on the higher ridgelines. The Appalachian Mountains cross the region; most of the major summits vary between 3,500 and 4,300 feet. Mount Mansfield, the highest point in Vermont at 4,393 feet, lies a few miles northeast of the boundary of the EAFR. The Adirondack Mountains to the west rise to between 4,000 and 5,000 feet. Major valleys include the Champlain to the west, the St. Lawrence to the north, and the Connecticut to the east.

3.2 Land Use

3.2.1 Land Use - EAFR

Land use on the EAFR can be divided into two distinct phases: (1) land use prior to 1926, when the EAFR was initially established and constructed, and (2) land use subsequent to the establishment of the EAFR, that is, during its use. The primary land use during phase one was agricultural. The second phase of land use began in 1926, when the United States government acquired 6,026 acres for the EAFR. In 1941, the EAFR was expanded to its current size of 11,218 acres. From 1926 to 1941, construction was minimal. A stone ammunition bunker and the ruins from a Civilian Conservation Corps (CCC) camp are all that survive from this period. Today, General Dynamics (GD) and the Vermont National Guard hold 546 and 10,672 acres of the EAFR, respectively. Administrative buildings, barracks, and maintenance and storage buildings for both organizations are located in the northwestern quarter of the EAFR. Firing ranges, bivouac areas, trails, and the main impact area (375 acres), shared by both GD and the Vermont National Guard are located in the remainder of the EAFR.

The EAFR is comprised of land in the three Chittenden County towns of Bolton, Jericho, and Underhill. The EAFR contains a significant portion of each town's land area: nearly 25 percent of Jericho, 9 percent of Underhill, and nearly 8 percent of Bolton. The EAFR is federal property, licensed to the State of Vermont Military Department. It is not subject to local zoning controls. The EAFR consists of land devoted to use as a military base: specifically, range and test activities. This category of land use includes a variety of auxiliary

uses to support the overall military base use, including a cantonment area where trainees are housed, an Army Mountain Warfare School, a Unit Training Equipment Site (UTES), biathlon facilities, numerous training areas, and firing ranges. Administrative buildings, barracks, and maintenance and storage buildings for both organizations are located in the northwestern quarter of the range. Firing ranges, bivouac areas, trails, and the main impact area, shared by both GD and the VTARNG, are located in the remainder of the range.

3.2.2 Training Areas

The EAFR has 10,319 acres of maneuver training land divided into eight training and maneuver areas. Each training area is further subdivided into 33 sub-areas, which are identified by an alphanumeric designator as shown in Figure 6 (EAFR Training Areas). The terrain of the training areas varies, ranging from fairly flat in the north to steep hills in the southern portion of the post. The LDR would be located adjacent to Range 5-3 which is located in the northern central area of the EAFR, within varied terrain with the predominant slope increasing in elevation to the north. The proposed project site is forested with the exception of the existing road, or trail, from Range 5-3 that has clearing limits as depicted on the attached plans. There has been selective logging within and around the proposed project site for many years. This forested 60-acre site is currently not being used and is otherwise forestland but has been used in the past for various training exercises at the EAFR since 1927.

3.2.3 EAFR Vicinity Land Use

The majority of land uses bordering the EAFR are conservation lands, agricultural lands and rural residential lands. Land use mapping based upon municipal land use maps and highlighting sensitive land uses and the EAFR is presented in **Figure 7** (Community Land Use and Noise Sensitive Uses). The existing land use of the EAFR and vicinity is primarily rural. As documented in the town plans for Bolton, Jericho, and Underhill, local land use planning goals seek to maintain and preserve rural character. Within the rural conservation zones in each town, residential uses are permitted at varying densities to protect the carrying capacity of the land. These environmentally based zones are not intended to serve as a buffer to the EAFR and its uses. Thus, the areas proximate to the EAFR contain residential uses. No restrictions or guidance has been incorporated into municipal development regulations that would acknowledge the need to buffer uses proximate to the EAFR.

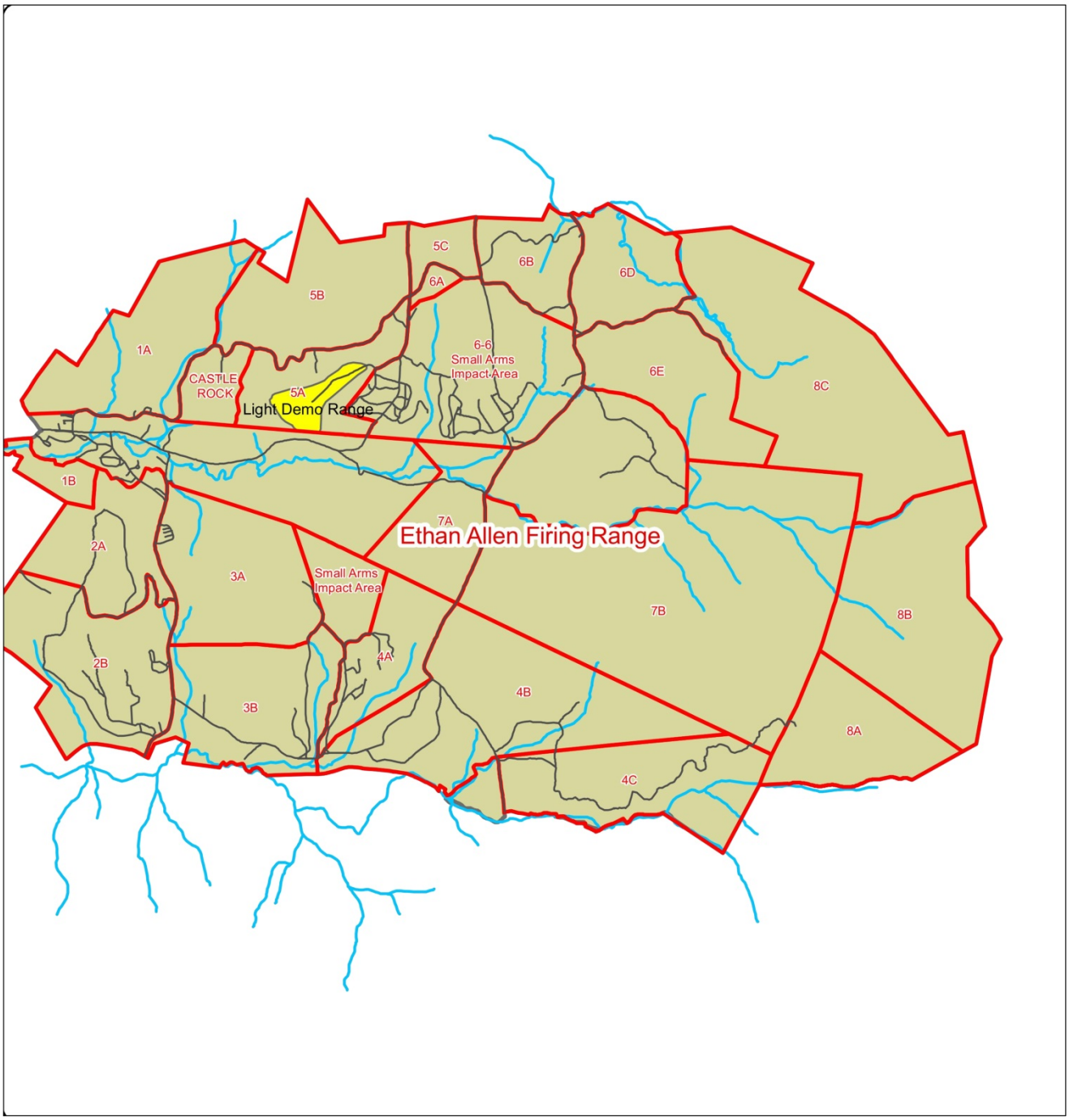

Figure 6 - EAFR Training Areas

0 0.375 0.75 1.5 Miles

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Training Areas
Streams
Light Demo Range

Ryan Ochs
State of Vermont Military Department
January 2018

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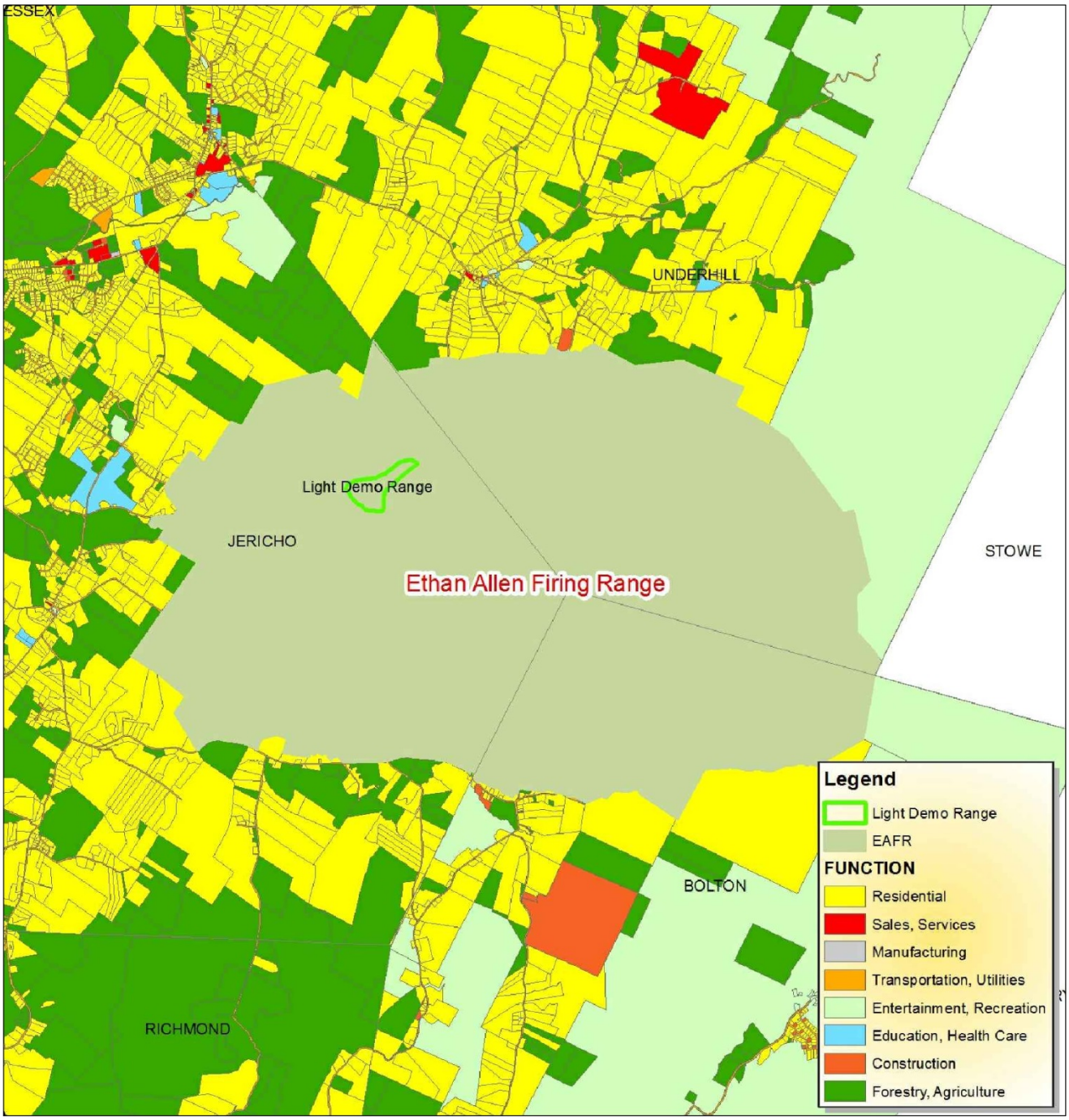

Figure 7 - Community Land Use and Noise Sensitive Uses

0 0.5 1 2 Miles

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Ryan Ochs
State of Vermont Military Department
June 2015

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3.3 Air Quality

The existing background ambient air quality of the Proposed Action area can be characterized based on air quality monitoring data collected by the Vermont Department of Environmental Conservation (VTDEC) Air Quality and Climate Division (AQCD). AQCD established and operates ambient air quality monitoring stations located throughout the state to assess the ambient air quality of the state in relation to National Ambient Air Quality Standards (NAAQS). The air quality data collected is compiled, analyzed, and summarized periodically and can be used to characterize regional air quality.

Available AQCD ambient air quality monitoring data (obtained via VTDEC website) was reviewed for various locations in the general vicinity of the EAFR. Pollutant concentrations for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and fine particulates from Underhill, Burlington, and Rutland have generally been well below the NAAQS. This data can be considered representative of regional air quality conditions in the area (note: data from Burlington and Rutland are influenced by higher population densities and local sources such as space heating, traffic, and industry). Ambient air quality trends for PM2.5 monitored in Underhill since 2007 indicate the lowest PM2.5 levels in the state and significantly below the NAAQS. The State of Vermont has always been designated as in "attainment" for the criteria pollutants. The EAFR and the surrounding area have always been considered in "attainment" of the NAAQS for all criteria pollutants.

The EAFR has a number of potential air emission sources related to range operations. Emissions include transportation and explosives detonation related to training activities. Localized fugitive dust can be generated by wind effects on exposed soils and unpaved roads, especially in conjunction with vehicle maneuvers (both on- and off-road). Dust emissions from roads are currently managed using soil stabilizers. Wind-borne dust originating from other exposed soils is managed using re-vegetation and by applying gravel.

There is no indication that training operations at the EAFR have had or are having any significant impact on ambient air quality in the surrounding area. The EAFR is not considered a major emission source and is not required to obtain a VTDEC operating permit nor is it subject to the Clean Air Act (CAA) Title V Operation Permit Program. Sources not subject to the CAA Title V Operation Permit Program, but subject to Subsection X of the Vermont Air Pollution Control Regulations, may limit the facility-allowable emissions by demonstrating that the actual emissions from the facility have not equaled or exceeded 10 tons per year in any calendar year since January 1, 1995.

3.4 Noise

The EAFR operates in conformance with the Statewide Operational Noise Management Plan (SONMP: Final 2013) prepared by the Army Operational Noise Program, a branch of the Army Public Health Center. SONMP provides guidance for noise management of VTARNG activities. SONMP provides a methodology for analyzing exposure to noise associated with military operations and provides land use guidelines for achieving compatibility between the noise generated by the Army and the surrounding communities. This analysis is referenced herein. The principal operational noise source for the EAFR is weapon firing.

3.4.1 Noise Assessment Terms and Methods

There is a large effective range of sound pressure, and therefore the human ear responds to sound on a logarithmic (rather than linear) scale. The decibel system (dB) was developed to quantify sound energy (loudness) into a meaningful and manageable scale. On this scale, the range of average human hearing runs from approximately zero (the threshold of hearing) to 140 for a healthy human ear, though zero is by no means the absence of sound (some people may hear sounds as low as -10 dB). A 3 dB increase

is roughly a doubling of sound energy, but it takes a 10 dB increase for something to sound twice as loud. Scientists have developed processes called frequency weighting, whereby certain ranges in which the ear is more sensitive are factored in more heavily than others where the ear is less sensitive. Consequently, when looking at decibel levels it is important to recognize whether the measurements are weighted or peak (i.e., unweighted). Frequency weighting is a type of filtering, and in the context of this plan the two important filters are A-weighting (dBA) and C-weighting (dBC). A-weighting is used most often and particularly for higher-frequency sounds such as aircraft and ground transportation. C-weighting is used for low-frequency events such as large arms and demolition explosions.

Noise is simply unwanted sound. The "unwanted" part of that definition is subjective to the receiver, and dependent upon many variables. Sound travels through air. Physical barriers can greatly reduce the travel of certain kinds of noise. These barriers can be as large as a berm or a wall near the source, or as tiny as a change in the insulation in the receiver's home, and they can be quite effective at reducing complaints from the public. Certain weather conditions make sound travel for great distances, and others barely at all. Temperature and wind velocity are the prime variables in this phenomenon, and the swing at one place between the most favorable and least favorable weather conditions can be as much as 40-50 dB (equating to a 16-32x increase in loudness).

Noise exposure to communities is translated into Noise Zones, which correspond to the range of decibel levels noise shown in **Table 4**. The four Noise Zones are defined as:

1. Zone III. Noise-sensitive land uses are not compatible in Zone III.
2. Zone II. Although local conditions such as availability of developable land or cost may require noise-sensitive land uses in Zone II, this type of land use is strongly discouraged on the installation and in surrounding communities. All viable alternatives should be considered to limit development in Zone II to non-sensitive activities such as industry, manufacturing, transportation, and agriculture.
3. Zone I. Noise-sensitive land uses are generally acceptable within Zone I. However, though an area may receive only Zone I levels, military operations may be loud enough to be heard or even judged loud on occasion. Zone I is not one of the contours shown on the map; rather it is the entire area outside of the Zone II contour.
4. LUPZ. The Land Use Planning Zone (LUPZ) is a subdivision of Zone I. The LUPZ is 5 dB lower than Zone II. Within this area, noise-sensitive land uses are generally acceptable. However, communities and individuals often have different views regarding what level of noise is acceptable or desirable. To address this, some local governments have implemented land use planning measures beyond the Zone II limits. Additionally, the implementation of planning controls within the LUPZ can develop a buffer to avert the possibility of future noise conflicts.

TABLE 4 - NOISE LIMITS (AR-200-1)

Noise Zone	Demolition and Large Caliber Activity dB CDNL
LUPZ	57-62
I	<62
II	62-70
III	>70

Notes:
CDNL = weighted average Day Night Level
dB = decibel
LUPZ = Land Use Planning Zone

For land use planning purposes, noise-sensitive land uses are acceptable within Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III.

3.4.2 Current Noise Environment

Current noise-generating activities at the EAFR generally consists of demolition and large caliber weapons (20 mm and greater).

Figures 8 (EAFR Baseline Conditions Noise Zones) and **9** (Detailed Off-Post Baseline Conditions Noise Zones), sourced from the 2015 Operational Noise Assessment, presented in **Appendix B**, depict the annual average noise levels for the existing activity at the VTARNG. The figures contain the baseline demolition and large caliber weapons Noise Zones. Although the Noise Zones are larger than those presented in the SONMP (U.S. Army 2013), included in **Appendix H**, annual average noise levels are still compatible with the surrounding land uses. The LUPZ extends beyond the northern boundary approximately 600 meters (0.37 miles). The increased howitzer expenditure (791 rounds) in FYs 2012 - 2014 is the primary driver of the increased Noise Zones. In FYs 2009-2011, there were only 80 howitzer rounds fired. The LUPZ extends beyond the northern boundary approximately 600 meters (0.37 miles), encompassing residential and agricultural land uses in the Town of Underhill. The SONMP determined that in most cases, this is not a risk to community quality of life or mission sustainment (U.S. Army 2013).

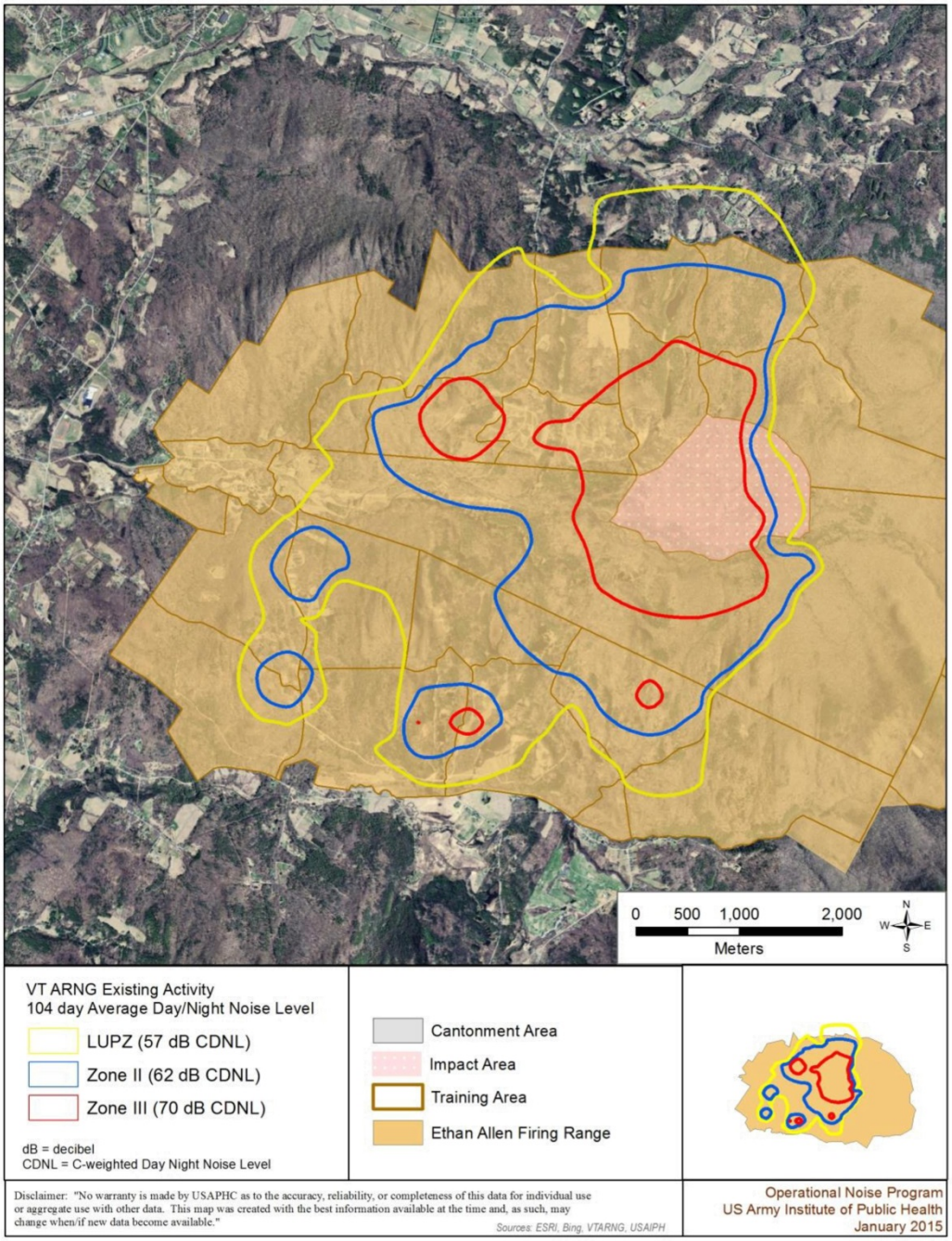

Figure 8 - Baseline Conditions Noise Zones

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

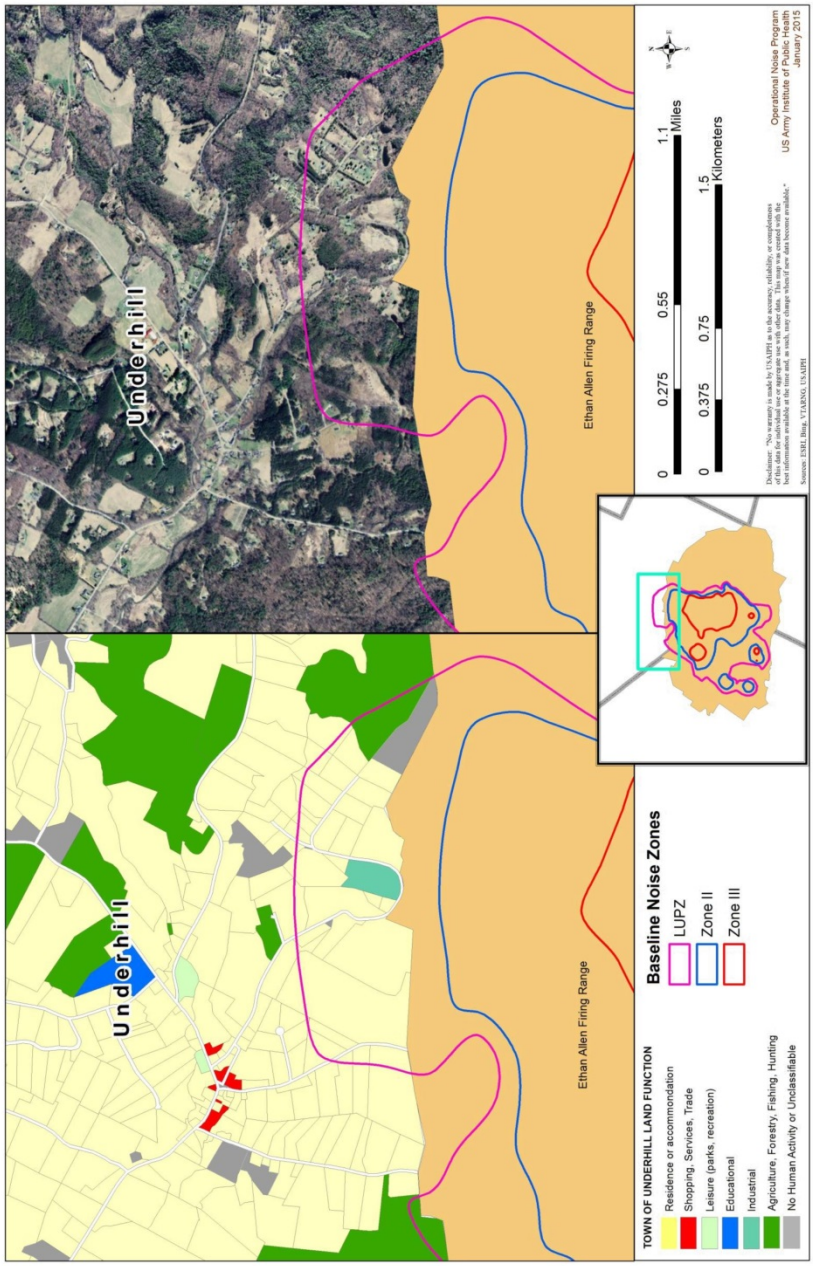

Figure 9 - Detailed Off-Post Baseline Conditions Noise Zone

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

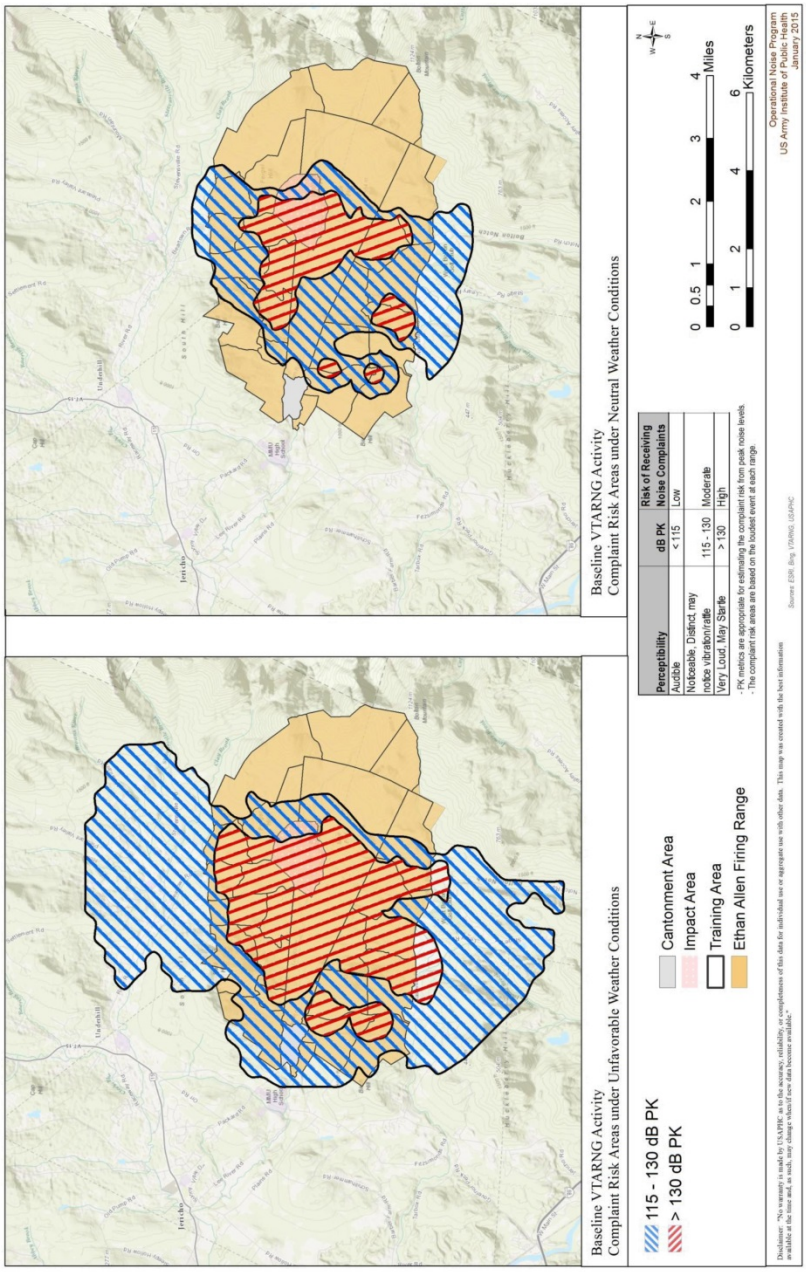

Figure 10 - Baseline Conditions Complaint Risk

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Based on annual average noise levels, the noise environment attributable to large caliber weapons firing and demolition activity at the EAFR is compatible with the surrounding land use. Only a very small portion of the LUPZ (57 – 62 dB CDNL) extends beyond the western boundary. Although land use contours indicate compatibility between the EAFR activity and surrounding land uses, individual events have the potential to generate noise complaints. The annual average noise levels environment attributable to VTARNG large caliber weapons firing and demolition activity are contained within the EAFR property. According to the complaint risk guidelines, depending upon the weather conditions, there is a low to moderate risk of complaints from baseline large caliber weapons and explosives training. Noise from individual large caliber and demolition activity may at times be noticeable or even deemed loud, by those in the community.

The Army has an obligation to U.S. citizens to recommend land use around its installations that will (a) protect citizens from noise and other hazards, and (b) protect the public's investment in these training areas.

Table 5 summarizes the total acreage for each Noise Zone, including the acreage of the portion extending off the installation boundary for baseline conditions. The LUPZ baseline conditions are shown in **Figure 8**. The Community Land Use and Noise Sensitive Uses are depicted in **Figure 7**.

TABLE 5 - BASELINE CONDITIONS NOISE ZONE ACREAGE

Noise Zone	Total Acreage	Off-Post Acreage
LUPZ	2,129	252
Zone II	1,988	0
Zone III	1,131	0

The peak noise levels are highly dependent upon the weather conditions. The noise assessment for the baseline conditions have been evaluated under both unfavorable weather conditions and neutral weather conditions.

Figure 10 (Baseline Conditions Complaint Risk), sourced from the 2015 Operational Noise Assessment, presented in **Appendix B**, depicts peak noise levels for the baseline large caliber and demolition activity. Under unfavorable weather conditions [PK15(met)], the moderate complaint risk area encompasses the Towns of Underhill to the north and Bolton to the south. The moderate complaint risk levels extend less than 800 meters (0.5 miles) beyond the western boundary; this area is primarily undeveloped. The high complaint risk area extends approximately 700 meters (0.44 miles) beyond the southern boundary, encompassing approximately three dozen homes. The off-post high complaint risk area is driven by artillery and mortar firing. Under neutral weather conditions [PK50(met)], there is a moderate risk of generating noise complaints along the northern and southern boundaries. The high complaint risk areas remain limited to the area surrounding the firing points and ranges.

3.5 Geology, Topography, and Soils

Geology: The surficial geology of the EAFR is primarily a product of glacial and early post-glacial influences, with the general features of the landscape developed prior to 12,000 Before Present (B.P.). The last advance of continental ice covered all of Vermont by 18,000 B.P., depositing a veneer of till and destroying deposits from previous periods of glaciation. By about 15,000 B.P., glaciation had begun. With the ice mass continuing to melt back in a northwesterly direction, the mountain peaks east of Jericho and Underhill were exposed. In the upper Lee River and Mill Brook valleys, ice contact deposits that may date back to this period can be found. Bedrock formations within the EAFR are covered with Pleistocene or early post-Pleistocene deposits comprising the following:

- Glacial till, usually as a thick mantle on the north and south sides of hills and at higher elevations
- Glacial outwash and ice contact deposits
- Lacustrine deposits of silt and sand
- Fluvial deposits of alluvium

The last three types are generally restricted to areas in the bottoms of the Lee River and Mill Brook Valleys at elevations below 800-900 feet.

Topography: The EAFR is located in the foothills of the western slope of the Green Mountain physiographic province, an area characterized by rugged slopes and narrow valleys. The mountains, with elevations of 2,700 to 3,600 feet, block access from the east. The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately 90 percent of the EAFR is forested, with 5 percent upland non-forested and 2 percent wetlands. The remaining land is developed military construction. Within the mountainous terrain are considerable scenic areas.

Soils: The Natural Resources Conservation Service Soil Survey for Chittenden County, Vermont (2010) identifies 21 soil map units within the boundaries of the EAFR. The foothills of the Green Mountains in and near the range have been heavily glaciated, resulting in soils that are both loamy and stony. The major soil series are as follows:

1. The majority of upland soils are of the Lyman-Marlow series. These soils were formed of glacial till derived from mica schist, and are classified as rocky to extremely rocky loams. Found primarily on hillsides and hilltops, they are shallow soils underlain by bedrock, well drained and low in fertility. Erosion potential is moderate to slight, unless disturbed, in which case, because of their sloping nature, considerable damage can be done. Potential for timber production is rated as only fair because of the low fertility and lack of drought tolerance.
2. Cabot soils are found in valleys and depressions. These soils were formed in glacial till derived from schist and limestone, and are classified as stony to extremely stony silt loam. These are deep and highly fertile soils, but because of a slowly permeable fragipan, they are poorly drained. This poor drainage is not a significant problem except on disturbed soil on steep hills, where extreme care must be taken. Because of the poor drainage, these soils are rated as having fair potential for timber production.
3. Peru series soils are found on the hillsides at lower elevations. These soils were formed in till derived from quartzite and schistose, and are classified as stony to extremely stony loam. They are deep, moderately well drained above a fragipan, and have low fertility. On disturbed ground, the erosion hazard is slight to severe, depending on the slope. Timber potential is rated as good.
4. The numerous other soils tend to be sandy or gravely loam soils. While these soils are not highly disposed towards erosion, slope dictates when care should be taken.

Based on Natural Resources Conservation Service soil mapping, the LDR would not contain any Prime Farmland or hydric soils. A small area of clearing along the southern portion of the LDR would occur in an area containing Statewide Significant soils.

3.6 Water Resources

The hydrology in the EAFR is influenced by the upland mountain and valley setting of the site. Groundwater hydrology in the range is largely defined in the lower areas by topography and the distribution and saturated thickness of high-conductivity glacial outwash deposits and low-conductivity glacial till deposits. Groundwater flows from hills toward valleys and discharges into streams, rivers, wetlands, and ponds. In the higher elevations, where soils are often shallow and bedrock close to the surface, the source of sufficient quantities of potable groundwater is deep within the bedrock.

Lee River and Mill Brook drain within the EAFR and have their headwaters within range boundaries. A few small tributaries occur with moderate to steep gradients. None are over a mile and a half in length. Several small ponds lie between Cushing and Feigel Hills. Beavers are currently active in these ponds and in many wetland areas. The EAFR is drained by three riparian systems: Lee River and its tributaries, Mill Brook and its tributaries, and Steinhour Brook. Steinhour Brook, a tributary of Browns River, runs in the northern portion of the property. All three streams originate on the installation; therefore, no drainage is received from the surrounding areas. A variety of conditions were found in the forested areas of the Lee River, with poor conditions in the central portion improving in the westernmost sections of the river. Mill Brook exhibited fair to good conditions throughout its length within the range. The Steinhour Brook is currently in excellent condition throughout its length in the EAFR.

The LDR would be located on a side slope adjacent to Range 5-3 and west of Range 6-6, LZ 6-6 and FP 15. There are not any adjacent water sources. The Lee River is approximately 1,000 feet to the south. The LDR would be not located within a floodplain, but wetlands do exist within the LDR.

A visit to the project site by Wetlands Ecologist Jeffrey Severson, of Oakledge Environmental Services, occurred on May 27, 2015 to delineate wetland boundaries and evaluate wetland functions. A relatively narrow, southerly trending wetland band is located in the topographically low area at the site, as shown on **Map W-1 – Wetlands**. The wetland is less than 0.5 acres and has been partially disturbed by activities and infrastructure associated with ongoing logging operations, including an existing logging road/skidder trail and canopy tree removal in some of the upland portions of the site. Most of the proposed project area consists of forested uplands on sloping hillsides on either side of the wetland.

A functional evaluation of the wetland was performed using the criteria outlined in the Vermont Wetland Rules. The functional evaluation indicates the wetland does not provide any wetland functions at a significant level. The District Wetlands Ecologist confirmed the wetland is a Class Three wetland, that is not regulated under the Vermont Wetland Rules and that it does not provide any wetland functions or values at a significant level.

3.7 Biological Resources

3.7.1 Land Cover

Forest cover is the largest component of the landscape at the EAFR. The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately 90 percent of the EAFR is forested, with 5 percent upland non-forested and 2 percent wetlands. The remaining land is developed military construction. Although the EAFR is an active military training facility, its large expanses of forest, wetlands, and maintained grassy openings create important habitats for numerous wildlife species.

Vegetation at the EAFR consists primarily of northern hardwood forest with some red oak and montane spruce-fir forest. The transition zone between these major forest types contains a mix of northern hardwoods (especially birch), and spruce and fir. Sub-units with these two broad forest types include the following: dry oak-hop hornbeam forest on the upper south slope of Bald Mountain; rich hardwood forest in a cove south of OP Hill summit; cliffs above the helicopter landing zone identified as LZ Gold; sand and gravel bars along the Lee River; and hemlock forest in a ravine along Mill Brook. (**Figure 15 – EAFR Land Cover)**

The Proposed Action would be an approximately 60-acre area within oak and northern hardwood forest types. 7.1 acres of forest would be cleared for the Proposed Action.

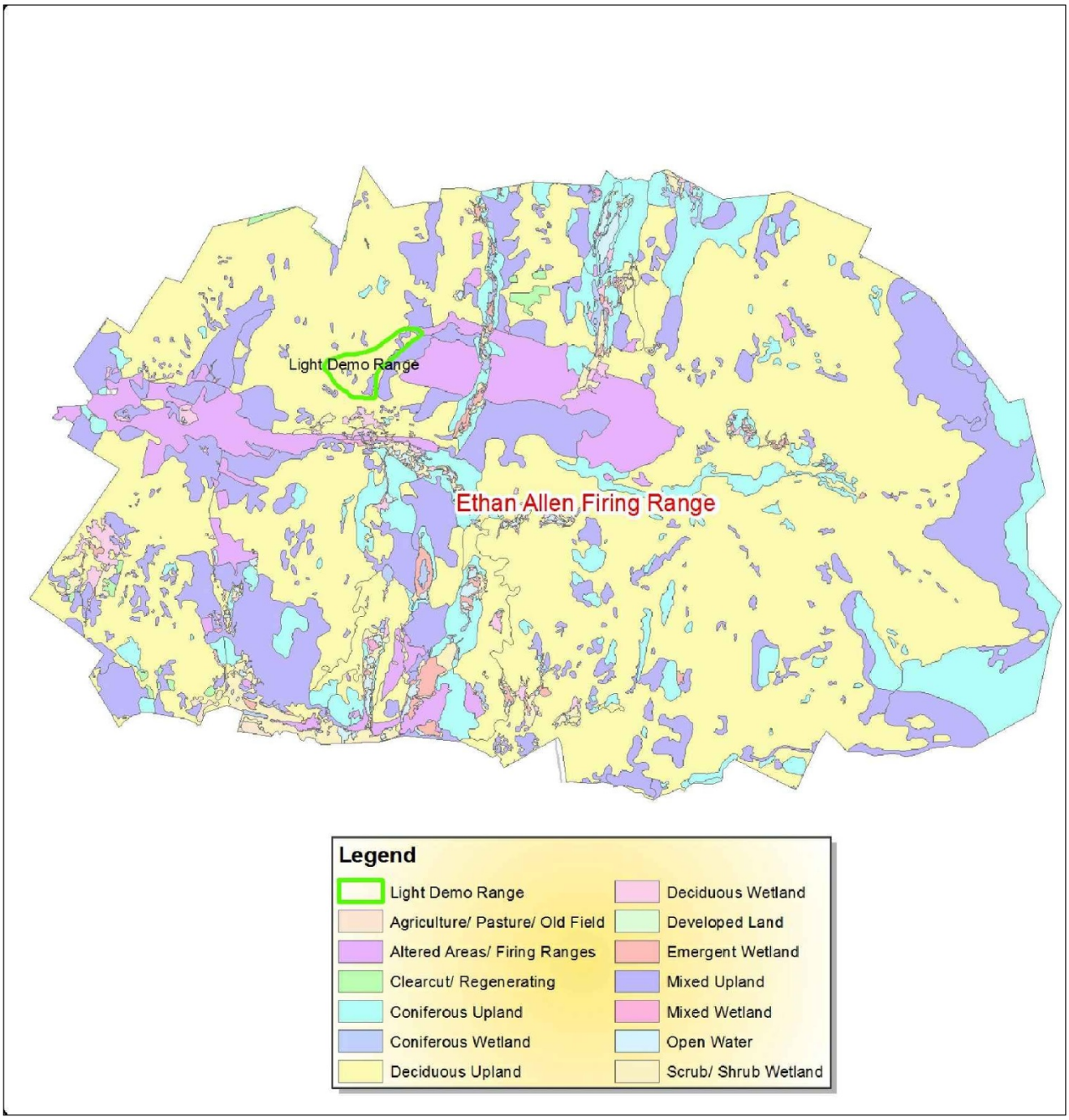

Figure 11 - EAFR Land Cover

0 0.35 0.7 1.4 Miles

N

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Ryan Ochs
State of Vermont Military Department
June 2015

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3.7.2 Rare, Threatened, and Endangered Plants

The Rare, Threatened, and Endangered (RTE) Plants and Natural Communities for the LDR study area was inventoried and assessed by Greenleaf Consulting Inc. (GCF). The findings are based on observations from site visits in November of 2014 and May of 2015. **Figure 12** presents LDR RTE and Natural Communities Inventory. **Figure 13** presents the LDR Wetlands, RTE Plants, Natural Communities, and Vernal Pools. No federally or state-listed RTE plants or natural communities were found during the botanical field visits within the project area. These findings include the assessment of the proposed road, LDRs, MPS lines and all associated areas. The complete report is included in **Appendix C**.

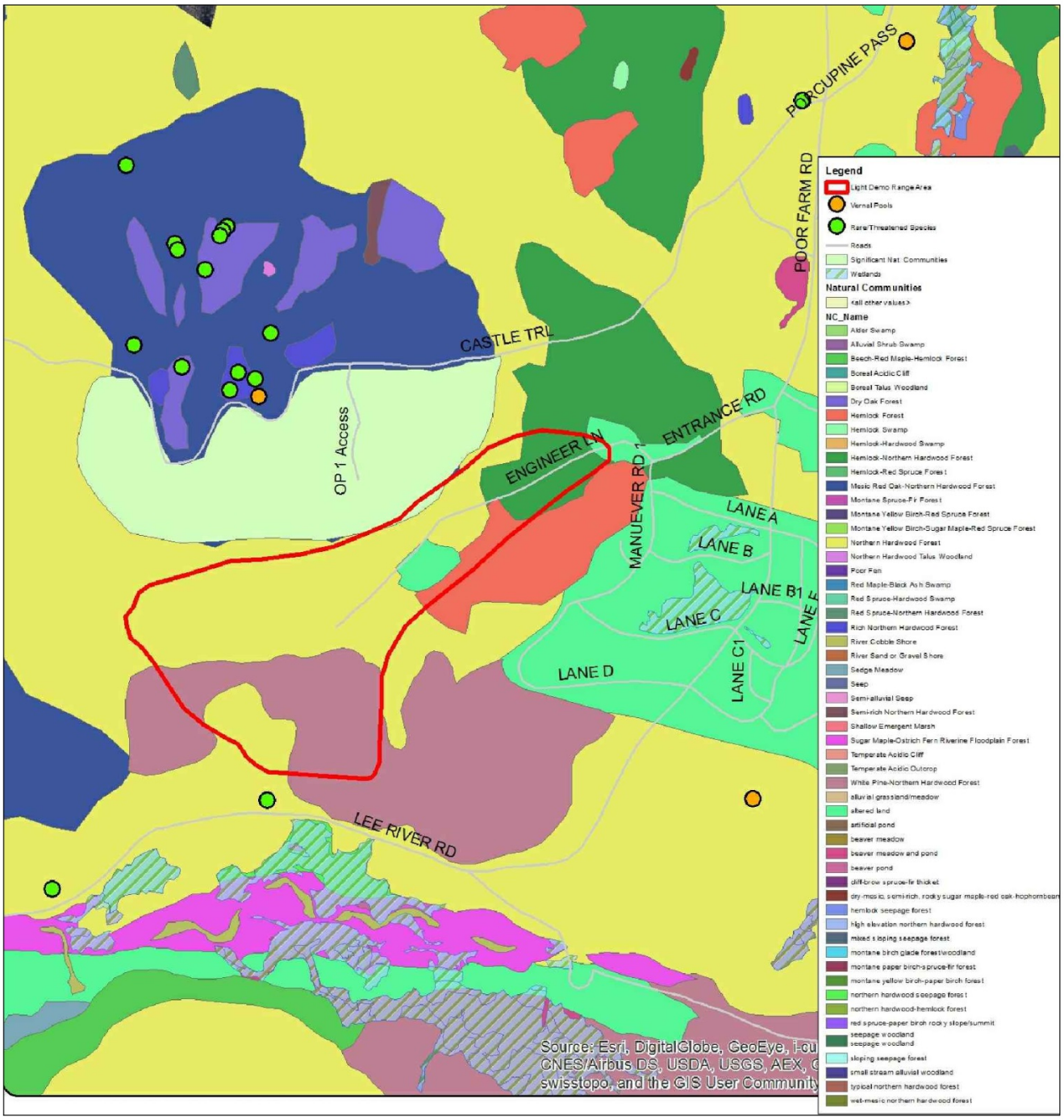

Figure 12 - Light Demo Range Rare, Threatened, and Endangered Plants and Natural Communities Inventory

0 0.05 0.1 0.2 Miles

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Ryan Ochs
State of Vermont Military Department
June 2015

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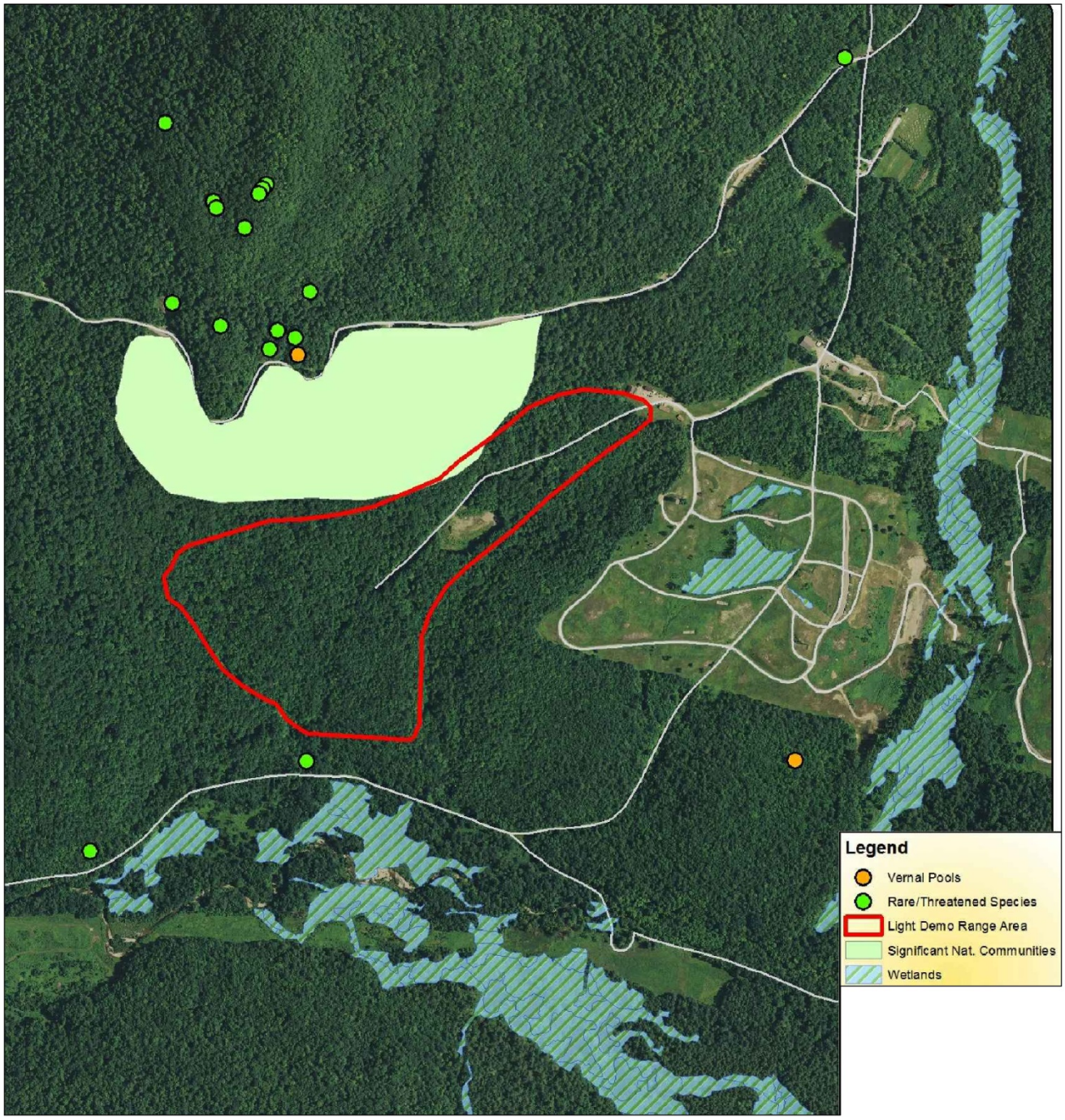

Figure 13 - Light Demo Range Wetlands, RTE Plants, Natural Communities, Vernal Pools

0 0.05 0.1 0.2 Miles

N

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Ryan Ochs
State of Vermont Military Department
June 2015

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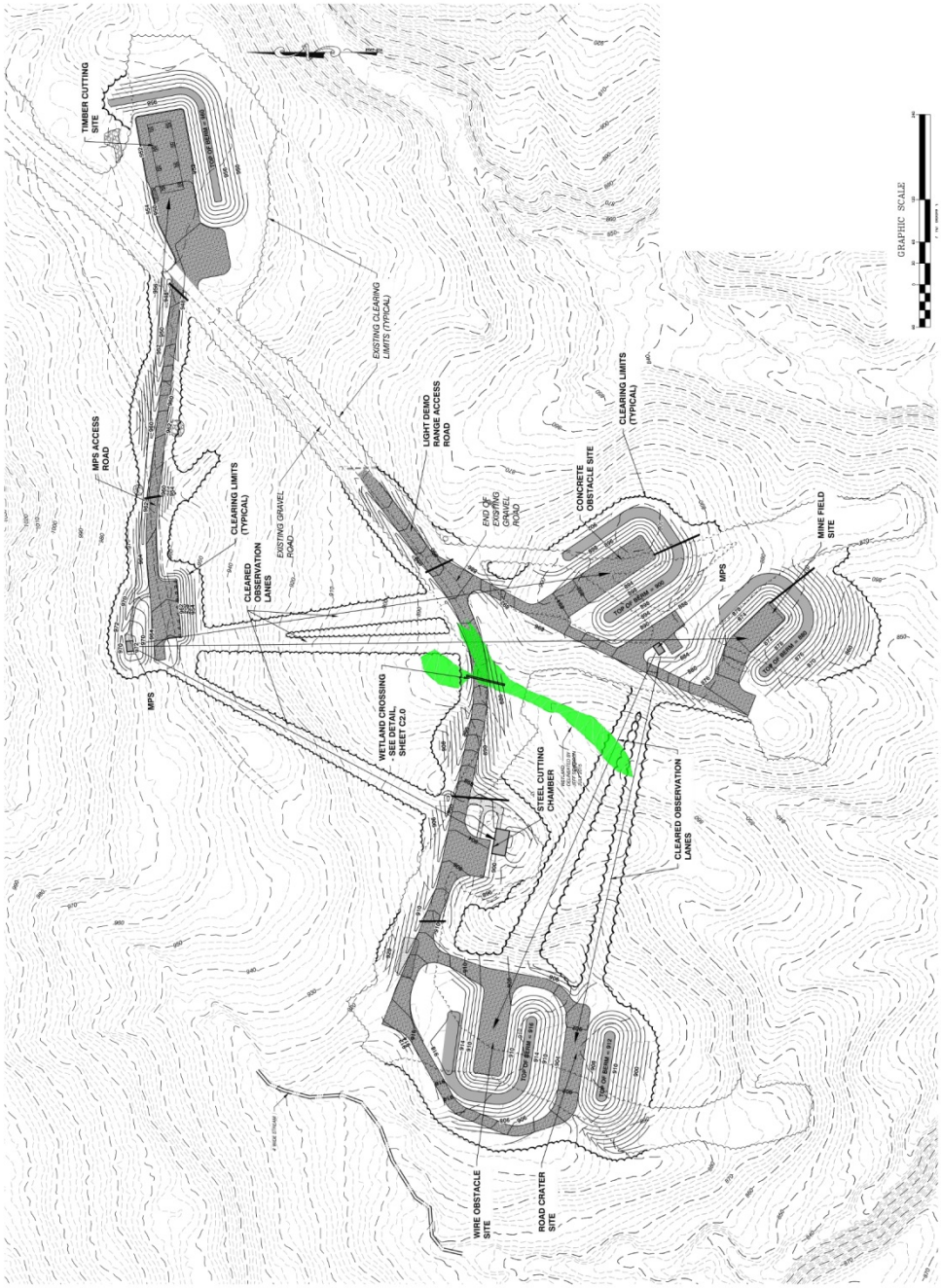


Map W-1 - Wetlands

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

3.7.3 Fish and Wildlife

Wildlife species (amphibians, reptiles, mammals, and birds) are diverse on the EAFR due to the size and diversity of available habitats. Elevations range from the Lee River basin at 600 feet to just below Bolton Mountain at 3,500 feet. Surveys were conducted for fish, amphibians, reptiles, birds, mammals, and invertebrates on the EAFR. These surveys were provided to the United States Fish and Wildlife Service (USFWS) on August 3, 2015. The USFWS responded to the submittal on October 21, 2015. Special attention was directed toward locating any RTE species suspected on the base. Surveys for birds and mammals are ongoing and occur to some extent on an annual basis. Wildlife found at the EAFR is diverse due to the mix of forests, riparian areas, and open areas.

In order to document the impact of the creation, proposed activities, and management of the LDR on state and/or federally RTE amphibians, reptiles, mammals, or birds, previous studies and literature were reviewed, habitat assessments were made, and wildlife inventories were conducted during 2015. Allan Thompson of Northern Stewards prepared a review, field studies, analysis, and recommendations of the project study area, that is, the LDR, with regard to wildlife. This report is summarized herein, as it relates to, impacts to RTE wildlife species and their associated habitats. Only a few RTE wildlife species have been observed on the EAFR. The state endangered little brown bat and NLEB have been observed foraging along roads, wetlands, and forested areas throughout the EAFR. No roosts have been identified, but bats are likely utilizing natural and man-made roosts within the EAFR. As the NLEB is listed under the federal Endangered Species Act (ESA), VTARNG has contacted the USFWS, and has provided them with the bat survey information. The state threatened eastern whip-poor-will and grasshopper sparrow have both been observed utilizing the open field conditions of RG6-6.

A list of wildlife species in the EAFR, in the vicinity of the proposed project, was compiled by Northern Stewards and is presented in **Appendix D**.

Mammals: Habitat conditions for mammals are primarily forested and within a large forest ecosystem that can offer habitat conditions suitable for many of Vermont's mammals. Forest habitats include mid to late successional forests and include many trees with cavities, roost characteristics, or down woody debris. Habitats are not the only limiting factor for mammal occurrence. Rare mammals are often limited by small populations. For example, the eastern mountain lion can find suitable habitat conditions within the EAFR if it were not for the limited number of available individuals for colonization in the Northeast.

Small mammal habitats are limited to forests or edge habitats. Of Vermont's RTE mammals, it is unlikely that habitat conditions are available for many. These sites are drier and lower in elevation than the rock vole or long-tailed shrew would prefer and lack sufficient down woody debris. However, little is known about these species habitat requirements. The roughly 10 acre clear-cut to support the LDR would create a unique habitat in itself and would offer edge habitat like productive soft mast, quality cover and high amounts of coarse woody debris. Lastly, the forest conditions within the habitat area of interest (HAOI) offer mature forest conditions, forage and nut production, and cover objects.

Habitats that support long-ranging mammals such as lynx, marten or cougar are typically thought of in a landscape setting, for example, throughout the EAFR. Indeed, conditions within the EAFR are suitable for the American marten, or Canada lynx, though less so. Areas of higher elevation that offer the softwood conditions typical of marten and lynx habitat preferences are present. Hare and grouse populations are abundant along the upper ridges and western facing slopes of the eastern EAFR. In addition, habitats that support deer populations as prey for cougars are equally suitable and ideal within this large forest ecosystem. However, suitable habitat conditions within the LDR overlap only with cougar habitat requirements. If populations exist or overlap within the EAFR, they would be expected to utilize areas within the LDR, but they do not and are therefore not expected to be present.

Vermont's bats require a roosting habitat; where they spend the nights and more importantly raise their young. These roosting sites are typically found within 1 mile of water and foraging areas. At least four types

of roosting sites are used by Vermont bats. The highest numbers of individuals of typically, the big brown and little brown, use buildings or other man-made structures. Tree boles with exfoliating bark, cracks or crevices where bats can crawl under and colonize and raise young are used by NLEBs, Indiana bats and to a lesser extent, little brown bats. Canopies of softwoods or red oaks are used by canopy roosting bats like red, hoary and silver-haired bats. And lastly, rocky cliffs and talus slopes are used as well by eastern small footed bats. There is some overlap with roosts used by a given species. All bats will use wetlands, fields, and forests during a foraging bout, but have specific within-site foraging niches based on form and function.

Northern Long-eared Bat: As the NLEB is listed under the federal Endangered Species Act (ESA), VTARNG has contacted the USFWS, and has provided them with the bat survey information. Both acoustic and mist-netting surveys were completed in efforts to determine the presence of the NLEB and any roost trees that may be in the project area. Acoustic surveys were conducted in early June, 2015, and included 9 detector nights in roughly a 60-acre habitat area of interest (HAOI), and an additional 200-meter buffer for a total area of 120 acres. There were 619 acoustic files recorded during the survey. Mist netting was conducted in the first week of July, 2015 at the same HAOI as the acoustic surveys. No NLEBs were trapped in this effort.

Memorandum for record: A memorandum for record is in Appendix D describing and summarizing the completed Section 7 consultation process for this project.

Photo 1 – Existing Range 5-3 Access Gate

Photo 2 – Existing Range 5-3 from North/West

Photo 3 – Existing gravel road from 5-3 to LDR

Photo 4 – Typical logging at Proposed LDR

Birds: Bird habitat within and around the proposed project area is a primarily homogeneous mid to late successional hardwood forest. Oak, hemlock, pine and aspen would be notable associates. Some large diameter oak, pine or hemlock is present however; little old growth conditions are present.

The VTARNG conducts surveys to identify nesting migratory birds inhabiting facilities or areas that may be disturbed through construction, demolition, or other operational activities. In accordance the Migratory Bird Treaty Act of 1918, BMPs would be implemented to avoid disturbing nests during egg laying or incubation. BMPs may include relocating the nest, as authorized using state or federal permits, or establishing barriers between bird nesting areas and project operations. The VTARNG would conduct breeding bird surveys prior to construction to verify any nesting migratory birds.

A list of RTE birds and those observed on the EAFR is included in **Appendix D**.

During May of 2015, two days of general bird observations were conducted. During these surveys no RTEs were detected. It is highly unlikely that any RTE species require habitats within or near the proposed project area. The grasshopper sparrow, listed by the State of Vermont as a threatened species, was observed last in 2012 in Range 6-6, 1000 meters to the east, and would likely not be impacted by the Proposed Action.

Amphibians: The HAOI includes three small streams. The eastern stream holds water longest and likely year round. The western most streams are both perennial and were dry during May of 2015. No vernal pools are present within the area of interest (AOI) or HAOI. No other wetlands are presently suitable for amphibians.

Of the RTE amphibians of Vermont, none have been known to occur within the HAOI, using wetlands in or near the HAOI, or within the EAFR. A mudpuppy record exists for Lee River in the 1980s outside of the EAFR. Mudpuppy surveys during 2012 did not observe any mudpuppies (Northern Stewards LC 2012). This lies well outside of the HAOI and would not be impacted by the LDR. The Jefferson salamander and blue spotted salamanders are known to utilize habitats similar to those found on the EAFR; vernal pools and wetlands like those associated with Lee River, but have not been observed or are likely to be present within the EAFR.

Streams were visited for 2 hours to turn cover objects for quick survey of stream breeding salamanders. Common stream breeding salamanders such as the northern two-lined salamander and dusky salamander were observed using streams and associated wetlands. These species and populations would not be anticipated to be impacted by the Proposed Action.

Reptiles: The proposed project area is primarily forested and supports no rocky outcrops and talus slopes. Reptile habitat within or near the HAOI includes cover objects like downed logs or foraging habitat along streams. Previous surveys have been conducted along Castle Trail Road that targeted talus slopes. Of the RTE reptiles of Vermont, only the ring-necked snake has been observed. Further, during May of 2015 the HAOI and streams were visited to inventory reptile activity. Areas were visited to search for reptiles. Cover objects were turned within the HAOI and within 100 feet of streams. A total of 6.0 hours during two days to survey target habitat conditions were conducted. Surveys supported previous efforts; only garter snakes and red-bellied snakes were observed.

Habitats for reptiles, primarily snakes, would be anticipated to be impacted both positively and negatively by the implementation of the Proposed Action. The creation of an open area between possible denning areas (rock cliffs to the north and west slopes) and foraging areas (Lee River and series wetlands) conducive to basking, cover and additional foraging is excellent. This area would be anticipated to support an increased number of snakes, primarily garter.

3.8 Cultural Resources

3.8.1 Introduction

An Archaeological Resource Assessment (ARA) (Report #852:2015) was conducted by the University of Vermont Consulting Archaeology Program (UVM CAP) in accordance with Section 106 of the National Historic Preservation Act (1966), as amended. This report builds on previous work, including the EAFR's cultural resources inventory, which identified and/or located many of the historic period sites on the EAFR property (Thomas et al. 2005) and the general, property-wide application of the digital GIS version of the Vermont Division of Historic Preservation's (VDHP) Environmental Predictive Model for Locating Precontact Archaeological Sites (Robins et al. 2009). The goal of this study was to more specifically identify potential cultural resources within the project area, detail the potential significance of any potential cultural resources, and recommend overall management and/or mitigation plans for each of several proposed project areas in terms of both precontact Native American and historic period sites. **Figure 14** presents the LDR Potential Archaeological Sensitive Areas, as derived from VDHP's digital predictive model for locating precontact Native American sites. The complete study is included in **Appendix F**.

Precontact Native American: Although the overall potential for precontact Native American sites within the limits of the EAFR property is considered to be relatively low as compared to other areas in the region, they do exist. To date, one precontact Native American site has been identified on property. This site, designated VT-CH-1127 in the Vermont Archaeological Inventory (VAI), is located on Beartown Road on a prominent ridge overlooking an expansive pond/wetland/stream complex that forms a tributary to the Browns River (Mandel 2014). Furthermore, a digital Geographic Information System (GIS) rendering of the VDHP's *Environmental Predictive Model for Locating Precontact Archaeological Sites* (**Figure 15 – LDR detail of the GIS Archaeological Sensitivity Map**) indicated that at least a few key archaeological sensitivity factors that may have attracted Native American habitation in the past are present within the Proposed Action area.

However, it is also important to note that there have been other archaeological Phase I site identification surveys conducted within the VTANG's Ethan Allen Training Center property that have proved negative for precontact Native American sites. Two of these areas tested were within in the Proposed Action area and two other areas tested were close to the Proposed Action area and in similar elevational and topographic environments as present within portions of the Proposed Action area.

Of the two areas already tested within the Proposed Action area, one was located on the top southern edge of a knoll-like spur that overlooked the Lee River valley to the south. The Lee River flows east to west approximately 300 meters (984 feet) south of the area tested. The top of the landform was wooded and fairly level at about 274.3 meters (900 feet) above mean sea level, but it had steep slopes forming its southern, eastern, and western boundaries. The sample area encompassed roughly 0.05 hectares (0.12 acres), while the overall landform was 2.5 hectares (6.2 acres). The tested area was located about 91 m (300 feet) west of Poor Farm Road and about 120-140 meters (393.7 and 459.3 feet) north of Lee River Road. The stratigraphy in this area consisted of a plow zone (Ap), generally about 22 cm (9 inches) deep, underlain by undisturbed subsoils (Bs-B soil) (Thomas et al 2005 3.23, 3.24). In addition to this area, some archaeological Phase I testing also was conducted in the woods to the west of the tank range along the top of a steep slope that angled down to a northeast to southwest trending drainage. Like the above area, this area also proved negative for precontact Native American sites.

Historic: Previous archaeological field inspections and surveys conducted by the UVM CAP, have identified numerous historic sites on the VTANG's Ethan Allen Training Center property (Thomas et. al. 2005; Robins and Crock 2009). Of these, J18 (VT-CH-747) and J53 (VT-CH-780), are located within or immediately adjacent to the 5-3 Demo Range project area. The historic site J18 (VT-CH-747), the 'I.C. Stone Site,' consists of a house cellar foundation on the north side of Lee River Road and a large barn

foundation on the south side of the road opposite the residence. In addition, there is a surface scatter of historic artifacts, possibly related to this farmstead, located 35 meters (114.83 feet) northeast of the house site (Thomas et. al. 2005:6.122-6.124). The historic site J53 (VT-CH-780), the 'S. Pease site,' is a 19th - 20th century farmstead located on the west side of Poor Farm Road and consists of the remains of a house cellar, well, barn (with silo pad) and an outbuilding (probably a sugarhouse) as well as a possible garbage dump.

From the available historic aerial photographs, it could be determined that a portion of the southern part of the 5-3 Demo Range project area had experienced significant land modification for previous military related activities. This included the sites of two old firing ranges that were built immediately north of Lee River Road, just west of its intersection with Poor Farm Road. These ranges appear to have been developed in the 1920s or 1930s and abandoned between 1942 and 1962 (Air Mapping Corp. 1942; Arial Explorations Inc., 1937; Geotechnics & Resources Inc. 1962). The sites of these ranges are now occupied by open mature forests. The evidence for their location consists of fairly level ground with remnants of earthen berms. The aerial imagery also indicated there were other areas of potential military disturbance located to the north and east of the old ranges, but that these disturbances appeared to be more limited to vehicles driving on the ground surface. Areas such as this, where no previous archaeological work had been conducted and where substantial ground disturbance could not be demonstrated by aerial image analysis, were subjected to field inspection.

Native American Consultation: On October 27, 1999, the DoD promulgated its annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*, provides additional guidance for this policy. Government-to-government consultation took place during the Integrated Cultural Resource Plan Update in 2010 in a letter from the Vermont Adjutant General to the President of the Stockbridge-Munsee Band of the Mohican Nation. The Stockbridge-Munsee Band of the Mohican Nation identified that they only have an interest in the southwestern quarter of Vermont. This was confirmed in an email on May 30, 2013, and again in an email from Ms. Bonnie Hartley of the Historic Preservation Assistant for the Stockbridge-Munsee Community in 2014. She again stated that they are only interested in the 2 armories in southern Vermont, and only if there is ground breaking disturbance activities. Although the Stockbridge-Munsee Band of the Mohican Nation indicated in 2014 that is was only interested in the projects occurring in the southwest quarter of Vermont, including the Bennington, Vergennes and Rutland areas, the VTARNG will send the Tribe a notification that the EA and FONSI are available for review. No Native American concerns regarding the Proposed Action have been identified. See **Appendix G** for email and correspondence between the Stockbridge-Munsee Band of the Mohican Nation and the VTARNG.

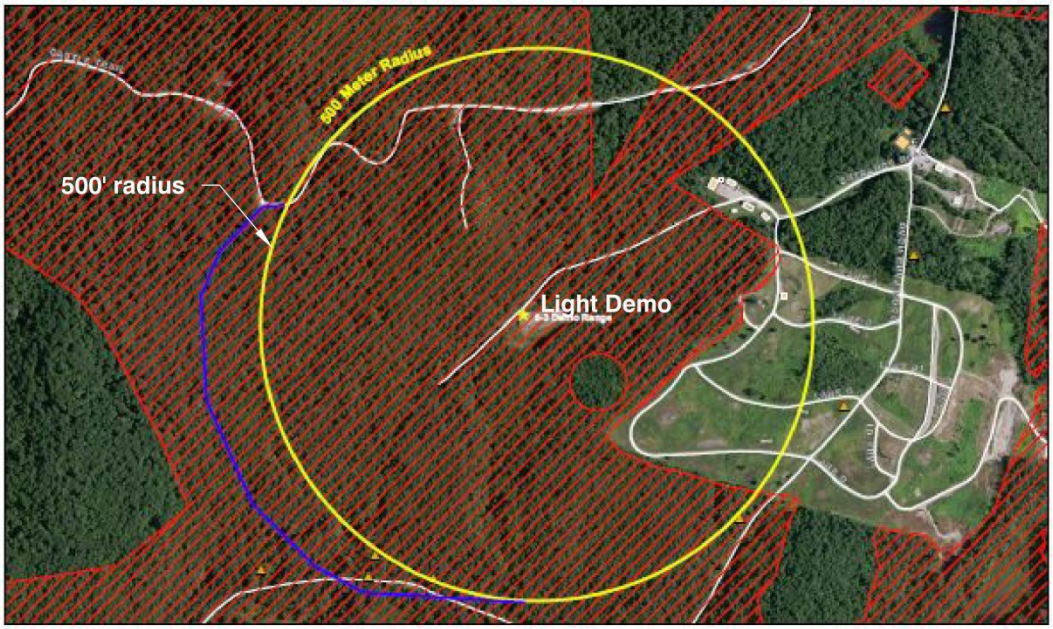
Visual Sensitivity: The EAFR is located in eastern Chittenden County, along the sparsely populated mountainous spine of Vermont, on the west slope of the Green Mountain Range. The terrain of the training areas varies from moderately flat in the north to steep hills in the southern portion of the range. Approximately ninety percent of the EAFR is forested with five percent upland, non-forested and two percent wetlands. The remaining land is developed military construction. Within the mountainous terrain are considerable scenic areas. The VTARNG provides stewardship of these lands, with limited public access. The Appalachian Mountains cross the region; most of the major summits vary between 3,500 and 4,300 feet. Mount Mansfield, the highest point in Vermont at 4,393 feet, lies a few miles northeast of the boundary of EAFR. The Adirondack Mountains to the west rise to between 4,000 and 5,000 feet. Major valleys include the Champlain to the west, the St. Lawrence to the north, and the Connecticut to the east. The proposed project area is a 60-acre range that is located on a side hill with varied terrain. (**Appendix A-topographic contours**) Elevations within the project area range from approximately 820 to 1,000 feet above mean sea level.

3.8.2 Existing Conditions

The proposed project area includes part of the steep slope of OP Hill, a large expanse on the broad top of a

lower unnamed hill to the east. Elevations within the project area range from approximately 250 to 305 meters (820 to 1,000 feet) above mean sea level. The project area has been logged on several occasions with the most recent logging occurring in 2014. The remainder of the project area is heavily forested.

The soils within portions of the project area were derived from glacial till and are generally a stony loam (Allen 1974). There are several areas of rock outcrop within the project area. Portions of the project area at times are moist, even saturated (occasionally with standing water or rivulets), which is likely due in part to the relatively impermeable fragipan that may lie within 0.5 to 0.9 meters (1.5 to 3 feet) of the ground surface throughout this area (Allen 1974). This type of soil has a relatively low natural fertility; originally the land within the project area was probably considered too rocky to work, but eventually some of it was cleared and used, possibly as unimproved pasture (Aerial Explorations Inc. 1937; Allen 1974).



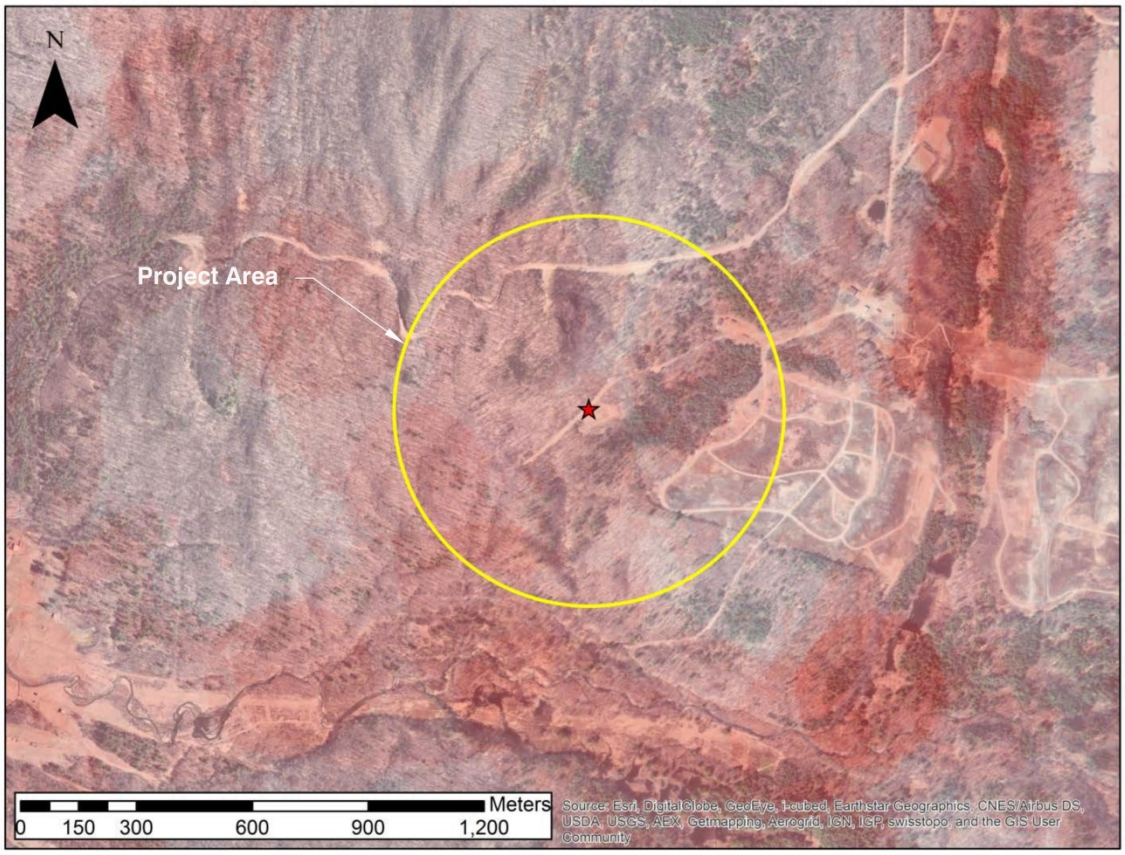
potential archaeological sensitive areas

Figure 14 - Light Demo Range Potential archaeological sensitive areas

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.



The areas with greater numbers of key archaeological sensitivity factors in common appear as more intense in color in this view

Figure 15 - Light Demo Range detail of the GIS Archaeological Sensitivity Map

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

Archaeological Sensitivity

The field survey identified a few areas of archaeological sensitivity. Areas with potential historical archaeological sensitivity included the two known farmstead sites and a 20th century military concrete bunker structure located north of Lee River Road in the area of the old ranges. In terms of sensitivity for precontact Native American sites, a number of areas were highlighted by the predictive model given that they exhibit "habitability" factors such as level terrain and proximity to water. While the project area does contain level landforms in proximity to seasonal draws and drainages, upon inspection in the field these areas are considered only marginally sensitive, especially considering the upland setting and negative results of previous archaeological studies of more sensitive locations in the near vicinity.

Based on the field inspection, UVM CAP determined that there are archaeologically sensitive areas within or immediately adjacent to the proposed 5-3 Demo Range project area. These include two previously identified historic sites, J18 and J53 as well as a small 20th century military bunker located north of Lee River Road that was recorded by GPS during this field inspection. These sites are outside of the project disturbance area and there would not be any anticipated impacts to these sites as part of this project.

Although several areas highlighted by the computer-based predictive model were examined closely for potential precontact Native American site sensitivity, none were assessed as moderately or highly sensitive for significant archaeological sites. The generally low sensitivity of the project area (compared to other parts of the property) and the negative results from previous archaeological Phase I site identification surveys, either within the project area or in similar environments nearby, indicates that there is a very low potential for precontact Native American sites in the 5-3 Demo Range project area. Therefore, the LDR or activities in the 5-3 Demo Range project area would be unlikely to impact significant precontact Native American archaeological resources.

Consultation with The State Historic Preservation Office (SHPO) was initiated on June 3, 2015. SHPO has reviewed the project and provided a determination of "no adverse effect," as noted in the returned letter with SHPO stamp dated May 4, 2016, included in **Appendix G**. The notice for the EA public comment period will state that comments are being solicited under NEPA and NHPA.

Historic Sensitivity

Previous archaeological field inspections and surveys conducted by the UVM CAP, have identified numerous historic sites on the VTANG's Ethan Allen Training Center property (Thomas et. al. 2005; Robins and Crock 2009). Of these, J18 (VT-CH-747) and J53 (VT-CH-780), are located within or immediately adjacent to the 5-3 Demo Range project area. The historic site J18 (VT-CH-747), the 'I.C. Stone Site,' consists of a house cellar foundation on the north side of Lee River Road and a large barn foundation on the south side of the road opposite the residence. In addition, there is a surface scatter of historic artifacts, possibly related to this farmstead, located 35 meters (114.83 feet) northeast of the house site (Thomas et. al. 2005:6.122-6.124). The historic site J53 (VT-CH-780), the 'S. Pease site,' is a 19th - 20th century farmstead located on the west side of Poor Farm Road and consists of the remains of a house cellar, well, barn (with silo pad) and an outbuilding (probably a sugarhouse) as well as a possible garbage dump.

From the available historic aerial photographs, it could be determined that a portion of the southern part of the 5-3 Demo Range project area had experienced significant land modification for previous military related activities. This included the sites of two old firing ranges that were built immediately north of Lee River Road, just west of its intersection with Poor Farm Road. These ranges appear to have been developed in the 1920s or 1930s and abandoned between 1942 and 1962 (Air Mapping Corp. 1942; Arial Explorations Inc., 1937; Geotechnics & Resources Inc. 1962). The sites of these ranges are now occupied by open mature forests. The evidence for their location consists of fairly level ground with remnants of earthen berms. The aerial imagery also indicated there were other areas of potential military disturbance located to the north

and east of the old ranges, but that these disturbances appeared to be more limited to vehicles driving on the ground surface. Areas such as this, where no previous archaeological work had been conducted and where substantial ground disturbance could not be demonstrated by aerial image analysis, were subjected to field inspection.

The two identified historic areas, J18 and J53 are outside of the project disturbance area and there will not be any impacts to these sites as part of this project.

3.9 Socioeconomics

The EAFR staff is composed of VTARNG personnel and U.S. Army personnel. Approximately 100 staff personnel work at the EAFR during the weekdays. During the weekend, when the majority of training occurs, the staff level increases to 350 staff persons. The staff administers to the training facility and provides stewardship of the range acreage. At present, the EAFR trains National Guard, Active Duty, and other Department of Defense (DoD), and non-DoD personnel. DoD throughput (the number of soldiers trained per year) has increased from 30,000 military personnel in 2005 to approximately 100,000 military personnel in 2008, an increase of 324 percent.

While the Proposed Action would not increase the user population at the EAFR, the EAFR has increased the number of trainees in recent years. This increase was accomplished through increased scheduling and utilization of the range throughout the year.

The EAFR provides benefit to the State of Vermont in a variety of ways, from a socioeconomic perspective. Two key benefits are the services that the EAFR provides to the State of Vermont and the nation, and the modest economic benefits to the regional economy. Soldiers provide service to their state and country, from emergencies at home in Vermont to wartime service overseas. The operations at the EAFR generate revenue to state and local economies through military and civilian wages, equipment rentals, utilities, telephone, and office supplies, as well as construction contractor payments and other prime contract awards.

Economic benefits to the region include military and civilian employment and goods, services, and construction, for a total economic impact to the region of $247,257,467 (see Table 6: Economic Impact of VTARNG). This sum, for fiscal year 2010, is an example of the payroll and spending in the region. This number includes an economic multiplier of 1.84. Economic multipliers account for additional spending in the region. For example, military and civilian employees of the VTARNG spend wages for a variety of goods and services; this spending travels through the regional economy, as would construction spending for both labor and materials. The secondary consequences are referred to as multiplier effects and are accounted for in the VTARNG's total economic impact.

Table 6
Economic Impact of VTARNG

Military pay and Allowances	$ 109,188,051
Civilian Payroll	$ 32,800,026
Goods and Services	$ 56,857,150
Military Construction	$ 48,412,240
Total Economic Impact	$ 247,257,467

Impact multiplier of 1.84 has been applied.
Source: VTARNG SONMP

Within one mile of the EAFR lie the Towns of Jericho to the west, Underhill to the north, and Bolton to the south. There are two schools located within one mile of the EAFR. The majority of the land to the east and south of the EAFR is forested, mountainous, and/or undeveloped. These communities are small, settled

Vermont towns (**Table 7: Population in Communities Surrounding EAFR**).

Table 7 Population in Communities Surrounding EAFR			
	2000	2010	Change
Jericho	5,015	5,355	6.8%
Underhill	2,980	3,016	1.2%
Bolton	971	1,182	21.7%
Vermont	608,827	625,741	2.8%
United States	281,424,602	308,745,538	9.7%
Source: Census Bureau, 2010 census data, VTARNG SONMP.			

3.10 Environmental Justice

In 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This order directs agencies to avoid the disproportionate placement of any adverse effects from federal policies and actions on minority and/or low-income populations. Federal review of Executive Order (EO) 13045, The Protection of Children from Environmental Health and Safety Risks, is also assessed in this section of the report. This related field of study is founded on a growing body of scientific evidence that children may suffer disproportionately from environmental health and safety risks. The region of influence for the EAFR consists of the Bolton, Jericho, and Underhill communities in Chittenden County, Vermont.

Vermont is the second-smallest state in the nation, with a 2010 population of 625,741. A significant demographic feature of Vermont is its lack of racial and cultural diversity. Ninety-five percent of the population is white and largely homogeneous. The greatest degree of diversity is in Chittenden County, especially in the towns of Burlington (89% white) and Winooski (83% white). A review of U.S. Census information, as shown in Table 8 (Selected Characteristics of the Population, EAFR Vicinity, Vermont and the United States), indicates that there is little minority population and low-income population in the vicinity to be impacted by this action. The minority population in the area is less than 5 percent of the population, which is considerably less than over 20 percent minority population in the nation as a whole. Similarly, the low-income population in Vermont, measured as persons below poverty level, is less than the nation as a whole. There is, therefore, no minority or low-impact population in the vicinity of this project for review under EO 12898, Environmental Justice.

TABLE 8

Selected Characteristics of the Population

Vermont and the United States

	Bolton Town	**Jericho Town**	**Underhill Town**	**Chittenden County**	**Vermont**	**USA**
Population, 2010 (April 1) estimates base	1,182	5,009	3,016	156,545	626,011	308,747,508
White persons, percent, 2011 (a)	97.0%	97.4%	97.4%	92.5%	95.5%	78.1%
Black persons, percent, 2011 (a)	0.4%	0.6%	0.4%	2.1%	1.1%	13.1%
Asian persons, percent, 2011 (a)	0.4%	0.6%	0.6%	2.8%	1.4%	5.0%
Persons below poverty level, percent, 2007-2011	5.5%	4.4%	4.7%	10.9%	11.3%	14.3%

FIPS Code 50

(a) Includes persons reporting only one race.

Source: US Census Bureau State & County Quick Facts

3.11 Infrastructure

The infrastructure resources for the EAFR are presented in this section of the report. Existing utilities, including water, sewer, fire protection, electricity, and solid waste, are presented and assessed with regard to the needs of the Proposed Action.

- Potable Water. There would be no proposed water sources or water line extensions as part of the Proposed Action.
- Fire Protection. The Underhill-Jericho Fire Department provides fire protection. The range does have limited firefighting capability on post. However, it is mostly set up for wildfire situations not structure fires.
- Wastewater Treatment. There would be no proposed wastewater systems or treatment as part of the Proposed Action.
- Storm Drainage. A Stormwater Pollution Prevention Plan would be enacted for the site. It provides for routine measures to protect the groundwater and surface waters from pollutant loading from range activities. State Stormwater Construction and General Permits would be submitted and attained for the proposed temporary construction related soil disturbances and post construction operational impervious stormwater runoff as part of this project.
- Electricity. Electricity is provided to the range via the Vermont Electric Cooperative. Underground power would be extended from Range 6-6 facilities to the Proposed Action.
- Heat. There would be no heated space in any of the buildings as part of the Proposed Action.
- Solid Waste. Solid waste is picked up by the State Military Department and taken to the Burlington Area Transfer Station, operated by Waste Systems International.

No infrastructure improvements would be contemplated at the Proposed Action in addition to what is noted above.

3.12 Hazardous and Toxic Materials/Wastes (HTMW)

A hazardous material is defined as any substance that poses an unreasonable risk to life, the environment, or property when not properly contained or used as defined in the VT Pamphlet 200-3, dated 14 February 2013, Hazardous Waste & Hazardous Material Management. The pamphlet further defines hazardous waste (HW) as a solid waste that is not specifically excluded from regulation as a HW in 40 C.F.R. 261.4(b) and is either listed as a hazardous waste or exhibits one of the characteristics of hazardous waste found at 40 C.F.R. 261 Subpart C. The United States Environmental Protection Agency (EPA) typically defines toxic materials as toxic chemicals of national concern, including PCBs, lead, mercury, and asbestos.

The VTARNG Environmental Office maintains an award-winning program, recognized by the ARNG Installations and Environment Directorate and other state ARNG offices, as a leader in the country in environmental stewardship. The EAFR is managed in conformance with environmental regulation, employing innovative technologies to prevent pollution where possible, and responding quickly and efficiently to clean up any spills of hazardous materials that may occur through mission-related operations. Based on evidence available through all federal and state databases, all contamination due to past practices has been adequately addressed and there are no outstanding environmental pollution issues at the EAFR.

Hazardous materials are not proposed to be stored on site as part of the Proposed Action.

Hazardous waste would not be generated as part of the Proposed Action. Spent artillery shells and casings, which may be hazardous wastes if disposed, are collected following use and recycled as scrap metal in accordance with established Qualified Recycling Program procedures. As defined in the NGB Environmental Baseline Survey (EBS) Standard Operating Procedure (SOP) dated February 2004, characterization of UXO is beyond the scope of an EBS. The presence of UXO in the proposed area is not likely, due to the procedures in place at the EAFR to ensure all UXO is located and destroyed.

4.0 Environmental Consequences

4.1 Introduction

This section describes the potential direct, indirect, and cumulative effects of implementing the Proposed Action or the No Action Alternative, as well as BMPs and/or mitigation measures that would reduce the level of identified impacts. The VTARNG considers BMPs integral to implementation, and they are not considered separate from the Proposed Action. Mitigation measures are defined as project-specific requirements (not routinely implemented by the VTARNG) necessary to reduce identified potentially significant adverse environmental impacts to less-than-significant levels. No project-specific mitigation measures are needed to reduce impacts of the Proposed Action to less-than-significant levels. Thus, no mitigation measures are identified in this EA. For more information on BMPs, refer to **Section 4.13**. Definitions of key terms used throughout **Section 4** are provided in **Section 7**.

4.2 Land Use

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on land use:

- Alternative would conflict with, divide, or substantially change existing EAFR land use or land cover.
- Alternative would conflict with, or cause changes to, existing EAFR land use or zoning.
- Alternative would limit the capability of the VTARNG to carry out its assigned mission to provide adequate training facilities at EAFR.

4.2.1 Effects of the Proposed Action

Under the Proposed Action, long-term, less-than-significant adverse land use impacts would be anticipated and would be managed with the implementation of BMPs. Currently, there are "noise-sensitive" land uses, that is, residential and institutional land uses within the immediate vicinity or noise zones of the EAFR. In most cases, this is not a risk to community quality of life or mission sustainment. The Noise Study, included in **Appendix B**, prepared as part of the LDR indicates an increase in the noise zones over the previously depicted noise zones. The increase is predominately due to the increase in engineering units and artillery fire and not from the Proposed Action.

Civilian populations may increase the outward sprawl of the town, which originally may have been a comfortable distance away from the installation; this leads to what is known as *encroachment*. The new residents in land directly adjacent to the installation may become irritated by installation noise. These processes can put severe limitations upon the ability of a military installation to support training and for assigned units to maintain an adequate level of readiness. If the military fails to respond to concerns of the civilian community, the potential exists for estrangement and a general unwillingness within the civilian community to work with the military to formulate creative land use ideas that allow communities and installations to exist in harmony. To prevent conflicts between military operations and civilian land use from reaching significant proportions, the military must take reasonable steps to protect the community from training noise, and it must work with the local governments and land owners to make sure that adjoining lands are developed in ways compatible with the noise environment.

The majority of land uses bordering the EAFR are conservation lands, agricultural lands and rural

residential lands. The existing land uses in the EAFR and vicinity is primarily rural. As documented in the town plans for Bolton, Jericho, and Underhill, a local land use planning goal is to maintain and preserve rural character. These environmentally based zones are not intended to serve as a buffer to the EAFR and its uses. Thus, the areas proximate to the EAFR contain residential uses. The widespread residential land use in the adjacent communities, however rural in character, imposes a constraint on the military land use, which was located in this rural portion of Vermont for the purpose of conducting a military firing range in an area with substantial natural buffers. Residences in single-family homes and farms are scattered close to the EAFR boundary in both Jericho and Underhill. The proximity of the EAFR to residential land uses should be considered by local planners when revising land use plans, ordinances, and zoning restrictions. The EAFR can participate in this process in order to inform the civilian population of training activities in the geographical areas affected by activities at the EAFR.

4.2.2 Effects of the No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities. Land uses at the EAFR and in the vicinity would remain under current conditions.

4.2.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels. The site is designated as military training land use, and will be utilized as such. Land use impact and implementation of BMPs is closely associated with noise impact. Noise-related BMP measures incorporated into the design to reduce land use impact in the vicinity include directing weapons firing toward the interior of the range. The EAFR implements BMPs to reduce the amount of noise generated by training operations. These actions include the prohibition of firing during specific times of the day, generally between the hours of 2200 and 0730. (see Section 4.4.3 for a detailed listing of these practices.) In addition, the VTARNG will continue its Operational Noise Management Program.

4.3 Air Quality

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact to air quality:

- Alternative would cause an exceedance of the NAAQS and/or require a conformity analysis.
- Alternative would substantially increase greenhouse gas emissions or airborne fugitive dust.
- Alternative would increase health risks for nearby sensitive receptors.

4.3.1 Effects of the Proposed Action

Anticipated air emissions from the Proposed Action would be short-term and long-term, less-than-significant adverse impacts to the existing air-quality environment in the vicinity of the Proposed Action area. Impacts would include (1) short-term air emissions during clearing and construction activities and (2) long-term air emissions from training operations (fugitive dust, weapons firing, and vehicular engine emissions).

4.3.2 Effects of the No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented. The EAFR would likely continue current operations. The EAFR has been demonstrated to have less-than-significant adverse air quality impacts related to current operations. Air quality would not be expected to change under the No Action Alternative.

4.3.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels. BMPs to minimize fugitive dust, such as use of a dust palliative to open soil surfaces and dirt roads, would be implemented as needed.

4.4 Noise

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on the noise environment:

- Alternative would create a Zone III boundary that extends off of EAFR during favorable weather conditions.
- Alternative would include routine activities that result in a Zone II that extends off of EAFR.
- Alternative would substantially increase noise resulting from traffic.
- Alternative would result in substantial disruptions to nearby sensitive receptors.

4.4.1 Effects of the Proposed Action

Under the Proposed Action, **s**hort-term and long-term, less-than-significant adverse impacts to the local noise environment would be anticipated and would be managed with the implementation of BMPs. Impacts would include short-term increased noise levels as a result of land clearance and construction activities and long-term increased noise levels as a result of proposed training. An Operational Noise Assessment was conducted in 2015 for the proposed LDR by the Army Public Health Center (APHC). This assessment was created to compare the baseline noise levels with the noise levels anticipated in the Proposed Action. Baseline levels were evaluated using current VTARNG training throughput numbers and current munitions usage. Noise zones were larger than those presented in the APHC 2013 EAFR Operational Noise Plan; however, annual average noise levels are still compatible with the surrounding land usage. The 2015 noise consultation is now considered an appendix to the 2013 Noise Plan as the baseline contours developed are more representative of the current noise environment at the EAFR. These new baseline conditions should be used to support future land use conditions and NEPA analyses.

Table 9 lists the total acreage for each Noise Zone, as well as the acreage of the portion extending off the installation boundary for projected conditions. The LUPZ baseline and proposed conditions are shown in **Figures 8** and **16**, respectively. The Community Land Use and Noise Sensitive Uses are depicted in **Figure 7**.

TABLE 9 - PROJECTED CONDITIONS NOISE ZONE ACREAGE

Noise Zone	Total Acreage	Off-Post Acreage
LUPZ	3,525	2,082
Zone II	2,524	155
Zone III	2,655	0

Findings from the Operational Noise Consultation, No. WS.0030762-d-15, dated January 2015 are as follows:

a. Noise Zones II and III from the baseline conditions remain within the EAFR indicating that existing annual average noise levels from VTARNG activity are generally compatible with the surrounding environment.

b. The addition of the LDR and the engineering units would increase the size of the Noise Zones. Under the projected conditions, the LUPZ would extend beyond the northern, southern, and western boundaries. Zone II would extend beyond the northern boundary approximately 550 meters (0.34 miles) and beyond the western boundary up to 200 meters (0.12 miles). The northern off-post Zone II would encompass approximately 12 residential properties which are considered pre-existing, non-conforming land uses. The western off-post Zone II would not contain residential structure. Zone III would remain within the EAFR.

c. Overall, complaint risk guidelines indicate a moderate probability of receiving noise complaints for both the existing and projected conditions. Under unfavorable weather conditions, there is a small area along the southern boundary (0.44 miles) in the high complaint risk area generated by artillery and mortar firing.

The peak noise levels are highly dependent upon the weather conditions. The noise assessment as part of the Proposed Action has been evaluated under both unfavorable weather conditions and neutral weather conditions.

Complaint Risk Projected Conditions:

Figures 16-19 depict the projected conditions noise zones. **Figure 20** depicts the projected conditions complaint risk areas. Under unfavorable weather conditions, the moderate complaint risk area encompasses the Towns of Underhill to the north, Bolton to the south and Jericho to the west. The high complaint risk area extends approximately 700 meters (0.44 miles) beyond the southern boundary. The off-post high complaint risk area is driven by artillery and mortar firing. Under neutral weather conditions, there is a moderate risk of generating noise complaints along the northern, southern, and western boundaries. The high complaint risk areas remain limited to the area surrounding the firing points and ranges.

The construction of the LDR would be anticipated to cause a minor increase in the noise contours beyond the 2013 drawn baseline conditions (the last full noise assessment on the range). These noise increases are mostly due to increased training numbers (actual soldiers on the range) unrelated to the construction of the Proposed Action and an increase of fired howitzer rounds during the 2012 - 2014 timeframe. These increases are due to deployment cycles, and associated training needs due to these deployments, and were not considered as part of the Proposed Action for this EA. The increased noise caused by other factors on the range may be considered in a future environmental and noise analysis. The 2015 Operational Noise Assessment is included in **Appendix B.**

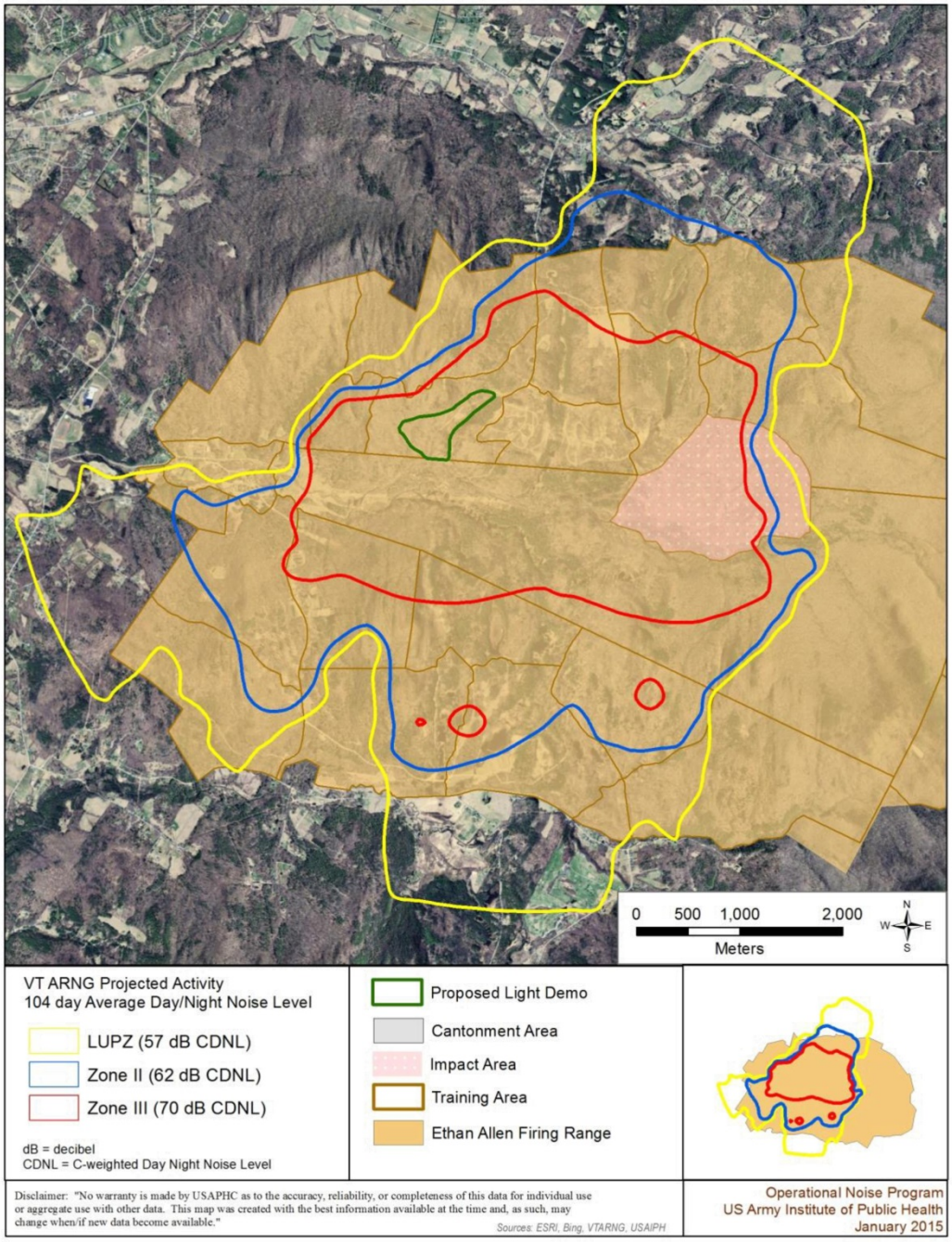


Figure 16 - Projected Conditions Noise Zones

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

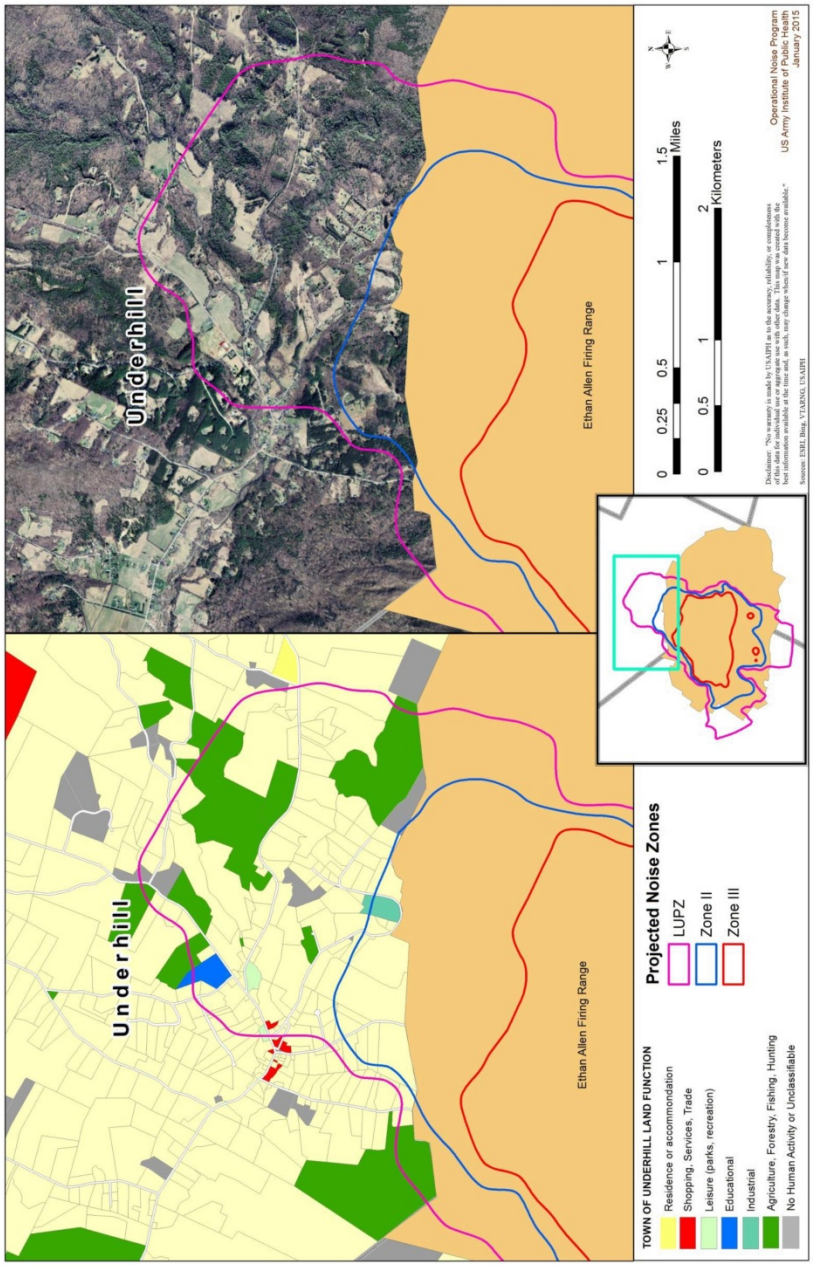


Figure 17 - Detailed View Northern Off-Post Projected Conditions Noise Zone

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

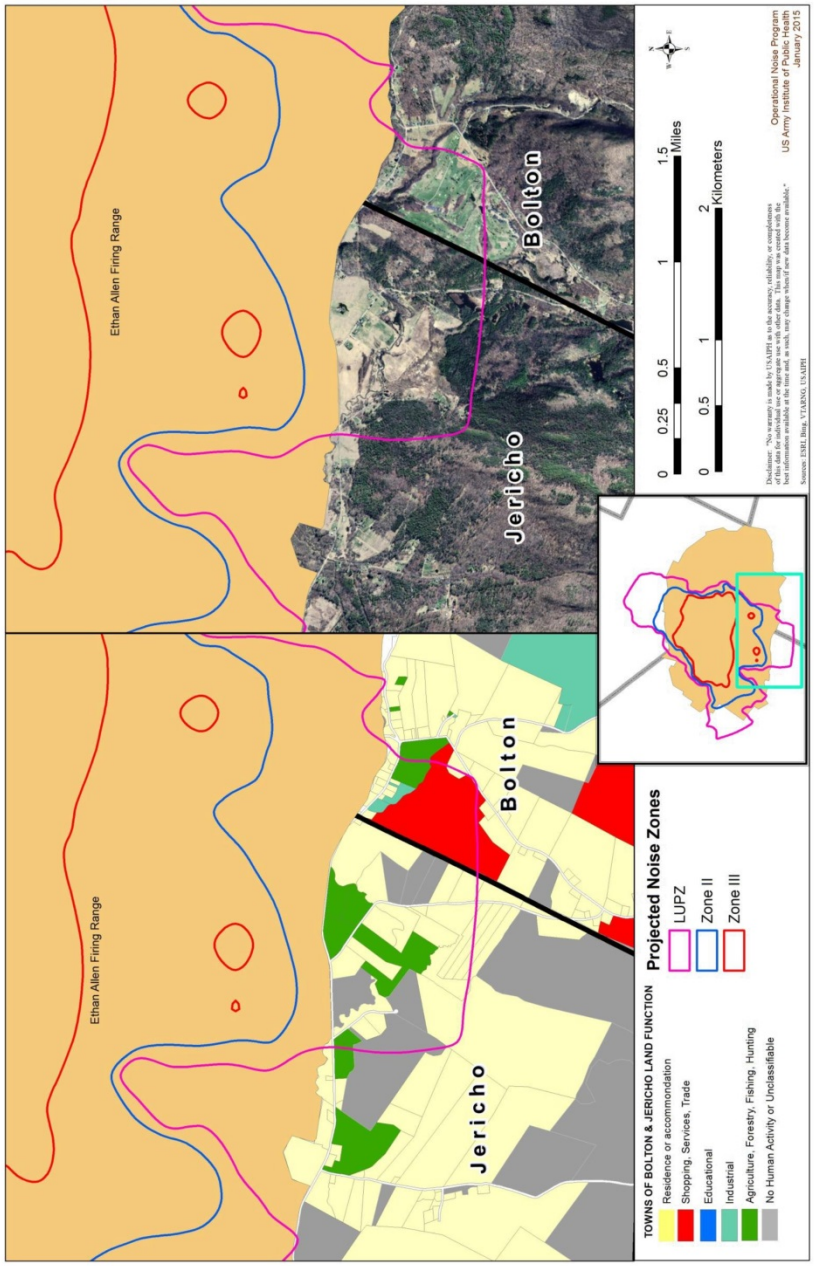


Figure 18 - Detailed View Southern Off-Post Projected Conditions Noise Zone

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

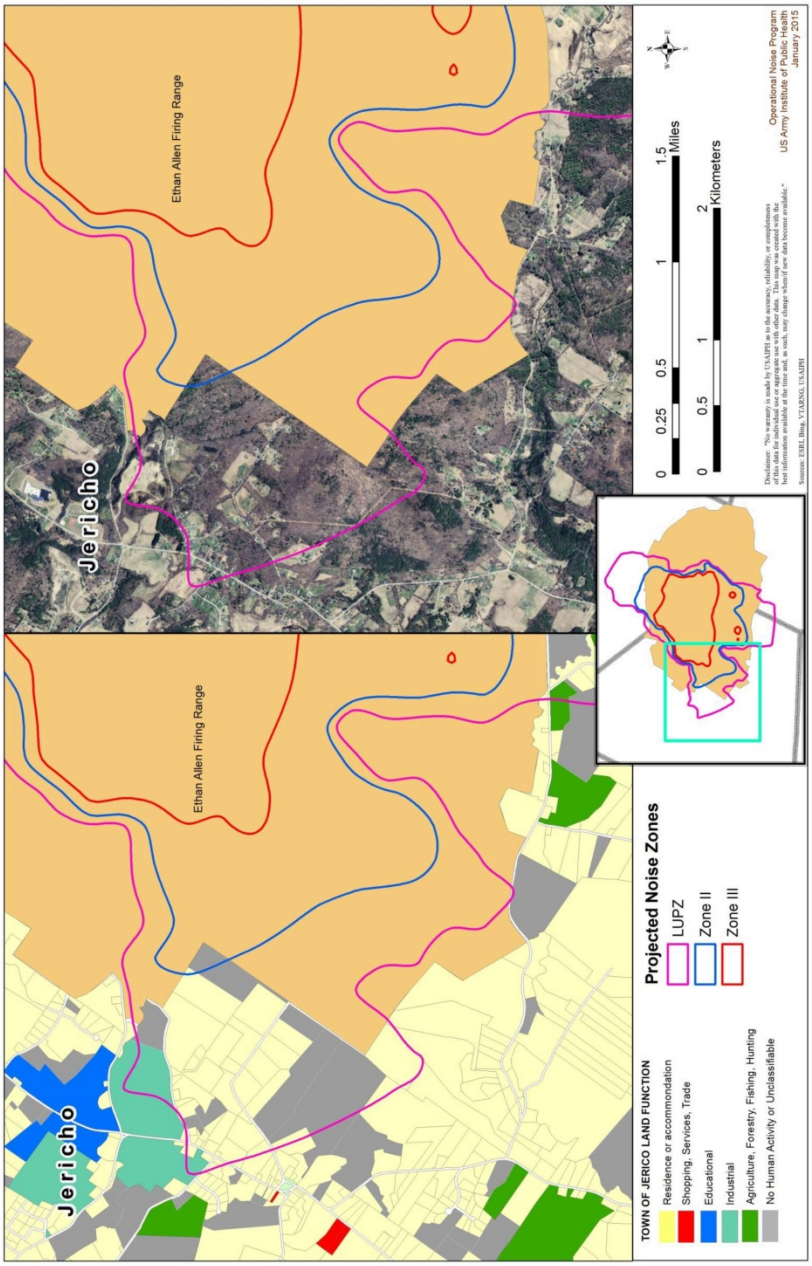


Figure 19 - Detailed View Western Off-Post Projected Conditions Noise Zone

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

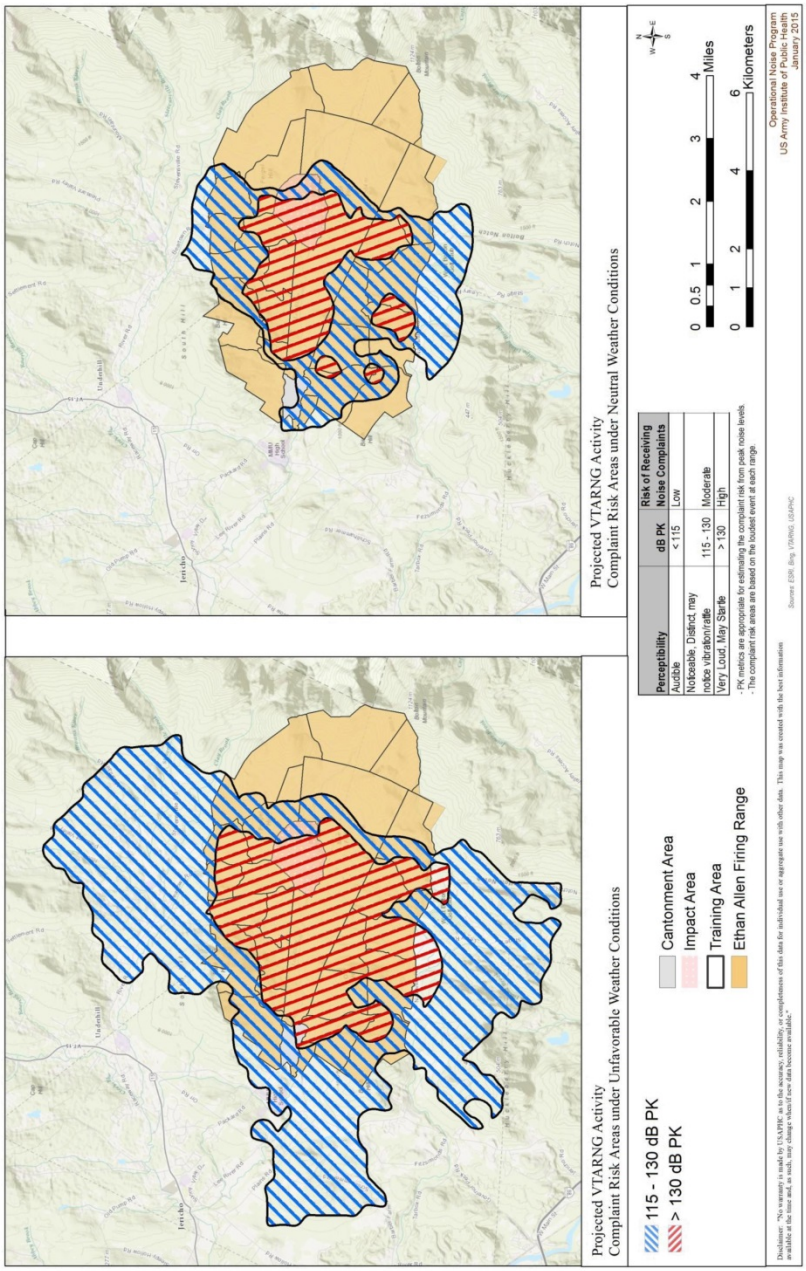


Figure 20 - Projected Conditions Complaint Risk

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

4.4.2 Effects of the No Action Alternative

The No Action Alternative would not increase the size or shape of the existing Noise Zones referenced in **Section 4.4.1**. The Noise Zones would remain similar to what is proposed due to the increases in engineering units and artillery fire.

4.4.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels. The EAFR would implement several BMPs to reduce the amount of noise generated by the Proposed Action. These actions include the prohibiting the operating hours of the Proposed Action Item during specific times of the day, generally between the hours of 2200 and 0730. (see below and Section 4.13 for a detailed listing of these measures.) In addition, the VTARNG will continue its Operational Noise Management Program to reduce the potential of incompatible land uses around its facilities that could severely impact its mission; it will continue to be a good neighbor to the surrounding communities. At a minimum, municipal governments are encouraged to support public disclosure of all Noise Zones in addition to any other information that may convey how military training operations may affect the noise environment. The VTARNG will continue to build its noise management program to:

1. Reduce potential incompatible land uses around training facilities,
2. Prevent detrimental effects on the mission, and
3. Carry on its good-neighbor relationship with surrounding communities.

The public is informed in advance of all VTARNG training activities via press release. The EAFR provides notices of training events to include artillery and small arms firing, and the routine upcoming two-month firing schedule (small caliber) to the surrounding communities. The Towns of Jericho and Underhill post the notices on the Town websites.

The VTARNG has designated the Public Affairs Office (PAO) as the primary noise complaint Point of Contact (POC). The PAO maintains a public website that is used to convey information to the public. In addition to informing that PAO of noise complaints, the VTARNG notifies the PAO when training is scheduled that has potential to impact neighbors. The PAO notifies neighbors about potential noise effects, while at the same time ensuring that there are no security risks posed by the information released.

4.5 Geology, Topography, and Soils

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on topography, geology, or soils:

- Alternative would substantially alter subsurface geological or mineral resources.
- Alternative would increase human safety risks to potential geological activity, such as possible subsidence, seismic activity, or high shrink/swell potential.
- Alternative would alter topography such that there would be a substantial risk of erosion.
- Alternative would subject new areas to training activities that would result in substantial changes to topography or soils (i.e., impact area for explosions).

4.5.1 Effects of the Proposed Action

Under the implementation of the Proposed Action, both short-term and long-term, less-than-significant adverse impacts to topography and soils would be anticipated and would be managed with the implementation of BMPs. No effects to the geology would be proposed or anticipated. No unique geological features or mineral-bearing resources exist in the area. Clearing, grading, and construction would have minor impacts to topography. Siting of the proposed range was carefully selected to minimize impacts to soils from grading, by using the existing roadway from Range 5-3, trails, and cleared land with minimal disturbance and without substantial cut and fill. Standard BMPs would be used during and after construction to minimize potential impacts from erosion and runoff.

4.5.2 Effects of the No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities. Land uses at the EAFR and in the vicinity would remain under current conditions.

4.5.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels. The following standard BMPs would be used during and after construction to minimize potential impacts from erosion and runoff: use of silt fence, erosion matting, stoned lined ditches, and check dams. Additional details are included in **Appendix A**.

4.6 Water Resources

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on water resources:

- Alternative would increase flooding in the Proposed Action area due to changes in drainage patterns or construction in the 100-year floodplain.
- Alternative would substantially alter the quantity or quality of surface water.
- Alternative would result in a net loss of wetland acreage or substantially degrade existing wetland quality.
- Alternative would substantially alter the quantity or quality of groundwater.

4.6.1 Effects of the Proposed Action

Under the implementation of the Proposed Action, both short-term and long-term less-than-significant adverse impacts to water resources would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements. Water resources in the vicinity of the Proposed Action consist of the Lee River, which is located approximately 1,000 feet to the south of the Proposed Action. The Proposed Action is not located within the 100-year floodplain and is not expected to impact any water resources. A Construction Stormwater Erosion Prevention and Sediment Control Permit from the VTDEC would be obtained prior to construction by the contractor. Post construction operational stormwater would be managed on-site through project design and inspected in accordance with State of Vermont General Permit 3-9015. This permit would be amended to include this action and would be obtained prior to construction by the contractor. Wetlands identified at the site are discussed in Biological Resources, **Section 4.7.1.2**.

4.6.2 The No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities. Water resources at the EAFR and in the vicinity would remain under current conditions.

4.6.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels. The implementation of standard BMPs during construction projects, such as the use of silt fencing and rapid re-vegetation following site clearing and grading, would minimize potential impacts from erosion and runoff to any nearby surface waters.

4.7 Biological Resources

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact to biological resources:

- Alternative would convert or degrade existing rare habitats not currently managed in a conservation plan.
- Alternative would convert or degrade a substantial amount of existing habitat.
- Alternative would result in substantial mortality of wildlife.
- Alternative would adversely affect populations of federally or state threatened or endangered species.

4.7.1 Effects of the Proposed Action

4.7.1.1 Plant Communities

Under the Proposed Action, both short-term and long-term less-than-significant adverse impacts to plant communities would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements. The Proposed Action area would encompass 60 acres which have been broken down into two sections. These are the proposed infrastructures (i.e. roads & buildings) and the project AOI. The proposed infrastructure area consists of +/- 9.7 acres. The proposed project area of interest consists of +/- 50.3 acres and surrounds the areas where infrastructure is proposed. These areas have been delineated by Civil Engineering Associates on their "Light Demo: Progress Plan" dated June 1, 2015. Annual vegetative control maintenance to the LDR would include brush hogging. No RTE plants or natural communities occur in the Proposed Action area. Human presence would be isolated to road and trail networks and range areas within the LDR. To avoid any impact outside of the LDR, as a BMP, foot traffic would not expand beyond existing trails.

Plant lists, historical data, qualitative & quantitative descriptions and the two botanical field inventories revealed no federally or state-listed RTE plants or natural communities as having occurred or currently occupying the +/- 9.7-acre proposed infrastructure area or the +/- 50.3-acre proposed project AOI.

The proposed infrastructure is situated entirely within the Northern Hardwood Forest Natural Community (State Ranking-5: Very Common). The proposed project AOI is situated within

Hemlock Forest (State Ranking-4: Common) and Hemlock-Northern Hardwood Forest (State Ranking-4: Common). The Natural Community delineations were previously produced by Brett Engstrom.

Two botanical field visits were conducted at the proposed LDR at the Vermont National Guard-EAFR facility in Jericho, Vermont in November, 2014 and May, 2015. No federally or state-listed RTE plant or natural community locations were known prior to the botanical site visits. Their absence was confirmed and no federally or state-listed RTE plants or natural communities were found during the botanical field visits within the project area. Future surveys should be conducted to continually monitor for the establishment of RTE plants, many of which prefer disturbed ground conditions. (**Figure 21**)

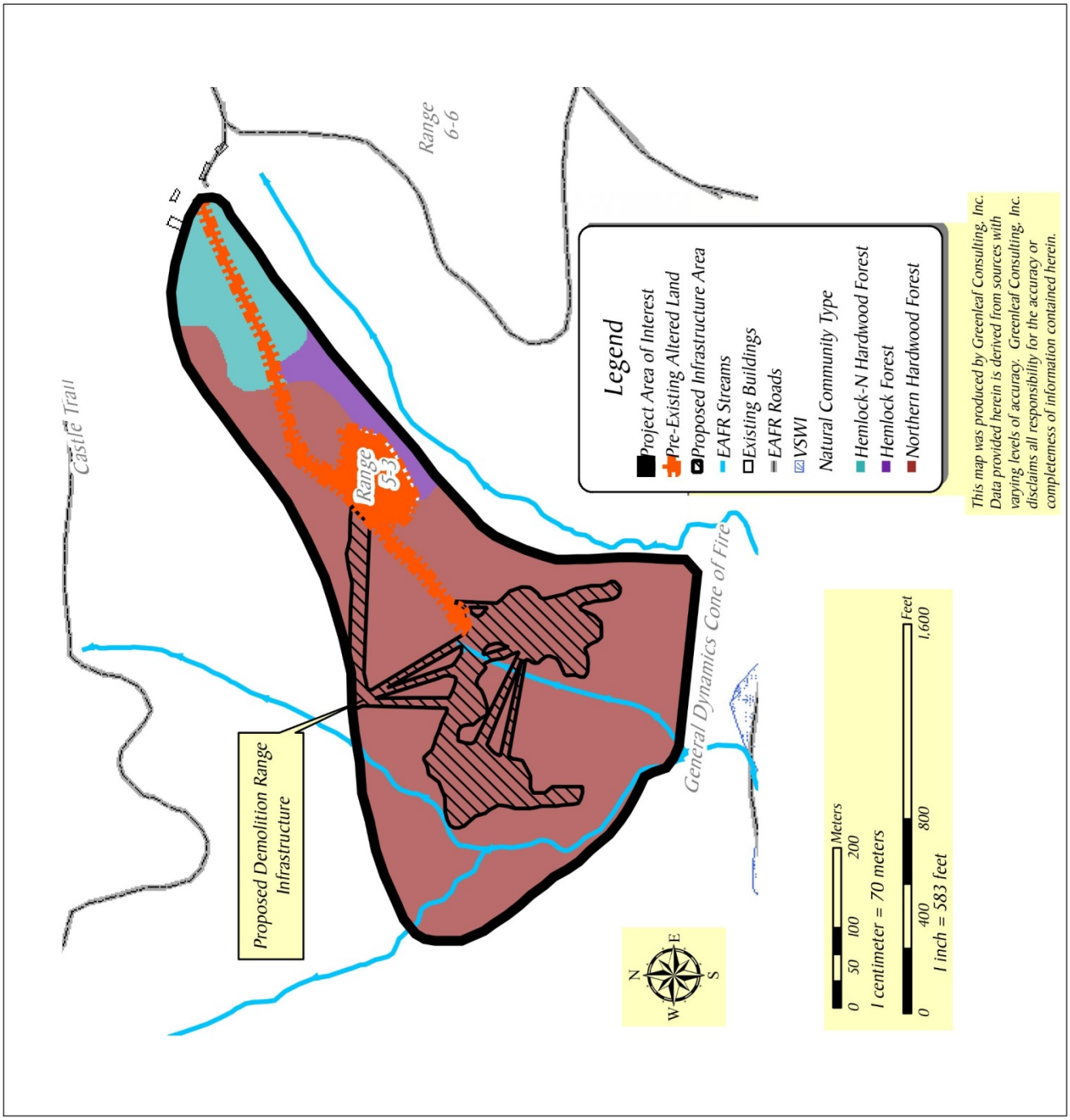


Figure 21 - Botanical Environmental Assessment

Light Demo Range
Ethan Allen Firing Range, Jericho, VT

State of Vermont Military Department
Vermont Army National Guard

Civil Engineering Associates, Inc.

4.7.1.2 Wetlands

A short-term, less-than-significant adverse impact to wetlands would be anticipated during construction of the Proposed Action. The Proposed Action would not adversely impact any significant wetland functions, and would avoid and minimize impacts to wetlands to the greatest extent practicable. The Proposed Action could be constructed in accordance with the wetland permitting requirements and conditions of the Army Corps.

A visit to the project site by Wetlands Ecologist Jeffrey Severson, of Oakledge Environmental Services, Inc., occurred on May 27, 2015 to delineate wetland boundaries and evaluate wetland functions. A relatively narrow, southerly trending wetland band is located in the topographically low area at the site, as shown on **Map W-1 – Wetlands**. The wetland is less than 0.5 acres and has been partially disturbed by activities and infrastructure associated with on-going logging operations, including an existing logging road/skid trail and canopy tree removal in some of the upland portions of the site. Most of the Proposed Action area consists of forested uplands on sloping hillsides on either side of the wetland. The LDR would have a less-than-significant impact to any wetlands or wetland function.

The access road to the Proposed Action site has been configured to follow the route of an existing, unimproved skidder trail for logging operations in this part of the range. The skidder trail crosses the wetland, in the location shown on **Map W-1**. The Proposed Action has been designed to minimize wetland impacts by siting the access road to utilize the previously-disturbed skidder trail where practical, and to cross the wetland at a relatively narrow location. The access road improvements for the Proposed Action would stabilize soils and reduce the potential for erosion along the skidder trail route. A 24-inch diameter HDPE culvert would be installed under the road bed in the lowest point of the wetland crossing to maintain natural storm runoff flows. Alternate routes up gradient and downgradient of the project site were evaluated and eliminated due to steep side slopes that exceed the proposed road grade and/or by long circuitous routes that would require extensive clearing and fill placement for construction.

The proposed road at the wetland crossing would include a 20-foot wide travel lane. The road's 3:1 side slopes would be seeded and mulched. The structural section of the road would include 12 inches of type 1 stone, wrapped in geotextile fabric, installed beneath the road on the existing grade. A 24-inch diameter HDPE culvert would be installed beneath the road at the wetland crossing. The proposed road would reduce the potential for erosion in this portion of the existing, unstabilized logging road/skid trail. Additional details are included in **Appendix A**.

The New England District of the United States Army Corps of Engineers (Corps) has issued General Permits (GPs) for the State of Vermont that became effective on December 6, 2017. The GPs authorize activities subject to Corps jurisdiction in wetlands and other waters of the United States that have no more than minimal individual and cumulative adverse environmental effects. The text of each GP and the associated General Conditions must be read to determine if an activity is eligible for authorization under the GPs.

Projects that require authorization under the GPs will be screened to determine if they are eligible for Self-Verification. Self-Verification projects were formerly identified as Category 1 projects, under previous Vermont GPs. A project that qualifies for Self-Verification "*may proceed without application or notification to the Corps, provided the project proponent verifies that the activity will meet the terms and conditions of applicable GPs*", and the project proponent complies with other applicable federal laws.

The Proposed Action has been designed to have less-than-significant adverse wetland impacts, as specified by the terms, conditions, and definitions in the GP issued by the Corps. The Proposed Action is designed to qualify for authorization as a Category 1 project under the GP, and would be constructed in full compliance with the terms and conditions of the GP.

Implementation of the Proposed Action would not require a Vermont Wetland Permit (state permit) from the Vermont Agency of Natural Resources (ANR).

4.7.1.3 Wildlife Communities

Under the Proposed Action, both short-term and long-term less-than-significant adverse and positive impacts to wildlife communities would be anticipated. Adverse impacts would be managed through the implementation of standard BMPs, in addition to adherence to regulatory requirements. The area of interest for the Proposed Action is roughly a 10-acre footprint where roads, buildings, training sites and forest clearing would occur as part of the Proposed Action.

Habitat associated with the Proposed Action consists of mid-late successional Northern Hardwoods with oak and birch components and includes two small streams and associated seeps. Forest openings offer foraging areas for birds, bats and small insects.

The creation of and proposed activities that would occur on the LDR would have no impact on any RTE amphibian species. There would be minimal impact to loss of terrestrial habitats to common species such as red-backed salamander, wood frog, American toad, and stream breeding salamanders.

Habitats for reptiles, primarily snakes, are impacted both positively and negatively. The creation of an open area between possible denning areas (rock cliffs to the north and west slopes) and foraging areas (Lee River and series wetlands) conducive to basking, cover and additional foraging would be excellent. It is anticipated that this area would support an increased number of snakes, primarily garter. The creation of the LDR and the proposed activities for the LDR would have an overall, positive impact on snakes and no impact on turtles.

The creation of the LDR and proposed activities would have no significant impact on RTE mammals of Vermont. Ongoing activities would have no significant impact. The creation of the LDR would increase small mammal abundance due to increase food resources and available cover objects. Species, typically shrews, that require moist conditions would not utilize these habitats and may have been pushed out.

As the NLEB is listed under the federal Endangered Species Act (ESA), VTARNG has contacted the USFWS, and has provided them with the bat survey information. Both acoustic and mist-netting surveys were completed in efforts to determine the presence of the NLEB and any roost trees that may be in the project area. Acoustic surveys were conducted in early June, 2015, and mist netting was conducted in the first week of July, 2015. No NLEBs were trapped in this effort. In conclusion, the VTARNG has determined that construction of the LDR at the EAFR would not likely have an adverse effect the NLEB. In response to the surveys, the USFWS indicated that by limiting the clearing of trees to the time period between October 1 and April 15 any direct adverse effects to the NLEB could be avoided. They also indicated that indirect adverse effects would not be likely due to the small amount of forest clearing relative to the available habitat in the immediate surrounding area.

The creation of the LDR and the proposed activities would result in long-term, less-than-significant impacts to bird species' use of the forest interior and to birds requiring forest conditions. The LDR

would have no significant impact on birds or bird habitats within or near the LDR. The minimal reveal of the proposed windows would create a less-than-significant impact to potential bird-window collisions. Bird collisions would be monitored and corrective actions would be taken if adverse impacts develop. Refer to building drawings in Appendix A.

In summary, there would be no significant adverse impacts to state or federally threatened or endangered wildlife species or habitats from the creation, proposed activities, or future management of the Proposed Action.

4.7.2 Effects of the No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities. Habitats at the EAFR and in the vicinity would remain under current conditions.

4.7.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels. BMPs that would be implemented to manage potential impacts to wildlife habitat of the NLEB include protecting habitat-related trees or conducting tree cutting during winter months (October - April).

4.8 Cultural Resources

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact to cultural resources:

- Alternative would degrade, or cause neglect of, an archaeological site, NRHP-listed or – eligible resource, or cemetery.
- Alternative would degrade, or decrease access to, cultural resources of value to federally recognized Native American tribes.

4.8.1 Effects of the Proposed Action

Precontact Native American Archaeological Potential

The Proposed Action would be anticipated to have no effect on historic, archeological, or recorded tribal resources. Based on the field inspection, UVM CAP determined that there are archaeologically sensitive areas within or immediately adjacent to the proposed 5-3 Demo Range project area. These include two previously identified historic sites, J18 and J53 as well as the small 20th century military bunker located north of Lee River Road that was recorded by GPS during this field inspection. These sites are outside of the Proposed Action area of disturbance and within the GD Cone of Fire. There will not be any impact as part of the Proposed Action to these areas and given their location outside of the Proposed Action area and within the GD cone of fire a buffer area is not warranted. Although several areas highlighted by the computer-based predictive model were examined closely for potential precontact Native American site sensitivity, none were assessed as moderately or highly sensitive for significant archaeological sites. The generally low sensitivity of the project area (compared to other parts of the property) and the negative results from previous archaeological Phase I site identification surveys, either within the project area or in similar environments nearby, indicates that there is a very low potential for precontact Native American sites in the 5-3 Demo Range project area. Therefore, any proposed improvements and/or activities in the 5-3 Demo Range project area would be unlikely to

impact significant precontact Native American archaeological resources.

4.8.2 Effects of the No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities. Cultural resources at EAFR and in the vicinity would remain under current conditions.

4.8.3 Mitigation Measures and Best Management Practices

The Proposed Action area is well removed from the routes of any known historic period public roadway and/or settlements. No evidence of any significant historic structural remains was observed during the field visit. Therefore, no further work concerning historic resources would be required for this area. No mitigation measures for historic resources would be required.

No significant historic archaeological resources are expected or found within the Proposed Action area. Any further cultural resource analysis, such as a Phase I archaeological survey, would not be necessary, as neither the construction nor the operation of the LDR would disturb the location of potential resources. No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

4.9 Socioeconomics

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on the socioeconomic environment:

- Alternative would substantially change local population growth rates or employment opportunities.
- Alternative would create a demand for housing, schools, public facilities, or recreational opportunities that exceeds existing supply.
- Alternative would increase risks to public health or safety, including safety of children.

4.9.1 Effects of the Proposed Action

Under the Proposed Action, no effect on socioeconomics would be anticipated. No increase in staff would be required to administer the Proposed Action within the EAFR. The soldiers to be trained would come from the VTARNG and other military personnel. No new staff would be anticipated to provide for the training needs of the EAFR. Therefore, there would be no adverse effect on socioeconomics as a result of implementing the Proposed Action. The local economy in the EAFR vicinity is not dependent upon the military; the local population is generally characterized as finding employment in business in western Chittenden County. No long-term effect on population, employment, income, or housing is expected, though some short-term positive effects to the local economy are anticipated from the individual construction projects.

4.9.2 Effects of the No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities. Land uses at the EAFR and in the vicinity would remain under current conditions. There would be a less than significant adverse impact due to loss of local revenue from visiting trainees and continued loss of training time due to travel to remote sites.

4.9.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

4.10 Environmental Justice

The concept of environmental justice is based on the premise that no segment of the population should bear a disproportionate share of adverse human health or environmental effects of a proposed Federal action. Historically, low-income and minority communities have, in some cases, been disproportionately affected by negative environmental effects, receiving few of the benefits of economic growth and development while absorbing much of the societal cost. In accordance with EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) and DoDI 4715.9, this section examines the demographic profile of the population around the proposed site.

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on environmental justice populations:

- Alternative would cause socioeconomic impacts that disproportionately affect low-income or minority populations.

4.10.1 Effects of the Proposed Action

Under the Proposed Action, no effect on environmental justice would be anticipated.

Findings with regard to Environmental Justice and the Protection of Children are presented herein in accordance with EO 12898 Environmental Justice and EO 13045, Protection of Children. There are three primary considerations to be made in assessing the potential environmental justice impacts of constructing the Proposed Action:

- No significant environmental impacts are anticipated.
- There are no significant minorities or low-income populations within the EAFR vicinity.
- Without significant impacts, and more importantly without a low-income or minority population to affect, there can be no disproportionately high and adverse impacts on those populations.

Therefore, there would be no adverse environmental justice impacts associated with construction of the Proposed Action.

Implementation of the Proposed Action would not have a disproportionately adverse effect on children. Any less-than-significant adverse environmental impacts are not anticipated to disproportionately impact children in the project vicinity. Children are frequently present at VTARNG installations as visitors for school trips and as users of recreational facilities, in particular the biathlon course. On such occasions, the VTARNG has taken and will continue to take precautions for their safety using a number of means, including fencing, limitations on access to certain areas, and provision of adult supervision.

4.10.2 Effects of the No Action Alternative

Under the No Action Alternative, training and activities would continue on existing ranges and facilities and there would be no potential environmental justice impacts. The No Action Alternative would not change the current activities and impacts associated with using the installation ranges. There would be no change in the type of training or in the number of troops using these ranges. Thus, there also would be no change in the regional economic or environmental impacts associated with these activities. There are no significant adverse impacts identified for the No Action Alternative, and as a result, there would be no significant adverse impacts related to either EO 12898 or 13045 from this alternative.

4.10.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

4.11 Infrastructure

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact on area infrastructure or transportation:

- Alternative would increase traffic such that it exceeds the capacity of local roadways.
- Alternative would restrict civilian airspace use outside the scope of any existing agreements with the FAA.
- Alternative would alter utilities such that demand exceeds supply or capacity, or would cause substantial alterations to existing utility systems.

4.11.1 Effects of the Proposed Action

Under the Proposed Action, short-term and long-term, less-than-significant adverse impacts to infrastructure would be anticipated to occur. Impacts would include (1) short-term impacts on infrastructure due to increased vehicle traffic associated with the construction of the Proposed Action and (2) long-term impacts on infrastructure due to increased vehicular traffic associated with increased training. These vehicular traffic impacts are anticipated to be negligible. The Proposed Action would not require potable water or septic systems. The only infrastructure required as part of the Proposed Action would be the extension of the existing electrical service line at Range 6-6 facilities to the Proposed Action area. The provision of this type of utility extension is not anticipated to impact any resources in the area, and would be accomplished within regulatory parameters.

4.11.2 Effects of the No Action Alternative

The No Action Alternative would not present any impact to infrastructure or utilities. The EAFR would continue to provide utility services as required by the needs of the VTARNG.

4.11.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

4.12 Hazardous Materials and Toxic Materials/Wastes (HTMW)

The Preferred Action Alternative and No Action Alternative were evaluated against the following significance criteria to determine if they would result in a significant impact to HTMW:

- Alternative would substantially increase generation of, or exposure of the public to, hazardous substances.
- Alternative would substantially increase the presence of hazardous substances in the environment (i.e., contamination).
- Alternative would substantially restrict the use of property due to hazardous waste, materials, or potential site remediation requirements.

4.12.1 Effects of the Proposed Action

Short-term and long-term, less-than-significant adverse impacts associated with Proposed Action would be anticipated due to minor land conversion activities (short-term) and maintenance and training operations (long-term). Less-than-significant adverse impacts would be managed through the implementation of BMPs and ongoing regulatory compliance. The potential for the Proposed Action to impact hazardous materials, or toxic waste, is presented in this section of the report, and would include ordnance use and disposal methods. The implementation of the Proposed Action would not be expected to create any potential public health hazard or increase the use of hazardous materials above historic levels at the EAFR. Hazardous waste was not and is not routinely generated in the proposed locations. Spent artillery shells and casings, which may be hazardous wastes if disposed, are collected following uses and recycled as scrap metal, in accordance with established Qualified Recycling Program procedures. The presence of UXO in the proposed area is not likely, due to the procedures in place at the EAFR to ensure that all UXO is located and destroyed. Increases in the generation of recyclable materials such as scrap metal would be expected due to increased usage of the EAFR for training purposes. Other increases in hazardous-material generation that would potentially occur include the generation of universal waste, a subcategory of hazardous waste, in the form of spent fluorescent lamps. No other increases of hazardous materials or waste are expected.

The EAFR had an Operational Range Assessment Program (ORAP) Phase I Qualitative Assessment Report completed in 2008 and an addendum completed in 2013. Phase 1 testing was completed and included water samples and inspections of all 54 operational ranges on the installation, including the existing smaller demolition range, which will be the center of the proposed LDR. Groundwater discharges to on-range surface waters indicate that Munition Constituents of Concern (MCOC), or explosive constituents, are not migrating off site via surface water at concentrations unacceptable to human health or environment. This study was completed by EA Engineering and Technology, Inc. The 2012 review was conducted by ZAPATA environmental. The BMPs outlined in this report will be implemented in the design and maintenance of this range. (ORAP 2008, 2013)

4.12.2 Effects of the No Action Alternative

The No Action Alternative would not present any impact to hazardous material. The EAFR would continue to properly dispose of hazardous material and manage the EAFR as required by the needs of the VTARNG.

4.12.3 Mitigation Measures and Best Management Practices

No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

4.13 Mitigation Measures and Best Management Practices

Per established protocols, procedures, and requirements, the VTARNG would implement BMPs and would satisfy all applicable regulatory requirements in association with the implementation of the Proposed Action. BMPs are included as components of the Preferred Action Alternative, as appropriate, and are described below. BMPs are regulatory compliance measures that the VTARNG regularly implements as part of their activities, as appropriate, across the State of Vermont. These are different from "mitigation measures," which are defined as project-specific requirements (not routinely implemented by the VTARNG) necessary to reduce identified potentially significant adverse environmental impacts to less-than-significant levels. With implementation of the following routine BMPs the Preferred Action Alternative would not result in significant adverse impacts to the current environmental setting.

Land Use and Noise: New residents in land directly adjacent to the installation may become irritated by installation noise. To prevent conflicts between military operations and civilian land use from reaching significant proportions, the VTARNG will continue to take reasonable steps to protect the community from training noise, and will continue to work with local governments and landowners to make sure that adjoining lands are developed in ways compatible with the noise environment.

The construction of the LDR would be anticipated to cause a minor increase in the noise contours beyond the 2013 drawn baseline conditions (the last full noise assessment on the range). These noise increases are mostly due to increased training numbers (actual solders on the range) and an increase of fired howitzer rounds during the 2012 - 2014 timeframe. These increases are due to deployment cycles, and associated training needs due to these deployments, and were not considered as part of the Proposed Action for this Environmental Analysis. The increased noise caused by other factors on the range may be considered in a future environmental and noise analysis.

Noise Zones II and III from the baseline conditions remain within the EAFR indicating that existing annual average noise levels from VTARNG activity are generally compatible with the surrounding environment. The addition of the LDR and the engineering units would increase the size of the Noise Zones. Under the projected conditions, the LUPZ would extend beyond the northern, southern, and western boundaries. Zone II would extend beyond the northern boundary approximately 550 meters (0.34 miles) and beyond the western boundary up to 200 meters (0.12 miles). The northern off-post Zone II would encompass approximately 12 residential properties which are considered pre-existing, non-conforming land uses. The western off-post Zone II would not contain residential structures. Zone III would remain within the EAFR. Overall, complaint risk guidelines indicate a moderate probability of receiving noise complaints for both the existing and projected conditions. Under unfavorable weather conditions, there is a small area along the southern boundary (0.44 miles) in the high complaint risk area generated by artillery and mortar firing.

Noise-related BMP measures incorporated into the design to reduce land use impact in the vicinity include directing weapons firing toward the interior of the range. The EAFR has taken several steps to reduce the amount of noise generated by training operations. These actions include the

prohibition of firing during specific times of the day, generally between the hours of 2200 and 0730.

VTARNG continues its Operational Noise Management Program to reduce the potential of incompatible land uses around its facilities that could severely impact its mission; it continues to be a good neighbor to the surrounding communities. Municipal governments are encouraged to support public disclosure of all Noise Zones in addition to any other information that may convey how military training operations may affect the noise environment. The VTARNG will continue to build its noise management program to:

1. Reduce potential incompatible land uses around training facilities,
2. Prevent detrimental effects on the mission, and
3. Carry on its good-neighbor relationship with surrounding communities.

The public is informed in advance of all VTARNG training activities via press release. The EAFR provides notices of non-routine training events (e.g., artillery firing) and the routine upcoming two-month firing schedule (small caliber) to the surrounding communities. The Towns of Jericho and Underhill post the notices on the Town websites.

Air Quality: Potential air quality impacts related to the Proposed Action would be anticipated to be less than significant. Fugitive dust can be controlled by use of a dust palliative to open soil surfaces and dirt roads as needed. No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

Geology, Topography, and Soils: The use of standard BMPs during and after construction, such as the use of silt fence, erosion matting, stoned lined ditches, and check dams, would minimize potential impacts from erosion and runoff. No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

Water Resources: The implementation of standard BMPs during construction projects, such as the use of silt fencing and rapid re-vegetation following site clearing and grading, would minimize potential impacts from erosion and runoff to any nearby surface waters. No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

Biological Resources: The plant communities at the Proposed Action site have been assessed. There were no federally or state-listed RTE plants or natural communities locations known prior to the site evaluation. Their absence was confirmed and no federally or state-listed RTE plants or natural communities were found during the botanical field visits within the project area. Less-than-significant adverse impacts to the existing wetlands or wetland functions would be anticipated as part of the Proposed Action. During construction, impacts to biological resources would be minimized through the design of the project and by utilizing BMPs. Both acoustic and mist-netting surveys were completed in efforts to determine the presence of the NLEB and any roost trees that may be in the project area. Acoustic surveys were conducted in early June, 2015, and mist netting was conducted in the first week of July, 2015. No NLEBs were trapped in this effort. The VTARNG has determined that construction of the LDR at the EAFR would not likely adversely affect the NLEB, the USFWS concurred in their response letter dated October 21, 2015. In response to the surveys, the USFWS indicated that by limiting the clearing of trees to the time period between October 1 and April 15 any direct adverse effects to the NLEB could be avoided. They also indicated that indirect adverse effects would not be likely due to the small amount of forest clearing relative to the available habitat in the immediate surrounding area. BMPs to protect the NLEB include protecting habitat-related trees and conduct tree cutting during winter months (October -

April). No mitigation measures would be necessary to reduce any adverse environmental impacts to below significant levels.

Cultural Resources: Based on the field inspection, UVM CAP determined that there are archaeologically sensitive areas within or immediately adjacent to the proposed LDR project area. These include two previously identified historic sites, J18 and J53 as well as the small 20th century military bunker located north of Lee River Road that was recorded by GPS during this field inspection. These sites are outside of the Proposed Action area of disturbance and within the GD Cone of Fire. Therefore, there would not be any impact to archaeologically sensitive areas within or immediately adjacent to the proposed LDR project area.as part of this project to these areas and given their location outside of the Proposed Action area and within the GD cone of fire a buffer area is not warranted.

Although several areas highlighted by the computer-based predictive model were examined closely for potential precontact Native American site sensitivity, none were assessed as moderately or highly sensitive for significant archaeological sites. The generally low sensitivity of the project area (compared to other parts of the property) and the negative results from previous archaeological Phase I site identification surveys, either within the project area or in similar environments nearby, indicate that there is a very low potential for precontact Native American sites in the LDR project area. Therefore, any proposed improvements and/or activities in the LDR project area would be unlikely and the proposed action would not impact precontact Native American archaeological resources. No mitigation measures nor BMPs would be necessary to reduce any adverse environmental impacts to below significant levels.

Socioeconomics: No adverse effects on socioeconomics would be anticipated as the result of implementation of the Proposed Action. No mitigation measures nor BMPs would be necessary to reduce any adverse environmental impacts to below significant levels.

Environmental Justice: No environmental justice impacts would be anticipated with the construction of the Proposed Action, in accordance with EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations; implementation of this project would also have no disproportionately negative effect on children in accordance with EO 13045, Protection of Children from Environmental Health Risks and Safety Risks. No mitigation measures nor BMPs would be necessary to reduce any adverse environmental impacts to below significant levels.

Hazardous and Toxic Materials/Wastes (HTMW): All hazardous materials and waste at the proposed locations would be managed in accordance with the procedures outlined in the VTARNG HWMP. In addition, spent casings and other scrap metal generated as a result of the Proposed Action would be recycled in accordance with Qualified Recycling Program (QRP) procedures. No mitigation measures nor BMPs would be necessary to reduce any adverse environmental impacts to below significant levels.

4.14 Cumulative Effects

As defined by CEQ Regulations at 40 CFR Part 1508.7:

Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a

period of time. (40 CFR 1508.7).

Cumulative impact analysis captures the effects that result from the Proposed Action in combination with the effects of other actions in the Proposed Action's region of influence.

This EA presents less-than-significant adverse to no cumulative impacts associated with geology, topography, soils, water and air quality, socioeconomics, environmental justice, or hazardous waste. In these areas, careful design has allowed the Proposed Action to avoid any sensitive resources.

Currently, there are "noise-sensitive" land uses, that is, residential and institutional land uses within the immediate vicinity or noise zones of the EAFR. In most cases, this is not a risk to community quality of life or mission sustainment. The construction of the Proposed Action would be anticipated to cause a minor increase in the noise contours beyond the 2013 drawn baseline conditions (the last full noise assessment on the range). These noise increases are mostly due to increased training numbers (actual soldiers on the range) unrelated to the construction of the Proposed Action and an increase of fired howitzer rounds during the 2012 - 2014 timeframe. These increases are due to deployment cycles, and associated training needs due to these deployments, and were not considered as part of the Proposed Action for this EA. The increased noise caused by other factors on the range may be considered in a future environmental and noise analysis. The full Operational Noise Assessment is included in **Appendix B**.

The permitted use of residential land throughout the adjacent communities, however rural in character, imposes a constraint on military land use, which was located in this rural portion of Vermont for the purpose of conducting a military firing range in an area with substantial natural buffers. Residences in single-family homes and farms are scattered close to the EAFR boundary in both Jericho and Underhill. Incompatible land use areas should be considered by local planners when revising land use plans, ordinances, and zoning restrictions in order to provide a uniform standard in the geographical areas affected by activities at the EAFR.

As detailed in this report, existing noise from training facilities has been identified as a concern. The complete noise study is included in **Appendix B.**

The military use and the rural residential character of the community can be compatible with the establishment of greater communication and dialogue. Improved communication can be identified as a recommendation of this report. As there are no other significant noise sources in the vicinity of the EAFR, no significant cumulative impacts are anticipated from implementation of the Proposed Action. No specific mitigation measures would be required other than continuing the Noise Management procedures and proactive public affairs program regarding noise.

The VTARNG has a documented commitment to environmental resources management at the EAFR. This can be seen in the INRMP and in numerous recent studies, including the biological reporting prepared for this NEPA EA, specifically the following: GCI's RTE Plants and Natural Communities Inventory, Northern Stewards' Impact to Wildlife and Wildlife Habitat from the LDR. These documents and others have been studied to provide site-wide planning as well as ranking and priorities for environmental stewardship and conservation. This body of work documents that no cumulative impact to plant or wildlife communities is anticipated as part of the LDR.

An ARA was conducted by the UVM CAP in accordance with Section 106 regulations under the National Historic Preservation Act (1966), as amended. This report builds on previous work,

including the EAFR's cultural resources inventory, which identified and/or located many of the historic period sites on the EAFR property, and the general, property-wide application of the digital GIS version of the VDHP's Environmental Predictive Model for locating Precontact Archaeological Sites. The goal of the ARA is to identify potential cultural resources in order to recommend overall management and/or mitigation plans for several proposed actions with regard to cultural resources. This report can also attest to the ongoing commitment to the identification and management of cultural resources within the EAFR and document that no significant cumulative impact to cultural resources are present at the EAFR.

The VTARNG reviewed the 2013 Chittenden County ECOS Plan, in addition to the State of Vermont Agency of Transportation website and did not identify any significant actions planned within the reasonably foreseeable future in the vicinity of the EAFR.

Interrelated cumulative impacts place demands on the local region, planning organizations, and the military's natural resource management, cultural resource management, and public works personnel. Through sound, integrated, long-range planning on both sides of the proverbial fence, these impacts are minimized.

No significant adverse cumulative impacts to the environment, induced by changes under the Preferred Action Alternative, would be anticipated in the Towns of Bolton, Jericho, or Underhill. Close coordination between the VTARNG and local planning authorities and community representatives would serve to minimize any potential future land use conflicts. Implementation of effective environmental management plans and programs would minimize or eliminate any potential cumulative degradation of the natural ecosystem.

5.0 Comparison of Alternatives and Conclusions

5.1 Comparison of the Environmental Consequences of the Alternatives

This NEPA EA evaluates construction and operational elements of the LDR for the EAFR. This EA analyzes the implementation of the Proposed Action, as well as the No Action Alternative.

The Proposed Action by the VTARNG is to construct a LDR adjacent to the existing Range 5-3 and utilize the existing gravel road to access the Proposed Action. The LDR would include an ammo breakdown building, concrete obstacle course, timber cutting site, mine site field, steel cutting chamber, wire obstacle site, road crater site, and two MPS structures.

The purpose of the LDR would be to adequately train soldiers in the military tasks of creating obstacles and barriers of varied materials with explosive ordnances. The lack of adequate demolition training facilities was identified by returning VTARNG members after deployment in Afghanistan. Allowing units to train at the LDR would improve and enhance the training benefits of the National Guard Soldiers, and would directly increase the readiness of all Army National Guard units in Vermont. To carry out these tasks, the VTARNG must adapt to changing world conditions and improve its capabilities to respond to a variety of circumstances across the full spectrum of military operations.

Due to the careful screening of areas under consideration for site development, this EA finds that the Proposed Action has been designed in an environmentally sensitive manner, in which adverse impacts would be less-than-significant. Implementation of the Proposed Action is not anticipated to result in significant impact to land use, air resources, noise levels, geology, soils, water resources, biological resources, cultural resources, socioeconomics, infrastructure, or hazardous material, as detailed herein.

In accordance with CEQ and Army regulations, analysis of the No Action Alternative is required in all ARNG EAs. The No Action Alternative provides a baseline against which the effects of a Proposed Action are measured. No Action would mean that the proposed activity would not take place. Within this EA, the No Action Alternative refers to the continuation of existing conditions without implementation of the Proposed Action which would result in the overall readiness of VTARNG to be reduced under the No Action Alternative. While feasible, this alternative is not desirable. The Preferred Action Alternative and No Action Alternative would result in the impacts identified throughout **Section 4** and summarized in **Table 10**.

Table 10: Alternative Comparison Matrix

Technical Resource Area	Preferred Action Alternative	No Action Alternative
Land Use and Aesthetics	Long-term, less-than-significant adverse land use impacts would be anticipated and would be managed with the implementation of BMPs.	No impact attributable to VTARNG action.
Air Quality	Short-term and long-term, less-than significant adverse impacts to the existing air-quality environment would be anticipated in the vicinity of the Proposed Action area. Impacts would include (1) short-term air emissions during clearing and construction	No impact attributable to VTARNG action. Ongoing operations' emissions would continue.

	activities and (2) long-term air emissions from training operations (fugitive dust, weapons firing, and vehicular engine emissions).	
Noise	Short-term and long-term, less-than-significant adverse impacts to the local noise environment would be anticipated and would be managed with the implementation of BMPs. Impacts would include short-term increased noise levels as a result of land clearance and construction activities and long-term increased noise levels as a result of proposed training.	No impact attributable to VTARNG action. Ongoing noise associated with current training operations would continue.
Geology, Topography, and Soils	Short-term and long-term, less-than-significant adverse impacts to topography and soils would be anticipated and would be managed with the implementation of BMPs. No effects to the geology would be proposed or anticipated.	No impact attributable to VTARNG action.
Water Resources	Short-term and long-term less-than-significant adverse impacts to water resources would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements.	No impact attributable to VTARNG action.
Biological Resources	Short-term and long-term less-than-significant adverse impacts to plant communities would be anticipated and would be managed through the implementation of standard BMPs and adherence to regulatory requirements. A short-term, less-than-significant adverse impact to wetlands would be anticipated during construction of the Proposed Action. The Proposed Action would not adversely impact any significant wetland functions, and would avoid and minimize impacts to wetlands to the greatest extent practicable. The project could be constructed in accordance with the wetland permitting requirements and conditions of the Army Corps. Short-term and long-term less-than-significant adverse and positive impacts to wildlife communities would be anticipated. Adverse impacts would be managed through the implementation of standard BMPs, in addition to adherence to regulatory requirements.	No impact attributable to VTARNG action.
Cultural Resources	No effects to cultural resources would be anticipated as a result of the Proposed Action.	No impact attributable to VTARNG action.

Socioeconomics (including Environmental Justice, and Protection of Children)	No effects to socioeconomics would be anticipated as a result of the Proposed Action.	Less-than-significant adverse impact due to loss of local revenue from visiting trainees. Less-than-significant adverse impact due to continued loss of training time due to travel to remote sites.
Infrastructure	Short-term and long-term, less-than-significant adverse impacts to infrastructure would be anticipated to occur. Impacts would include (1) short-term impacts on infrastructure due to increased vehicle traffic associated with the construction of the Proposed Action and (2) long-term impacts on infrastructure due to increased vehicular traffic associated with increased training. These vehicular traffic impacts are anticipated to be negligible.	No impact attributable to VTARNG action.
Hazardous and Toxic Materials/Wastes	Short-term and long-term less-than-significant adverse impacts due to minor land conversion activities (short-term) and maintenance and training operations (long-term) would be anticipated. Less-than-significant adverse impacts would be managed through the implementation of BMPs and ongoing regulatory compliance.	No impact attributable to VTARNG action.

5.2 Conclusions

This EA has been prepared under the direction of the VTARNG in compliance with the NEPA of 1969, its implementing regulations, 32 C.F.R. Part 651, in order to assess the potential environmental impacts of the Proposed Action and the No Action Alternative. The Proposed Action consists of the construction of a LDR which would include an ammo breakdown building, concrete obstacle course, timber cutting site, mine site field, steel cutting chamber, wire obstacle site, road crater site, and two MPS structures. The No Action Alternative is an examination of the effects should the proposed activity not take place.

The project has been sited within EAFR on lands that reflect the VTARNG's environmental screening process and military requirements for safety and protection at firing ranges. The location was selected with consideration for EAFR's steep slopes, natural and cultural resources, and areas of potential site contamination.

The implementation of the Proposed Action would anticipate less-than-significant adverse impacts to the following resources: land use and aesthetics, air quality, noise, geology, topography, soils, water resources, biological resources, infrastructure, and hazardous and toxic materials/wastes. The implementation of the Proposed Action would anticipate no effects to the following resources: cultural resources and socioeconomics (including environmental justice, and protection of children).

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7.0 Glossary

Acronyms and Abbreviations

ADNL	Average Day Night Sound Level
AFP	Artillery Firing Point
AMFS	Army Mountain Warfare School
AOI	Area Of Interest
AQCD	Air Quality and Climate Division
ARA	Archaeological Resource Assessment
ARNG	Army National Guard
AR	Army Regulation
BMP	Best Management Practices
BP	Before Present
CAA	Clean Air Act
CAP	Consulting Archaeology Program
CDNL	C- weighted Day-Night Average Sound Level
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CRMP	Cultural Resource Management Plan
CWA	Clean Water Act
dBA	Decibel - A-weighting
dBC	Decibel - C-weighting
DNL	Day-Night Average Sound Level
DoD	Department of Defense
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EAFR	Ethan Allen Firing Range
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
FICUN	Federal Interagency Committee on Urban Noise
FONSI	Finding of No Significant Impact
FP	Firing Point
FY	Fiscal Year
GD	General Dynamics
GIS	Geographic Information Systems
GCI	Greenleaf Consulting Inc.
HAOI	Habitat Area Of Interest
HWMP	Hazardous Waste Management Plan
ICRMP	Integrated Cultural Resources Management Plan
ICUZ	Installation Compatible Use Zone
INRMP	Integrated Natural Resource Management Plans
IONMP	Installation Operational Noise Management Plan
ITAM	Integrated Training Area Management
KD	Known Distance
LFSH	Live Fire Shoothouse
LUPZ	Land Use Planning Zone
MILES/TES	Multiple Integrated Laser Engagement Systems/Tactical Engagement Systems

MPS	Missile Proof Shelter
NAAQS Standard	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NHPA	National Historic Preservation Act
NLEB	Northern Long-eared Bat
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxide
NRHP	National Register of Historic Places
NZ	Noise Zone
O3	Ozone
OP	Observation Point
ORAP	Operational Range Assessment Program
PAO	Public Affairs Office
SIP	State Implementation Plan
SO2	Sulfur Dioxide
SONMP	Statewide Operational Noise Management Plan
SOP	Standard Operating Procedure
SVMD	State of Vermont Military Department
TA	Training Area
UAC	Urban Assault Course
USC	United States Code
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTES	Unit Training Equipment Site
UVM	University of Vermont
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
VTANR	Vermont Agency of Natural Resources
VTARNG	Vermont Army National Guard
VTDEC	Vermont Department of Environmental Conservation
VTDHP	Vermont Division for Historic Preservation

8.0 List of Preparers

This EA of EAFR for the LDR was prepared by the following persons:

- Mr. Michael J. O'Hara, REM, Natural Resource Administrator, Vermont Army National Guard. Mr. O'Hara holds a Bachelor's Degree in Biology from Idaho State University and a Bachelor's Degree in English from Fort Lewis College. Mr. O'Hara has 19 years of experience in the preparation and oversight of environmental documentation.

- Mr. Ryan Ochs, GIS Analyst, Vermont Army National Guard. Mr. Ochs has a degree in Forest Science from Pennsylvania State University and a Post Graduate GIS Certificate from Portland State University. Mr. Ochs has approximately 16 years of experience in the field of GIS mapping and database management with an emphasis in Forest Management.

- Mr. Clarke Elliott, Owner of Civil Engineering Associates, Inc. Mr. Elliott holds a Bachelor of Science in Civil Engineering from the University of Vermont. Mr. Elliott has 33 years of experience in the design and construction management of civil works including site engineering, roadway design, foundations and structural design, water supply and wastewater. Mr. Elliott is a professional engineer in the State of Vermont.

- Mr. Christopher Galipeau, Staff Engineer / Project Manager at Civil Engineering Associates, Inc. Mr. Galipeau has Bachelor of Arts from Saint Michael's College and a Bachelor of Science in Civil Engineering from the University of Vermont. Mr. Galipeau has 18 years of experience working in the Civil Engineering discipline including project management, site engineering and design, surveying, layout, construction inspection, water supply, wastewater design and local and state permitting.

- Greenleaf Consulting, Inc. (GCI) prepared the forest and plant resource assessments.

- Northern Stewards (NS) prepared the wildlife assessments.

- The United States Department of Defense (DoD), Public Health Center prepared the SONMP

- University of Vermont Consulting Archaeology Program (UVM CAP) prepared the cultural resource reporting.

9.0 Agencies and Individuals Consulted

United States Fish and Wildlife Service
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Concord, NH 03301

United States Fish and Wildlife Service
Regional Office
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Army Corps of Engineers
Vermont Field Office
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Sherry White, THPD
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Bowler, WI 54416

ATTN: Mr. Scott Dillon, Survey Archaeologist
Vermont Division for Historic Preservation National
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Montpelier, VT 05620-1201

Ms. Emily Boedecker, Commissioner

Vermont Department of Environmental Conservation
Vermont Agency of Natural Resources
1 National Life Drive, Main 2
Montpelier, VT 05620-3520

Mr. Louis Porter, Commissioner
Vermont Department of Fish and Wildlife
103 South Main Street
Waterbury, VT 05671-0501

Ms. Amy Grover, Town Clerk
Town of Bolton
3045 Theodore Roosevelt Highway
Bolton, VT 05676

Mr. Brian Bigelow, Town Administrator
Town of Underhill
P.O. Box 32
Underhill Center, VT 05490

Mr. Todd Odit, Town Administrator
Town of Jericho
P.O. Box 39
Jericho, VT 05465

Appendix A

STATE OF VERMONT

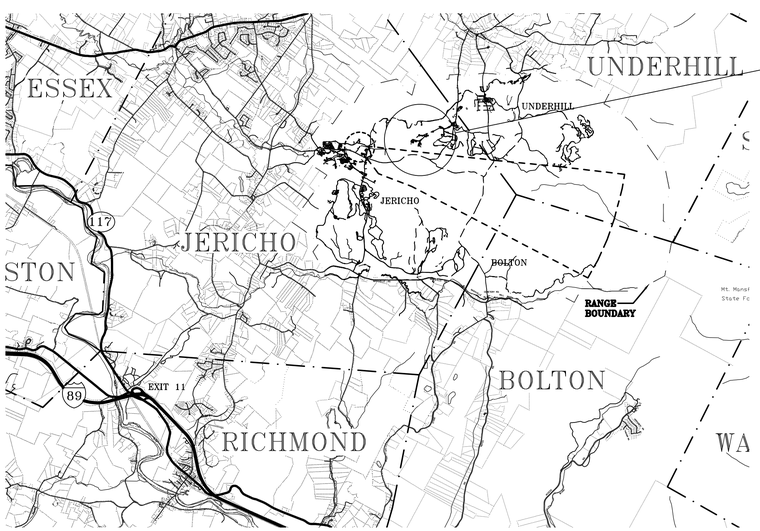
VTARNG - Camp Ethan Allen Training Site
Light Demo Range

AGENCY OF ADMINISTRATION
2 GOVERNOR AIKEN AVENUE
MONTPELIER, VT 05633-5801
MICHAEL J. OBUCHOWSKI, COMMISSIONER

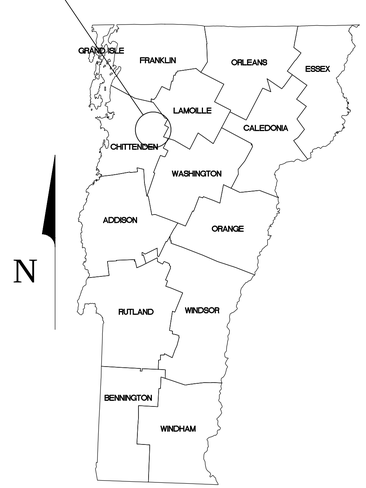
STATE OF VERMONT MILITARY DEPARTMENT
789 VERMONT NATIONAL GUARD RD
COLCHESTER, VT 05448-3099

MARCH 2017

PROJECT LOCATION:
Camp Ethan Allen Training Site - Jericho, VT



CAMP ETHAN ALLEN TRAINING SITE
SCALE: 1" = 6000'



INDEX OF SHEETS

SITE:

L-1	PROJECT LOCATION PLAN
C1.0	OVERALL SITE PLAN
C1.1	SOILS PLAN
C1.2	OVERALL RANGE PLAN
C1.3	RANGE ACCESS ROAD PLAN
C1.4	PARTIAL RANGE PLAN
C1.5	PARTIAL RANGE PLAN
C1.6	PARTIAL RANGE PLAN
C1.7	PARTIAL RANGE PLANS
C2.0	SITE DETAILS
C2.1	SITE DETAILS
C2.2	SITE DETAILS
C3.0	PROFILES
C4.0	EROSION CONTROL PLAN
C4.1	EROSION CONTROL NOTES AND DETAILS
C4.2	EROSION CONTROL DETAILS

ARCHITECTURAL/STRUCTURAL:

A1.0	AMMO BREAKDOWN BUILDING PLANS and ELEVATIONS
A1.1	ROOF FRAMING and DETAILS
A2.0	BUILDING SECTIONS and DETAILS
A2.1	BUILDING SECTIONS and DETAILS
A2.2	BUILDING NOTES
S1.0	STEEL CUTTING CHAMBER

SET #_____
DO NOT COPY

GENERAL NOTES:

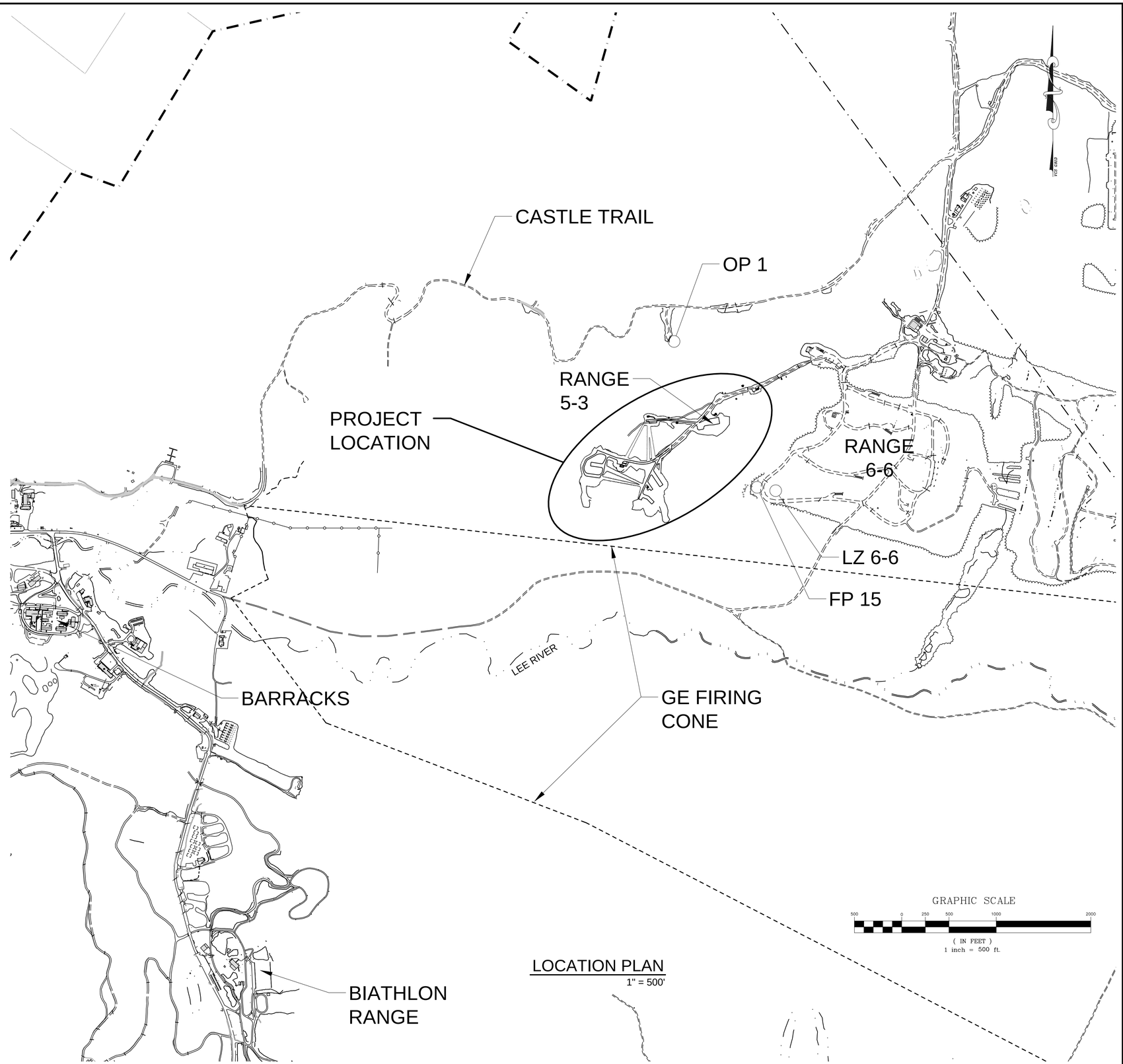
1. Underground utilities shown hereon are based on utility evidence visible at ground surface and are subject to field verification by excavation. Utilities shown do not purport to constitute or represent all utilities located upon or adjacent to the surveyed premises. All discrepancies shall be reported to the Engineer. The Contractor shall contact Dig Safe (888–344–7233) prior to any construction. In addition, the Contractor shall hire a private utility locating firm to locate Owner owned underground utilities prior to start of any excavation.
2. The Contractor shall be responsible for conforming to all OSHA (State/Federal) regulations including trenching and confined space requirements.
3. The Contractor shall submit shop drawings for all items and materials incorporated into the site work. Work shall not begin on any item until shop drawing approval is granted.
4. All existing utilities not incorporated into the final design shall be removed or abandonded as indicated on the plans or directed by the Engineer.
5. The Contractor shall be maintain as–built plans (with ties) for all underground utilities. Those plans shall be submitted to the Owner at the completion of the project.
6. The Contractor shall repair/restore all disturbed areas (on or off the site) as a direct or indirect result of the construction.
7. All grassed areas shall be maintained until full vegetation is established.
8. Maintain all trees outside the construction limits.
9. The Contractor shall be responsible for all work necessary for complete and operable facilities and utilities.
10. In addition to the requirements set in these plans and specifications, the Contractor shall complete the work in accordance with all permit conditions.
11. The tolerance for finish grades for all gravel surfaces shall be 0.1 feet.
12. Any dewatering necessary for the completion of the sitework shall be considered as part of the contract and shall be the Contractor's responsibility.
13. Existing pavement to be removed shall be disposed of at an approved off–site location. Existing excavated material to be removed shall be disposed of at a designated on–site location. Contractor is responsible for stockpiling excavated material from trucks at the designated waste area.
14. If there are any conflicts or inconsistencies with the plans or specifications, the Contractor shall contact the Engineer for verification before work continues on the item in question.
15. Horizontal and vertical datum based on VCS NAD 83 and NAVD 88 respectively and are calculated based upon GPS observations performed on site during the time of survey.
16. Existing stone walls and foundations shall not be disturbed except as shown on the plans.
17. All construction personnel will be required to attend an orientation and ordnance identification session that the EOD unit will provide, prior to entering the project site. Subsequent new field employees are also required to attend the safety course. The ordnance session will cover identification of various ordnance with may be encountered and procedures for notification of EOD personnel.
18. The Contractor is responsible for obtaining testing and inspection services indicated in the Contract documents, typical for concrete and soil testing.
19. The Contractor is responsible for all layout and Field Engineering required for completion of the project. Civil Engineering Associates will provide an AutoCAD file where applicable.

CLEARING NOTES:

1. FIREWOOD OBTAINED FROM THE CLEARING ON THIS PROJECT SHALL BE DISPOSED OF AT AN OFF-SITE LOCATION.
2. EXISTING STUMPS TO BE REMOVED SHALL BE DISPOSED OF AT THE LOCATION INDICATED ON THE PLANS OR AN ON-SITE LOCATION INDENTIFIED AT THE PRE-BID MEETING.
3. TREES/LIMBS/BRUSH SHALL BE CHIPPED (AFTER FIREWOOD REMOVED) AND CHIPS CAN EITHER BE PILED ON SITE OR REMOVED.
4. CLEARING WILL BE REQUIRED ALONG ROADWAY EDGES FOR PROPOSED CONSTRUCTION.

AT POTENTIAL STUMP DUMP:

- STUMP DUMP IS A STOCKPILE AREA
- CONTRACTOR WILL BE RESPONSIBLE FOR PUSHING STUMPS INTO STOCKPILES FROM TRUCKS
- CONFIRM FINAL LOCATION WITH OWNER



LOCATION PLAN
1" = 500'

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

LIGHT DEMO RANGE

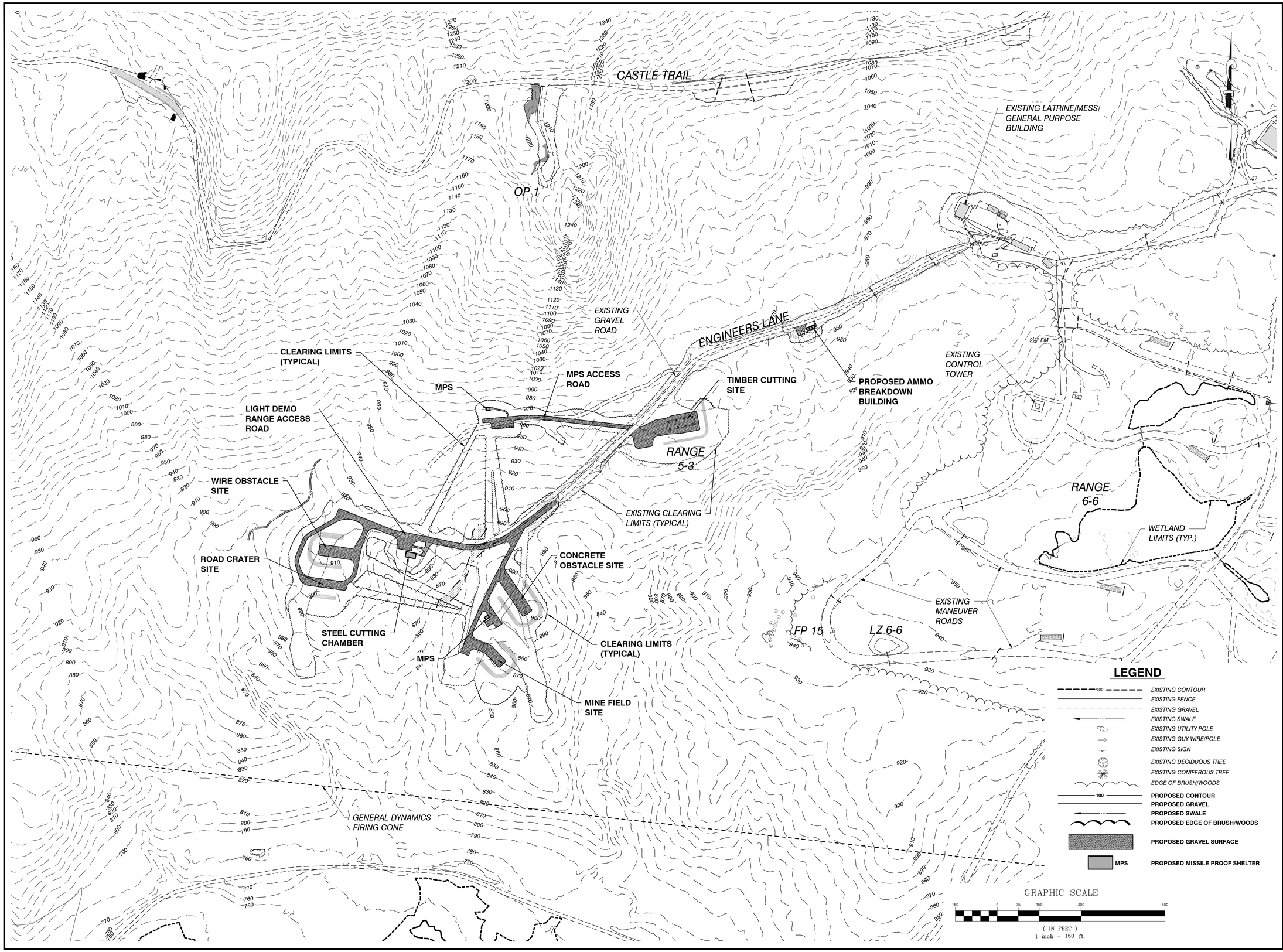
CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

PROJECT LOCATION PLAN

DATE: 3/24/2017
SCALE: 1" = 500'
PROJ. NO. 13100.00

DRAWING NUMBER: L-1



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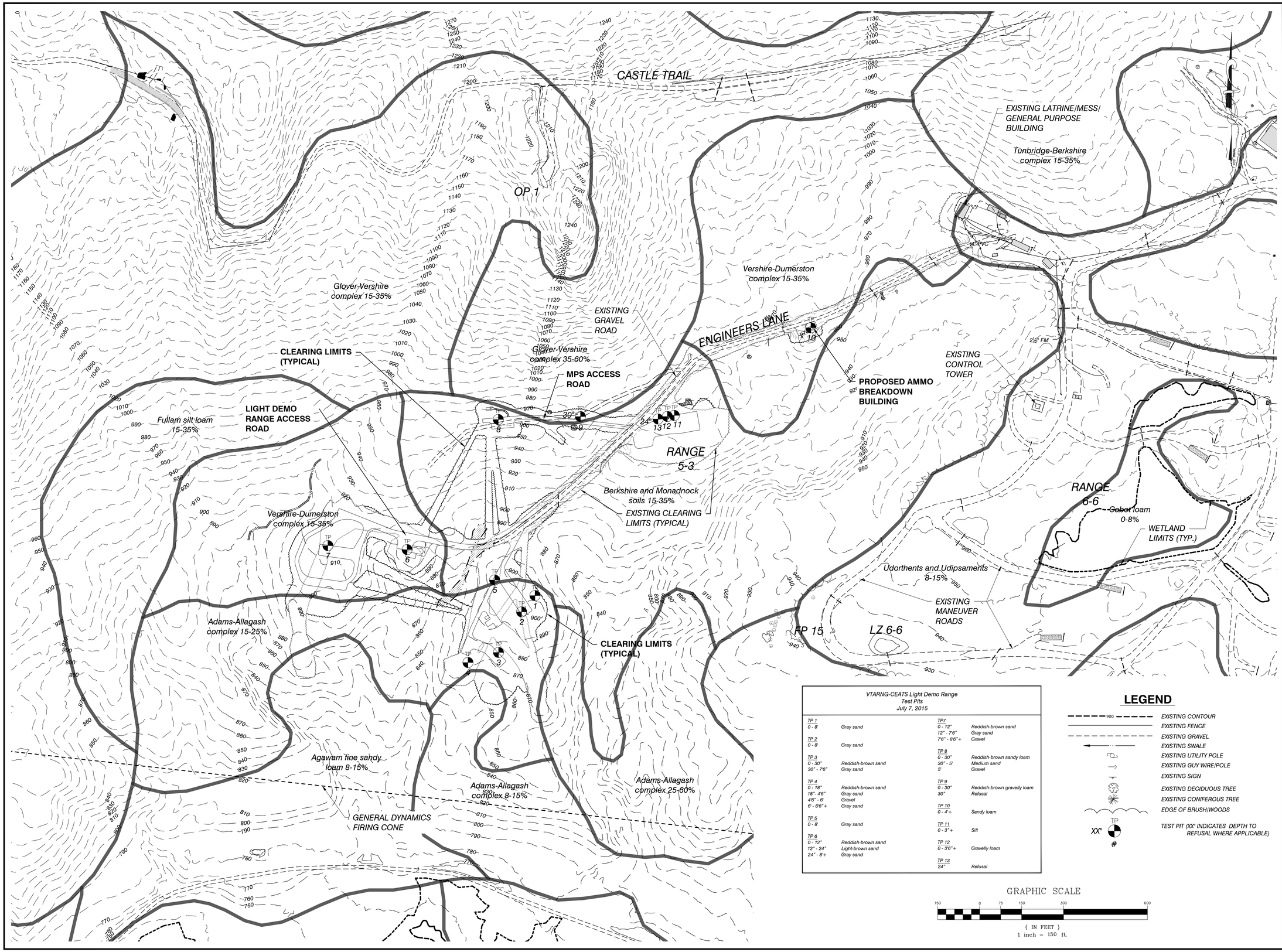
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

OVERALL SITE PLAN

DATE: 3/24/2017
SCALE: 1" = 150'
PROJ. NO. 13100.00
DRAWING NUMBER: C1.0



VTARNG-CEATS Light Demo Range
Test Pits
July 7, 2015

TP 1		TP7	
0 - 8'	Gray sand	0 - 12"	Reddish-brown sand
		12" - 7'6"	Gray sand
TP 2		7'6" - 8'6"+	Gravel
0 - 8'	Gray sand		
		TP 8	
TP 3		0 - 30"	Reddish-brown sandy loam
0 - 30"	Reddish-brown sand	30" - 5'	Medium sand
30" - 7'6"	Gray sand	5'	Gravel
TP 4		TP 9	
0 - 18"	Reddish-brown sand	0 - 30"	Reddish-brown gravelly loam
18"- 4'6"	Gray sand	30"	Refusal
4'6" - 6'	Gravel		
6' - 6'6"+	Gray sand	TP 10	
		0 - 4'+	Sandy loam
TP 5			
0 - 8'	Gray sand	TP 11	
		0 - 3"+	Silt
TP 6			
0 - 12"	Reddish-brown sand	TP 12	
12" - 24"	Light-brown sand	0 - 3'6"+	Gravelly loam
24" - 8'+	Gray sand		
		TP 13	
		24"	Refusal

LEGEND

- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING GRAVEL
- EXISTING SWALE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE/POLE
- EXISTING SIGN
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EDGE OF BRUSH/WOODS
- TEST PIT (XX" INDICATES DEPTH TO REFUSAL WHERE APPLICABLE)

GRAPHIC SCALE

150 0 75 150 300 600

(IN FEET)
1 inch = 150 ft.

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PROJECT:

LIGHT DEMO RANGE

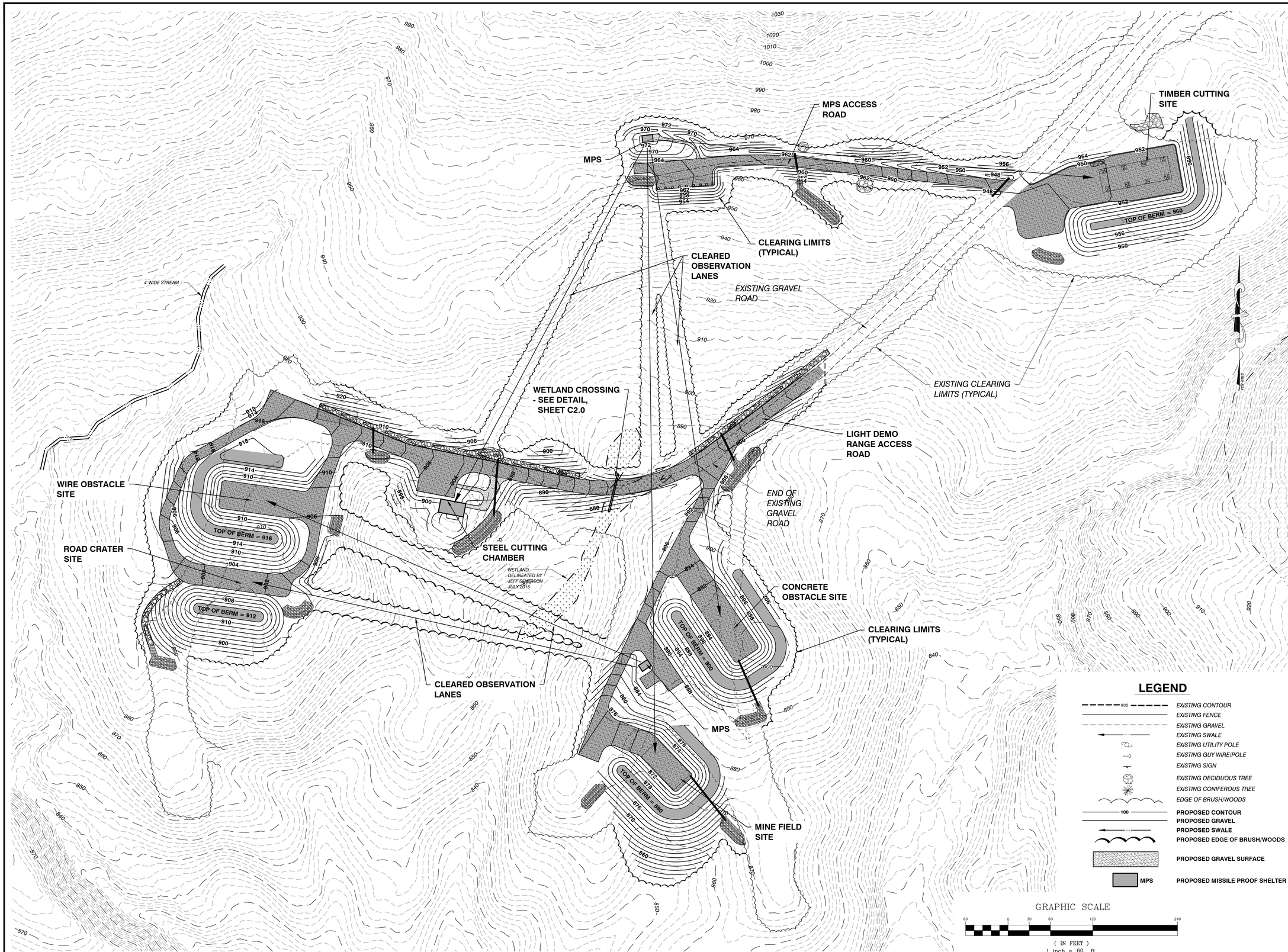
CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

SOILS PLAN

DATE: 3/24/2017
SCALE: 1" = 150'
PROJ. NO. 13100.00

DRAWING NUMBER: C1.1



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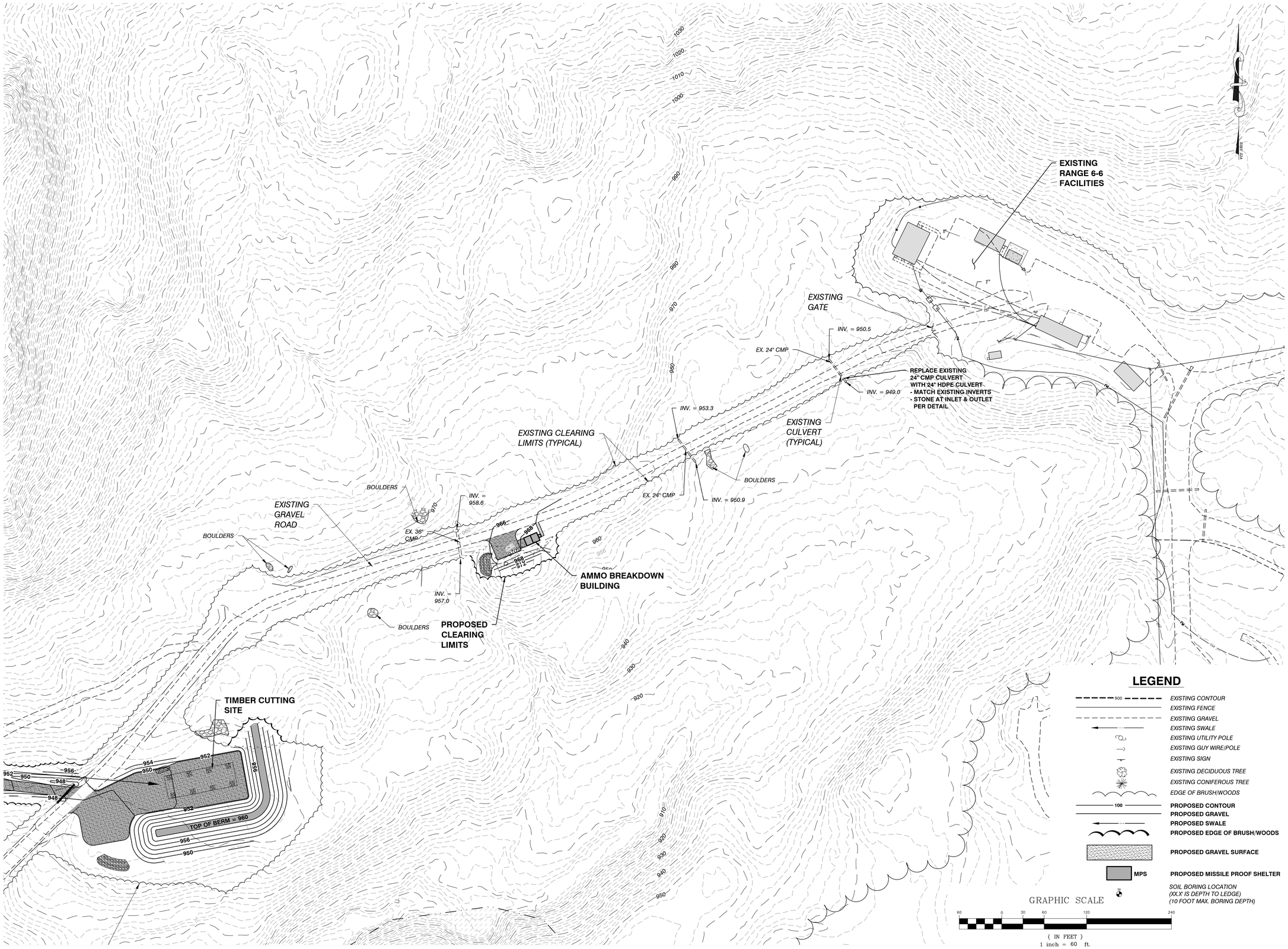
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

OVERALL RANGE PLAN

DATE
3/24/2017
SCALE
1" = 60'
PROJ. NO.
13100.00

DRAWING NUMBER
C1.2



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DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

RANGE ACCESS ROAD PLAN

DATE
3/24/2017
SCALE
1" = 60'
PROJ. NO.
13100.00

DRAWING NUMBER
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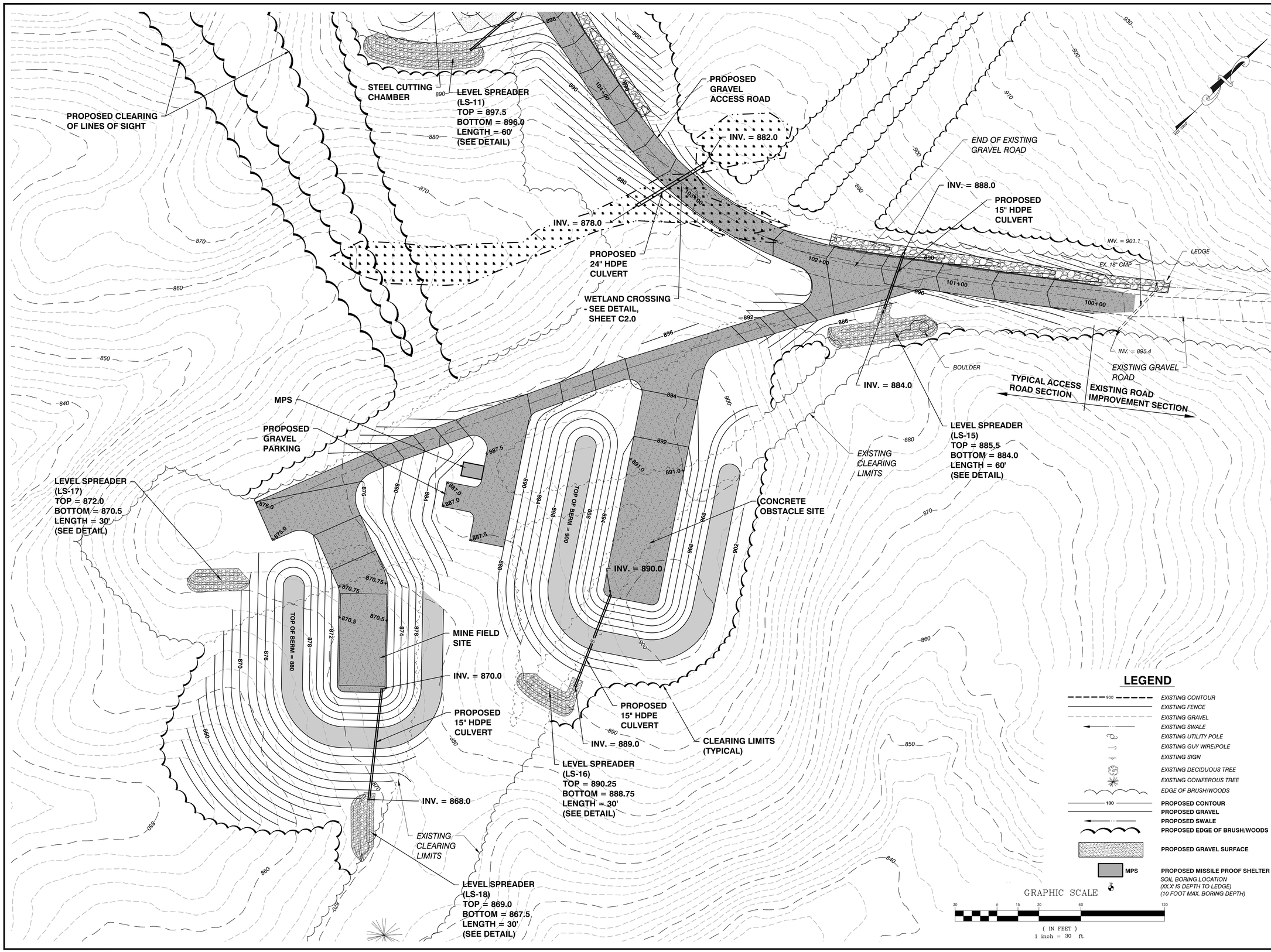

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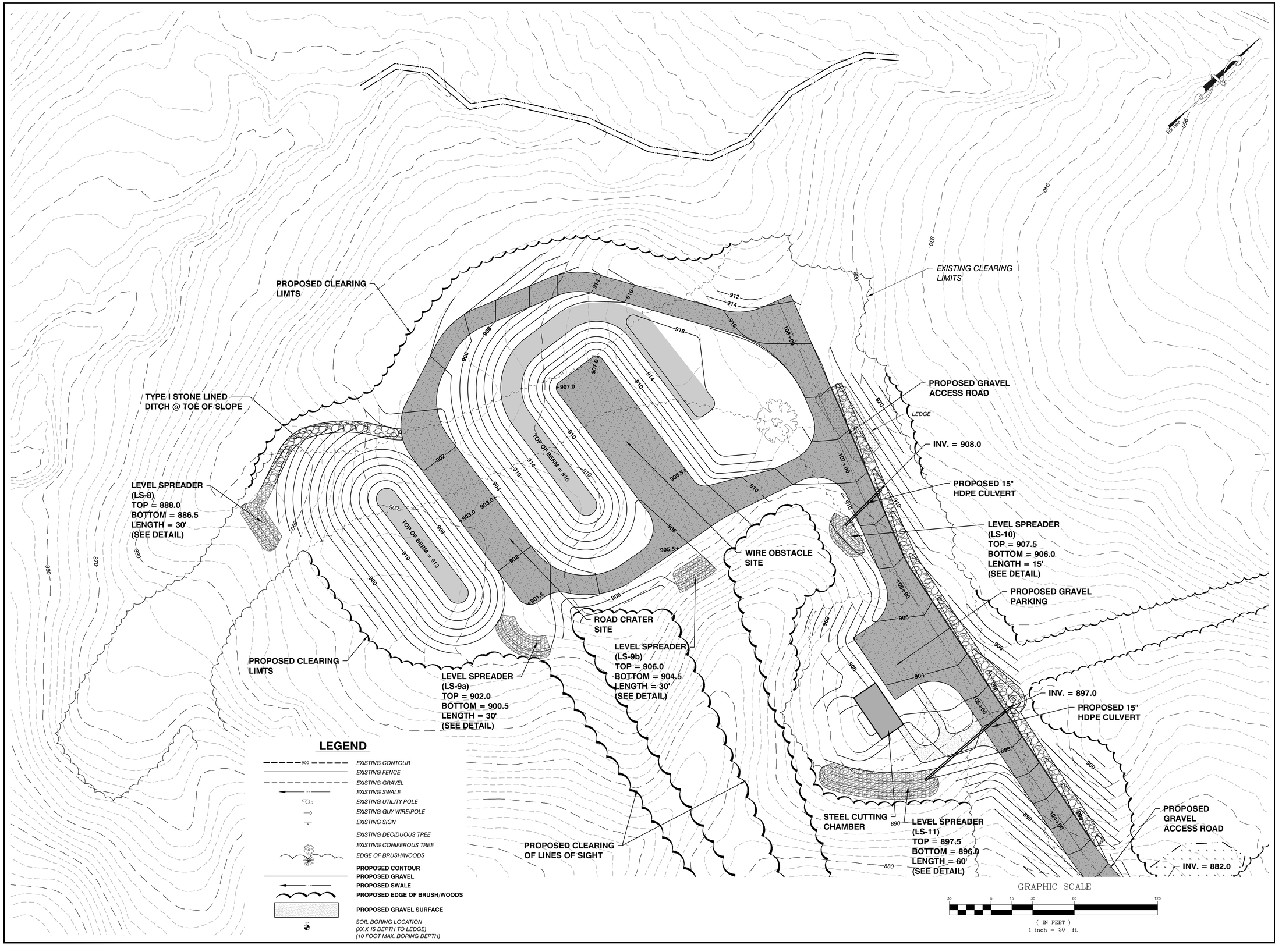
DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

PARTIAL RANGE PLAN

DATE: 3/24/2017
SCALE: 1" = 30'
PROJ. NO. 13100.00

DRAWING NUMBER: C1.4



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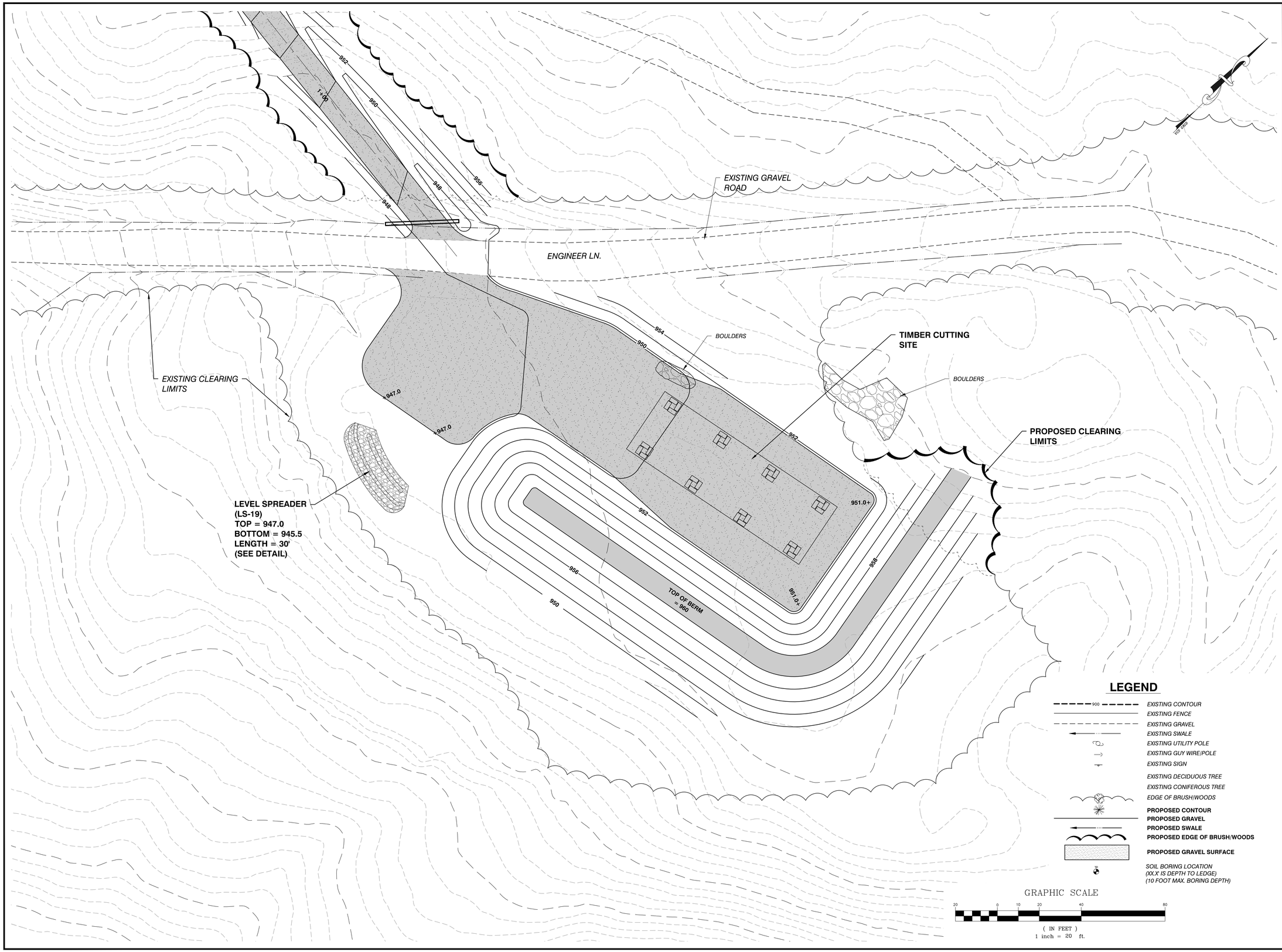
DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

PARTIAL RANGE PLAN

DATE: 3/24/2017
SCALE: 1" = 30'
PROJ. NO. 13100.00
DRAWING NUMBER: C1.5



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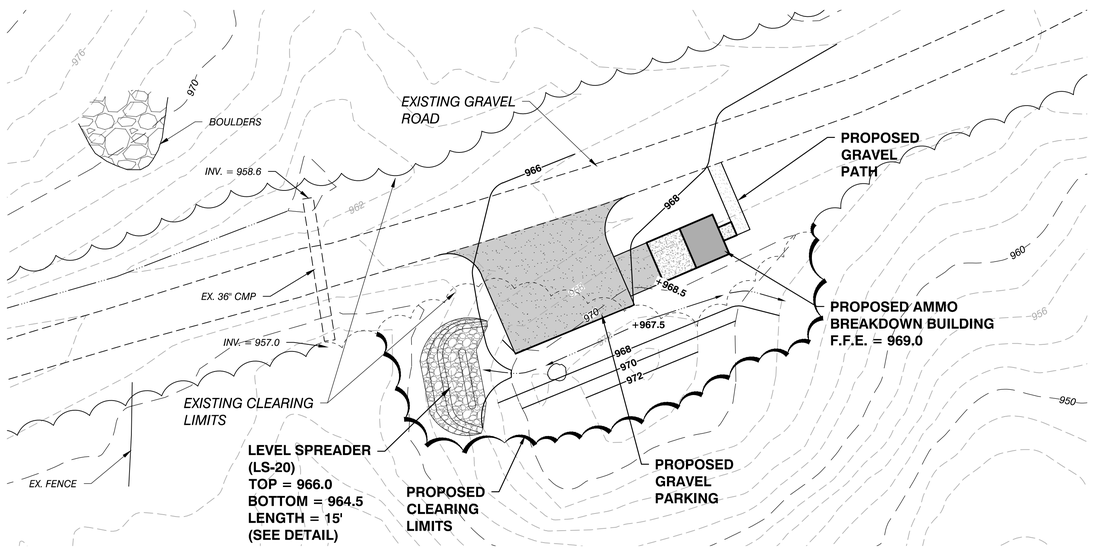
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

PARTIAL RANGE PLAN

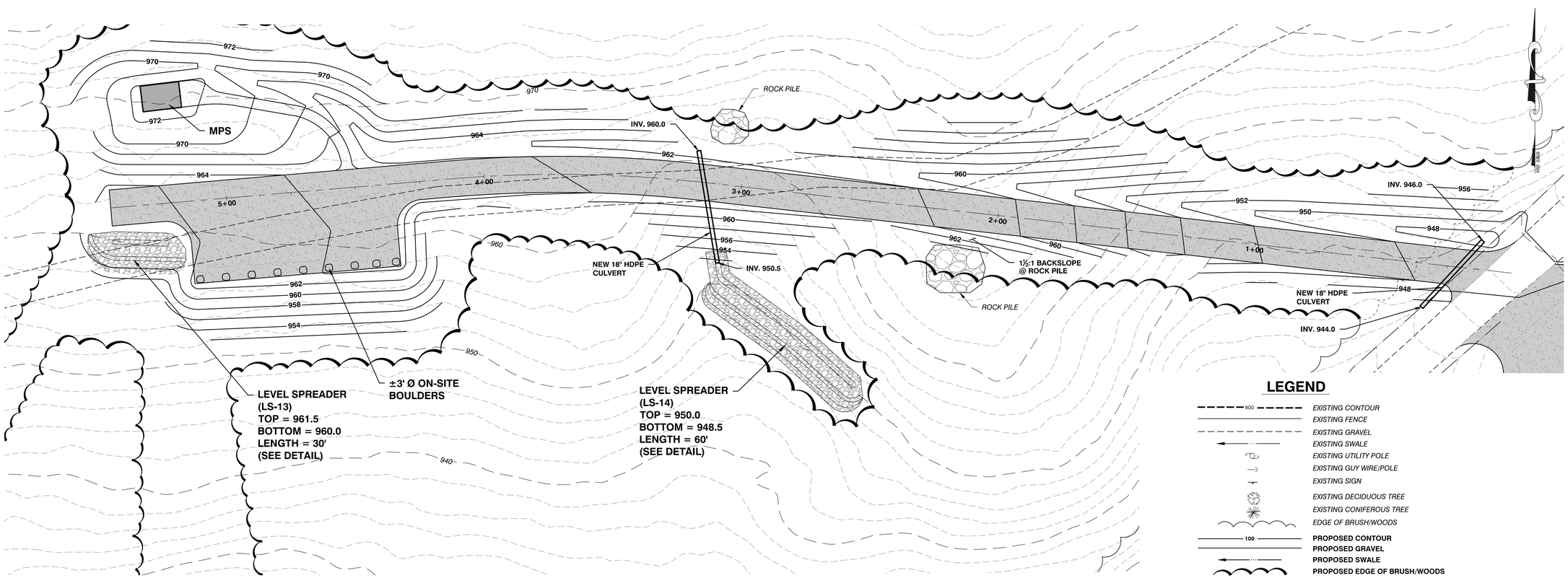
DATE
3/24/2017
SCALE
1" = 20'
PROJ. NO.
13100.00

DRAWING NUMBER
C1.6



AMMO BREAKDOWN BUILDING

SCALE: 1" = 20'



MPS ACCESS ROAD

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

LEGEND

- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING GRAVEL
- EXISTING SWALE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE/POLE
- EXISTING SIGN
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EDGE OF BRUSH/WOODS
- PROPOSED CONTOUR
- PROPOSED GRAVEL
- PROPOSED SWALE
- PROPOSED EDGE OF BRUSH/WOODS
- PROPOSED GRAVEL SURFACE
- MPS — PROPOSED MISSILE PROOF SHELTER
- SOIL BORING LOCATION (XX.X IS DEPTH TO LEDGE) (10 FOOT MAX. BORING DEPTH)

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PROJECT:

LIGHT DEMO RANGE

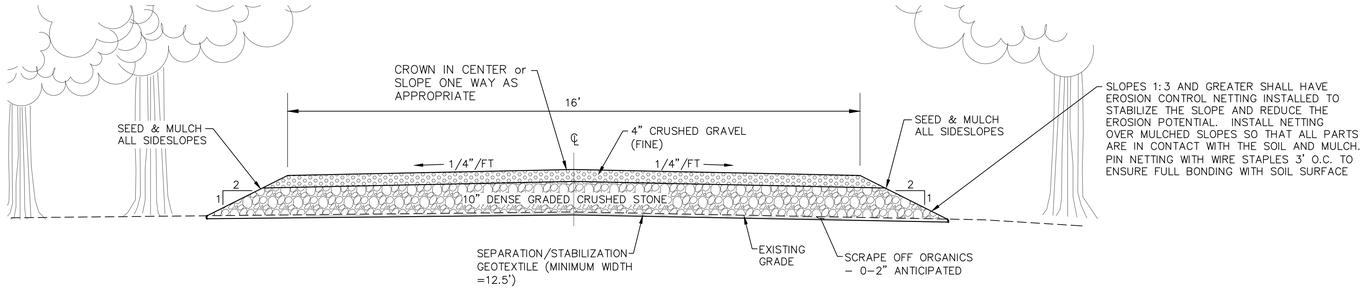
CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

PARTIAL RANGE PLANS

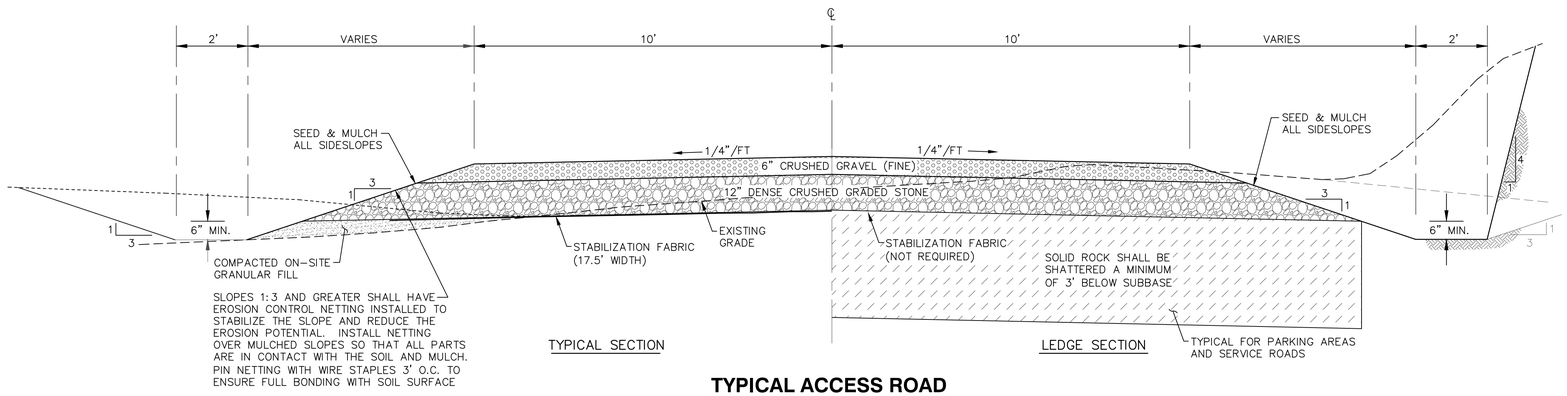
DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO. 13100.00

DRAWING NUMBER: C1.7



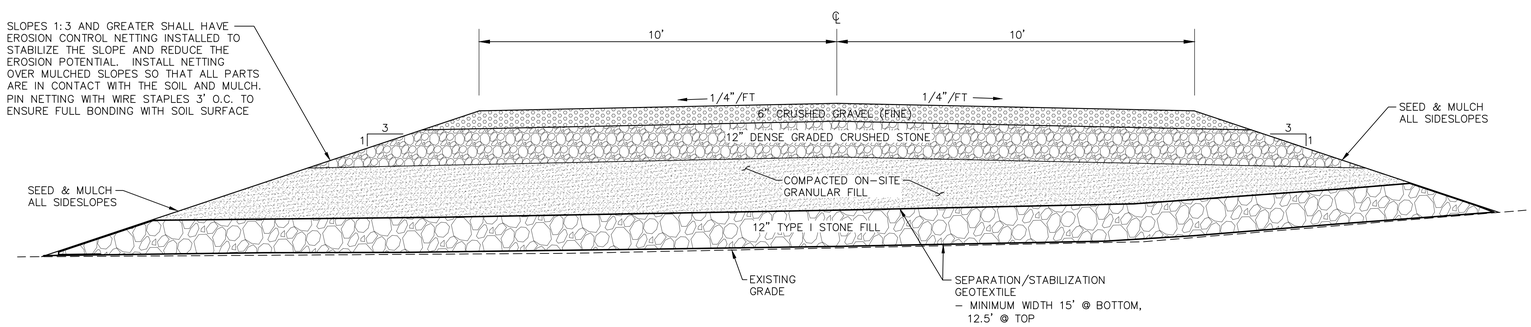
TYPICAL SECTION - EXISTING ROAD IMPROVEMENTS

SCALE: 1/2" = 1'



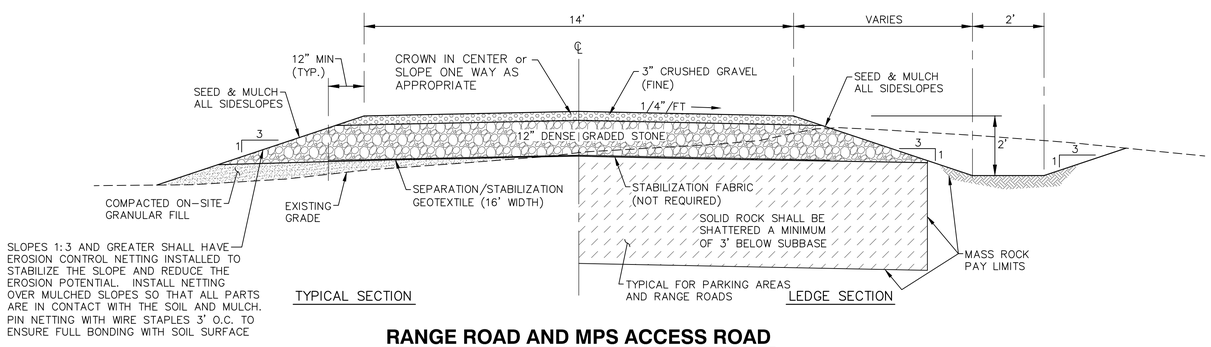
TYPICAL ACCESS ROAD

SCALE: 1/2" = 1'



TYPICAL SECTION -WETLAND CROSSING

SCALE: 1/2" = 1'



RANGE ROAD AND MPS ACCESS ROAD

SCALE: 1/2" = 1'

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PROJECT:

LIGHT DEMO RANGE

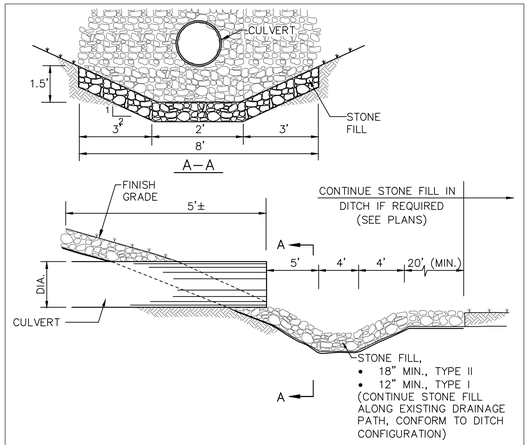
CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

SITE DETAILS

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00

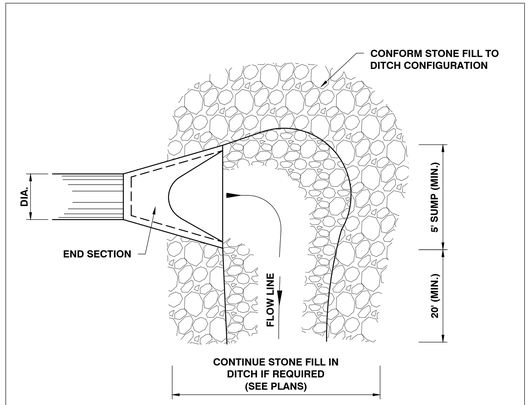
DRAWING NUMBER: C2.0

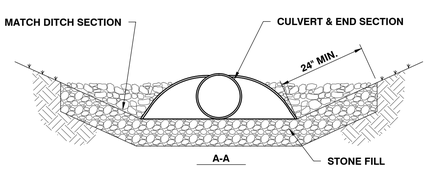


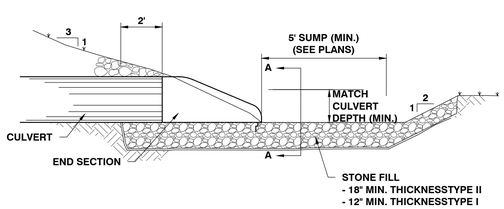
STONE FILL @ CULVERT OUTLET

ALL DRAINAGE PIPE TO HAVE STONE FILL @ CULVERT OUTLETS

N.T.S.





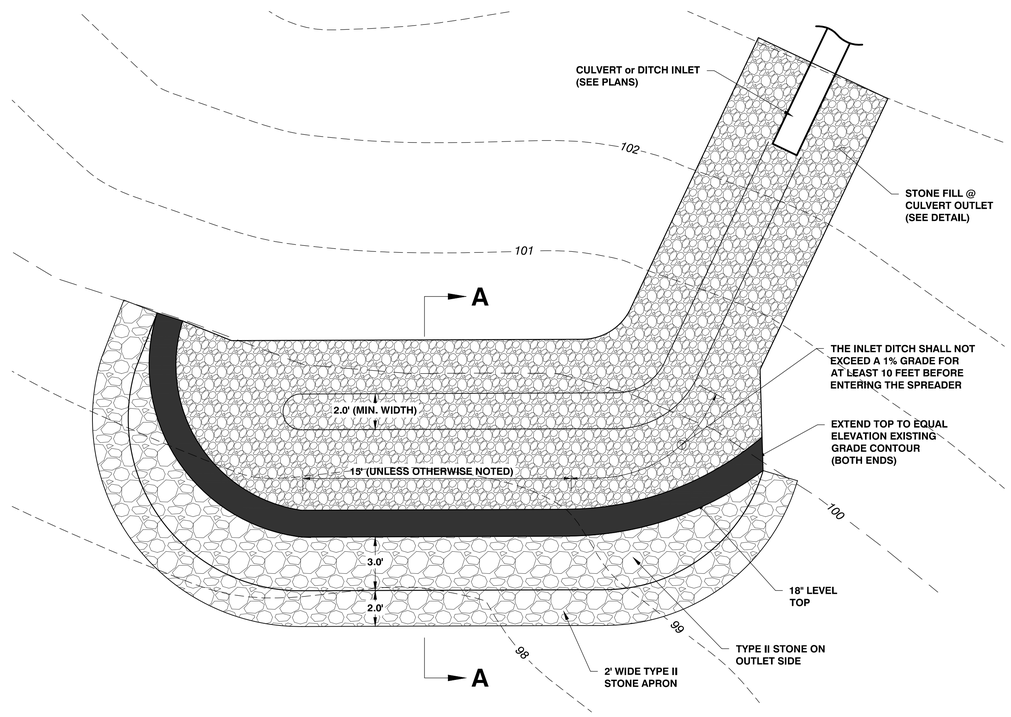


END SECTION DETAIL w/ STONE FILL @ INLET

N.T.S.

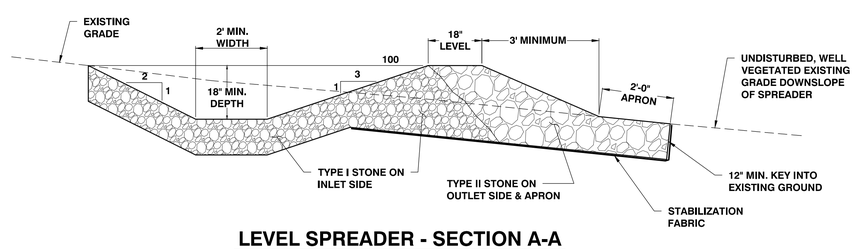
NOTE: ALL DRAINAGE PIPES TO HAVE AN END SECTION & STONE FILL @ THE INLET

ST-015 REVISED 08/11/2015



LEVEL SPREADER - PLAN VIEW

SCALE: 1/4" = 1'



LEVEL SPREADER - SECTION A-A

SCALE: 1/2" = 1'

LEVEL SPREADER NOTES:

1. CONSTRUCT LEVEL LIP TO 0% GRADE TO ENSURE UNIFORM SHEET FLOW. LEVEL SPREADER SHALL BE CONSTRUCTED ON UNDISTURBED SOIL (NOT FILL)
2. THE INLET DITCH SHALL NOT EXCEED A 1% GRADE FOR AT LEAST 10 FEET BEFORE ENTERING THE SPREADER.
3. STORM RUNOFF CONVERTED TO SHEET FLOW ACROSS THE OUTLET APRON SHALL FLOW ONTO STABILIZED AREAS. RUN-OFF SHALL NOT BE CONCENTRATED IMMEDIATELY BELOW THE POINT OF DISCHARGE.
4. CONSTRUCTION OF LEVEL LIP SPREADER SHALL BE FROM UPHILL SIDE ONLY. LEVEL LIP & AREA BELOW SPREADER SHALL BE AT EXISTING GRADES & UNDISTURBED BY EARTHWORK OR EQUIPMENT.
5. CONSTRUCT SPREADER WITH LIP AT EXISTING ELEVATION AS SPECIFIED.
6. DOWNGRADIENT RECEIVING AREA MUST BE NATURALLY WELL VEGETATED. MAINTAIN 20' SEPARATION FROM SPREADER TO TOP OF RECEIVING SWALE.

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JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

SITE DETAILS

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO. 13100.00

DRAWING NUMBER: C2.1

BUILDING BACKFILL

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:
1. Building perimeter and site structure backfilling to subgrade elevations.
2. Fill under slabs on grade.
3. Consolidation and compaction.
4. Fill for over–excavation.

1.02 REFERENCES

A. ANSI/ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates

B. ANSI/ASTM D698 – Test Methods for Moisture–Density Relations of Soils and Soil–Aggregate Mixtures – Using Standard Effort

C. ANSI/ASTM D1557 – Test Methods for Moisture–Density Relations of Soils and Soil–Aggregate Mixtures – Using Modified Effort

1.03 SUBMITTALS

A. Testing laboratory reports indicating that material for backfill under structure meets requirements of this Section.

B. Field density test reports of backfill in place.

PART 2 – PRODUCTS

2.01 FILL MATERIALS

A. Compacted Fill/Granular Borrow – Sand Borrow (Vtrans spec. 703.03)
Granular backfill used as fill against foundation walls outside the foundation. It shall be obtained from approved sources and shall meet the following grading requirements:

Sieve Designation	Percent Finer by Weight
2"	100
1½"	90–100
½"	70–100
No. 4	60–100
No. 100	0–20
No. 200	0–8

B. Granular Backfill (Vtrans spec. 704.08)
Granular backfill used as fill below structural fill and outside the foundation will be well–graded gravel. It shall be obtained from approved sources and shall meet the following grading requirements:

Sieve Designation	Percent Finer by Weight
3"	100
No. 4	45–75
No. 100	0–12
No. 200	0–6

C. Drainage Course (Vtrans spec. 704.16)
Rock for drainage applications shall be produced from natural gravels or crushed quarried rock and shall consist of clean, hard, sound, and durable material. It shall be obtained from approved sources and shall meet the following grading requirements:

Sieve Designation	Percent Finer by Weight
1"	100
¾"	90–100
⅜"	20–55
No. 4	0–10
No. 8	0–10

D. Dense Graded Crushed Stone
Dense Graded Crushed Stone should consist of a well graded crushed run stone and should meet the requirements for Vermont AOT Standard Specifications Item 704.06 Dense Graded Crushed Stone for Subbase and the gradation requirements shown in Table 704.06A of the Vermont AOT Standard Specifications.

Sieve Designation	Percent Finer by Weight
3½"	100
3"	90–100
2"	75–100
1"	50–80
½"	30–60
No. 4	15–40
No. 200	0–6

E. Structural Fill – Crushed Gravel (Vtrans spec. 704.05)
Structural fill used as fill directly under slabs will be well–graded gravel. It shall be obtained from approved sources and shall meet the following grading requirements:

Sieve Designation	Percent Finer by Weight
2"	100
1½"	90–100
No. 4	30–60
No. 100	0–12
No. 200	0–6

2.02 GEOTEXTILE

A. Subsurface Drainage Geotextile: Nonwoven needle–punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 3; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 3; AASHTO M 288.
2. Grab Tensile Strength: 200 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 75 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
9. Weight: 4.0 oz/yd2 minimum.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused are acceptable.
B. Verify underground tanks are anchored to their own foundation to avoid floatation after backfilling.

3.02 PREPARATION

A. Generally, compact subgrade to density requirements for subsequent backfill materials.
B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with crushed gravel fill and compact to density equal to or greater than requirements for subsequent backfill material.
C. Prior to placement of aggregate base course material, compact subsoil to 95 percent of its maximum dry density in accordance with ANSI/ASTM D698

3.03 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
C. Place geotextile fabric as shown in the plans.
D. Granular Backfill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.
E. Employ a placement method that does not disturb or damage foundation perimeter drainage and utilities in trenches.
F. Maintain optimum moisture content of backfill materials to attain required compaction density.
G. Backfill against supported foundation walls: Do not backfill against unsupported foundation walls. No backfill material shall be placed against a newly completed structure until the concrete has been cured for 7 days.
H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
I. Slope grade away from building a minimum of ¼ inch per foot, or as shown in plans, unless noted otherwise.
J. Make grade changes gradual. Blend slope into level areas.

3.04 TOLERANCES

A. Surface of fill under building slabs shall be graded smooth and even, free of voids, compacted as specified, and to the required elevation. Fill shall be final graded to within a tolerance of ½" when tested with a 10' straight edge.

3.05 FIELD QUALITY CONTROL

A. Compaction Requirements: Standard Proctor/ASTM D698 or Modified Proctor/ASTM D1557 (see schedule)
B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.06 SCHEDULE

All backfills to be placed in 8" (Maximum) lifts, compacted as specified below:

Location	Material	% Compaction	Proctor
Under Footings	Undisturbed Native Material or: Drainage Stone	--	--
Interior Slab–on–Grade	Drainage Stone	--	--
Interior, Adjacent to Foundation Walls	Structural Fill or Granular Backfill	95%	D1557
Exterior, Adjacent to Foundation Walls	Granular Backfill: or Compacted Fill / Granular Borrow	95%	D698

A. Testing Agency: Contractor will engage a qualified independent engineering testing agency to perform field quality control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design–bearing capacities in accordance with Geotechnical Report. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

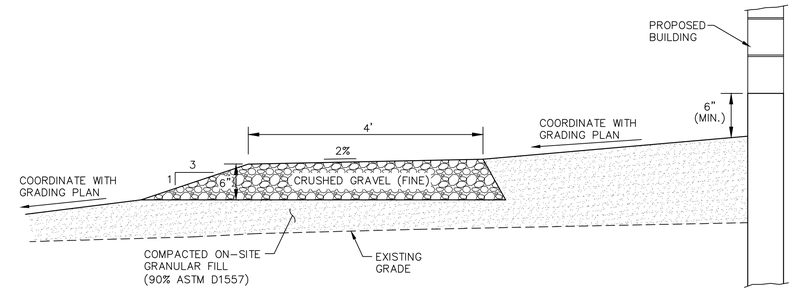
D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable, Tests will be performed at the following location and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 200 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests per lift.

2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests per lift.

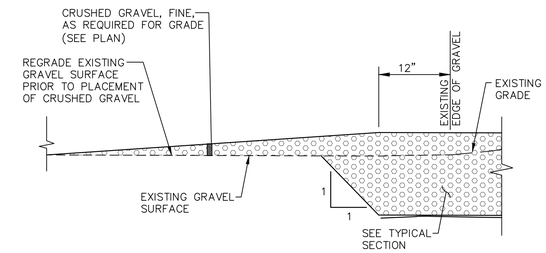
3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer tan 2 tests per lift.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.



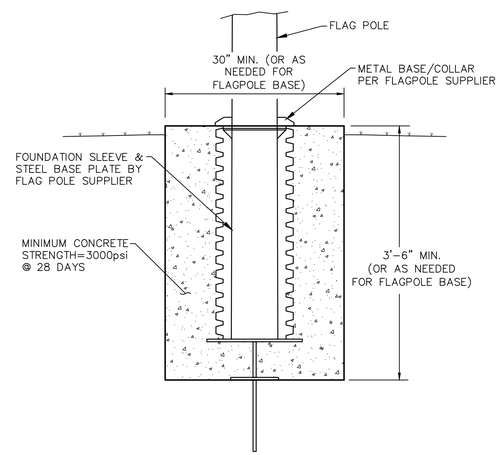
TYPICAL PATH SECTION

N.T.S.



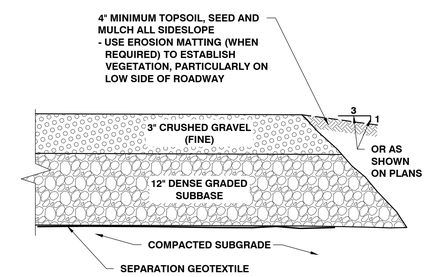
TRANSITION FROM EXISTING GRAVEL @ IMPROVEMENT AREAS

N.T.S.



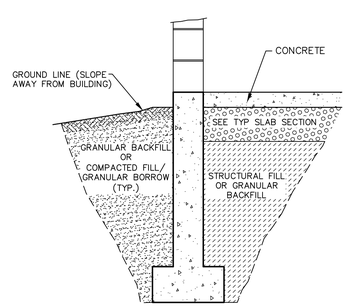
FLAGPOLE BASE DETAIL

(INSTALL PER MANUFACTURERS RECOMMENDATIONS) NTS



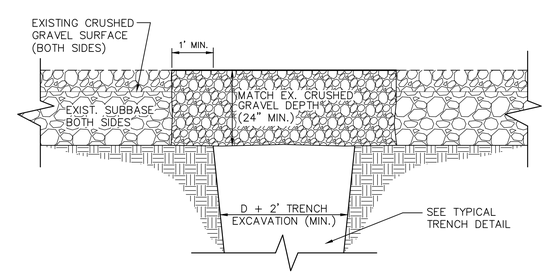
TYPICAL ACCESS/PARKING SECTION

N.T.S.



TYPICAL FOUNDATION BACKFILL SECTION

N.T.S.



GRAVEL ROAD REPAIR SECTION

NTS

NOTES:
1. ALL BACKFILL SHALL BE MADE IN SIX (6") LIFTS AND COMPACTED TO NOT LESS THAN 95% MAXIMUM DRY DENSITY ACCORDING TO ASTM D698.
2. CRUSHED GRAVEL SHALL MEET VTRANS SPECIFICATION FOR CRUSHED GEARVEL – FINE, 704.05A.

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CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
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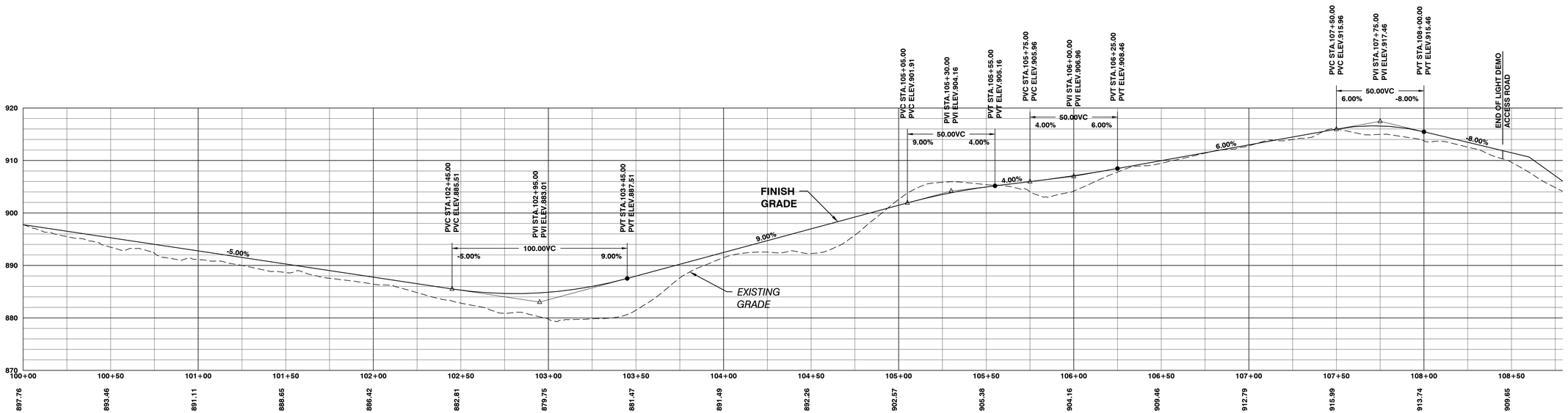
SITE DETAILS

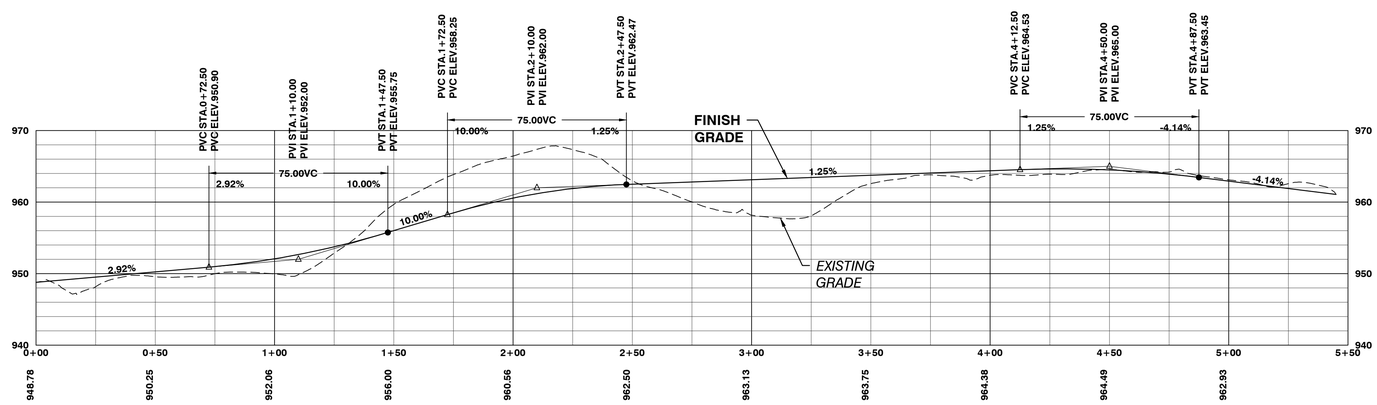
DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO. 13100.00

DRAWING NUMBER: C2.2



LIGHT DEMO ACCESS ROAD

HORIZONTAL SCALE 1" = 30'
VERTICAL SCALE 1" = 10'



MPS ACCESS ROAD

HORIZONTAL SCALE 1" = 30'
VERTICAL SCALE 1" = 10'

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TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

PROFILES

DATE
3/24/2017
SCALE
AS SHOWN
PROJ. NO.
13100.00

DRAWING NUMBER
C3.0

STONE CHECK DAM (TYPICAL LOCATIONS SHOWN, INSTALL AS REQUIRED BASED ON SITE/WEATHER CONDITIONS DURING CONSTRUCTION)

MPS ACCESS ROAD

TIMBER CUTTING SITE

MPS

CLEARING LIMITS (TYPICAL)

CLEARED OBSERVATION LANES

INSTALL STONE LINED DITCH AS SHOWN ON PLANS (TYPICAL FOR SLOPES 5% AND GREATER)

4' WIDE STREAM

EXISTING GRAVEL ROAD

INSTALL EROSION CONTROL MATTING ON BERM SLOPES AND DITCHES AS NEEDED (TYPICAL)

STONE CHECK DAM (TYPICAL LOCATIONS SHOWN, INSTALL AS REQUIRED BASED ON SITE/WEATHER CONDITIONS DURING CONSTRUCTION)

WETLAND CROSSING - SEE DETAIL, SHEET C2.0

EXISTING CLEARING LIMITS (TYPICAL)

LIGHT DEMO RANGE ACCESS ROAD

WIRE OBSTACLE SITE

END OF EXISTING GRAVEL ROAD

ROAD CRATER SITE

STEEL CUTTING CHAMBER

CONCRETE OBSTACLE SITE

CLEARING LIMITS (TYPICAL)

CLEARED OBSERVATION LANES

MPS

SILT FENCE TO BE INSTALLED PRIOR TO SOIL DISTURBANCE IN UPHILL AREAS. CONCEPTUAL LOCATIONS SHOWN, SILT FENCE TO BE INSTALLED AS REQUIRED BASED ON SITE/WEATHER CONDITIONS DURING CONSTRUCTION

MINE FIELD SITE

INSTALL EROSION CONTROL MATTING ON BERM SLOPES AND DITCHES AS NEEDED (TYPICAL)

TOP OF BERM = 960

TOP OF BERM = 916

TOP OF BERM = 912

TOP OF BERM = 900

TOP OF BERM = 880

TOS ELEV.

LEGEND

- EXISTING CONTOUR
- EXISTING FENCE
- EXISTING GRAVEL
- EXISTING SWALE
- EXISTING UTILITY POLE
- EXISTING GUY WIRE/POLE
- EXISTING SIGN
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EDGE OF BRUSH/WOODS
- PROPOSED CONTOUR
- PROPOSED GRAVEL
- PROPOSED SWALE
- PROPOSED EDGE OF BRUSH/WOODS
- PROPOSED GRAVEL SURFACE
- MPS — PROPOSED MISSILE PROOF SHELTER

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

EROSION CONTROL NOTES

1. SILT FENCE TO BE INSTALLED WHERE SHOWN PRIOR TO SOIL DISTURBANCE IN UPHILL AREAS.
2. EROSION CONTROL MEASURES SHOWN ON PLANS ARE CONCEPTUAL. ADDITIONAL MEASURES MAY BE NECESSARY BASED ON SITE/WEATHER CONDITIONS DURING CONSTRUCTION.
3. PROVIDE EROSION CONTROL MEASURES AT AMMO BREAKDOWN BUILDING AND LOCATIONS CHOSEN FOR STUMP DUMP AND BORROW AREAS.

EROSION CONTROL LEGEND

- SILT FENCE
- EROSION MATTING
- STONE LINED DITCH
- STONE CHECK DAM

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EROSION CONTROL PLAN

DATE: 3/24/2017
SCALE: 1" = 60'
PROJ. NO. 13100.00

DRAWING NUMBER: C4.0

Introduction

The work under this section includes but is not limited to providing all labor, equipment and materials for the installation of all required site related erosion control measures. If not otherwise directed on the plans, erosion control shall be in strict conformity with the latest revision of the "Low Risk Site Handbook for Erosion Prevention and Sediment Control " available from the VT DEC Stormwater Section.

This project is being constructed on federally owned land. The EPA construction general permit (GCP) will provide coverage for construction related activities inclusive of erosion and sediment control and stormwater pollution prevention. The contractor shall be responsible for designating a Storm Water Pollution Prevention Plan (SWPPP) Operator and filing the electronic Notice of Intent Form (NOI) with the EPA at least 14 days prior to start of construction. NOI forms at: http://cfpub.epa.gov/npdes/stormwater/cgpenoi.cfm

The following narrative and implementation requirements represent the minimum standard for which this site is required to be maintained as regulated by the State of Vermont.

Any best management practices (BMP's) depicted on the project's EPSC Site plan which go beyond the Handbook requirements are considered to be integral to the management of the site and represent components of the municipal EPSC approval for the project which shall be implemented.

The EPSC plan depicts one snap shot in time of the site. All construction sites are fluid in their day to day exposures and risks as it relates to minimizing sediment loss from the site. **It is the responsibility of the Contractor to implement the necessary BMP's to comply with the Low Risk Handbook standards outlined on this sheet based on the interim site disturbance conditions which may or may not be shown on the EPSC Site Plan.**

1. Mark Site Boundaries

Purpose:
Mark the site boundaries to identify the limits of construction. Delineating your site will help to limit the area of disturbance, preserve existing vegetation and limit erosion potential on the site.

How to comply:
Before beginning construction, walk the site boundaries and flag trees, post signs, or install orange safety fence. Fence is required on any boundary within 50 feet of a stream, lake, pond or wetland, unless the area is already developed (existing roads, buildings, etc.)

2. Limit Disturbance Area

Purpose:
Limit the amount of soil exposed at one time to reduce the potential erosion on site.

Requirements:
The permitted disturbance area is specified on the site's written authorization to discharge. Only the acreage listed on the authorization form may be exposed at any given time.

How to comply:
Plan ahead and phase the construction activities to ensure that no more than the permitted acreage is disturbed at one time. Be sure to properly stabilize exposed soil with seed and mulch or erosion control matting before beginning work in a new section of the site.

3. Stabilize Construction Entrance

Purpose:
A stabilized construction entrance helps remove mud from vehicle wheels to prevent tracking onto streets.

Requirements:
If there will be any vehicle traffic off of the construction site, you must install a stabilized construction entrance before construction begins.

How to install
Rock Size: Use a mix of 1 to 4 inch stone
Depth: 8 inches minimum
Width: 12 feet minimum
Length: 40 feet minimum (or length of driveway, if shorter)
Geotextile: Place filter cloth under entire gravel bed

Maintenance:
Redress with clean stone as required to keep sediment from tracking onto the street.

4. Install Silt Fence

Purpose:
Silt fences intercept runoff and allow suspended sediment to settle out.

Requirements:
Silt fence must be installed:
- on the downhill side of the construction activities
- between any ditch, swale, storm sewer inlet, or waters of the State and the disturbed soil

** Hay bales must not be used as sediment barriers due to their tendency to degrade and fall apart.*

Where to place:
- Place silt fence on the downhill edge of bare soil. At the bottom of slopes, place fence 10 feet downhill from the end of the slope (if space is available).
- Ensure the silt fence catches all runoff from bare soil.
- Maximum drainage area is ¼ acre for 100 feet of silt fence.
- Install silt fence across the slope (not up and down hills!)
- Install multiple rows of silt fence on long hills to break up flow.
- Do not install silt fence across ditches, channels, or streams or in stream buffers.

How to install silt fence:
- Dig a trench 6 inches deep across the slope
- Unroll silt fence along the trench
- Ensure stakes are on the downhill side of the fence
- Join fencing by rolling the end stakes together
- Drive stakes in against downhill side of trench
- Drive stakes until 16 inches of fabric is in trench
- Push fabric into trench; spread along bottom
- Fill trench with soil and pack down

Maintenance:
- Remove accumulated sediment before it is halfway up the fence.
- Ensure that silt fence is trenched in ground and there are no gaps.

5. Divert Upland Runoff

Purpose:
Diversion berms intercept runoff from above the construction site and direct it around the disturbed area. This prevents clean water from becoming muddied with soil from the construction site.

Requirements:
If storm water runs onto your site from upslope areas and your site meets the following two conditions, you must install a diversion berm before disturbing any soil.
1. You plan to have one or more acres of soil exposed at any one time (excluding roads).
2. Average slope of the disturbed area is 20% or steeper.

How to install:
1. Compact the berm with a shovel or earth-moving equipment.
2. Seed and mulch berm or cover with erosion control matting immediately after installation.
3. Stabilize the flow channel with seed and straw mulch or erosion control matting. Line the channel with 4 inch stone if the channel slope is greater than 20%.
4. Ensure the berm drains to an outlet stabilized with riprap. Ensure that there is no erosion at the outlet.
5. The diversion berm shall remain in place until the disturbed areas are completely stabilized.

6. Slow Down Channelized Runoff

Purpose:
Stone check dams reduce erosion in drainage channels by slowing down the storm water flow.

Requirements:
If there is a concentrated flow (e.g. in a ditch or channel) of storm water on your site, then you must install stone check dams. Hay bales must not be used as check dams.

How to install:
Height: No greater than 2 feet. Center of dam should be 9 inches lower than the side elevation
Side slopes: 2:1 or flatter
Stone size: Use a mixture of 2 to 9 inch stone
Width: Dams should span the width of the channel and extend up the sides of the banks
Spacing: Space the dams so that the bottom (toe) of the upstream dam is at the elevation of the top (crest) of the downstream dam. This spacing is equal to the height of the check dam divided by the channel slope.
Spacing (in feet) = Height of check dam (in feet)/Slope in channel (ft/ft)

Maintenance:
Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam. If significant erosion occurs between check dams, a liner of stone should be installed.

7. Construct Permanent Controls

Purpose:
Permanent storm water treatment practices are constructed to maintain water quality, ensure groundwater flows, and prevent downstream flooding. Practices include detention ponds and wetlands, infiltration basins, and storm water filters.

Requirements:
If the total impervious* area on your site, or within the common plan of development, will be 1 or more acres, you must apply for a State Storm water Discharge Permit and construct permanent storm water treatment practices on your site. These practices must be installed before the construction of any impervious surfaces.

How to comply:
Contact the Vermont Storm water Program and follow the requirements in the Vermont Storm water Management Manual. The Storm water Management Manual is available at:
www.vtwaterquality.org/stormwater.htm
*An impervious surface is a manmade surface, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways, and walkways, from which precipitation runs off rather than infiltrates.

8. Stabilize Exposed Soil

Purpose:
Seeding and mulching, applying erosion control matting, and hydroseeding are all methods to stabilize exposed soil. Mulches and matting protect the soil surface while grass is establishing.

Requirements:
All areas of disturbance must have temporary or permanent stabilization within 7, 14, or 21 days of initial disturbance, as stated in the project authorization. After this time, any disturbance in the area must be stabilized at the end of each work day.

The following exceptions apply:

- Stabilization is not required if earthwork is to continue in the area within the next 24 hours and there is no precipitation forecast for the next 24 hours.
- Stabilization is not required if the work is occurring in a self-contained excavation (i.e. no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation, utility trenches).

All areas of disturbance must have permanent stabilization within 48 hours of reaching final grade.

How to comply:
Prepare bare soil for seeding by grading the top 3 to 6 inches of soil and removing any large rocks or debris.

Seeding Rates for Temporary Stabilization
April 15 - Sept. 15 --- Ryegrass (annual or perennial: 20 lbs/acre)
Sept. 15 - April 15 --- Winter rye: 120 lbs/acre

Seeding Rates for Final Stabilization:Choose

Seeding Rates for Final Stabilization:			
Choose from:	Variety	lbs./acre	lbs./1000 sq.ft.
Birds foot trefoil	Empire/Pardee	51	0.1
or			
Common white clover	Common	8	0.2
plus			
Tall Fescue	KY-31/Rebel	10	0.25
plus			
Redtop	Common	2	
or			
Ryegrass (perennial)	Pennfine/Linn	5	0.1
1- Mix2.5 each of Empire and Pardee OR 2.5 lbs. of Birdsfoot and 2.5 lbs. white clover per acre			

Mulching Rates
April 15 - Sept.15 -- Hay or Straw: 1 inch deep (1-2 bales/1000 s.f.)
Sept.15 - April 15 -- Hay or Straw: 2 in. deep (2-4 bales/1000 s.f.)

Erosion Control Matting
As per manufacturer's instructions

Hydroseed
As per manufacturer's instructions

9. Winter Stabilization

Purpose:
Managing construction sites to minimize erosion and prevent sediment loading of waters is a year-round challenge. In Vermont, this challenge becomes even greater during the late fall, winter, and early spring months.
'Winter construction' as discussed here, describes the period between October 15 and April 15, when erosion prevention and sediment control is significantly more difficult.
Rains in late fall, thaws throughout the winter, and spring melt and rains can produce significant flows over frozen and saturated ground, greatly increasing the potential for erosion.

Requirements for Winter Shutdown:
For those projects that will complete earth disturbance activities prior to the winter period (October 15), the following requirements must be adhered to:
1. For areas to be stabilized by vegetation, seeding shall be completed no later than September 15 to ensure adequate growth and cover.
2. If seeding is not completed by September 15, additional non-vegetative protection must be used to stabilize the site for the winter period. This includes use of Erosion Control Matting or netting of a heavy mulch layer. Seeding with winter rye is recommended to allow for early germination during wet spring conditions.
3. Where mulch is specified, apply roughly 2 inches with an 80-90% cover. Mulch should be tracked in or stabilized with netting in open areas vulnerable to wind.

Requirements for Winter Construction
If construction activities involving earth disturbance continue past October 15 or begin before April 15, the following requirements must be adhered to:
1. Enlarged access points, stabilized to provide for snow stockpiling.
2. Limits of disturbance moved or replaced to reflect boundary of winter work.
3. A snow management plan prepared with adequate storage and control of meltwater, requiring cleared snow to be stored down slope of all areas of disturbance and out of storm water treatment structures.
4. A minimum 25 foot buffer shall be maintained from perimeter controls such as silt fence.
5. In areas of disturbance that drain to a water body within 100 feet, two rows of silt fence must be installed along the contour.
6. Drainage structures must be kept open and free of snow and ice dams.
7. Silt fence and other practices requiring earth disturbance must be installed ahead of frozen ground.
8. Mulch used for temporary stabilization must be applied at double the standard rate, or a minimum of 3 inches with an 80-90% cover.
9. To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
   - If no precipitation within 24 hours is forecast and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
   - Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches.
10. Prior to stabilization, snow or ice must be removed to less than 1 inch thickness.
11. Use stone to stabilize areas such as the perimeter of buildings under construction or where construction vehicle traffic is anticipated. Stone paths should be 10 to 20 feet wide to accommodate vehicular traffic.

10. Stabilize Soil at Final Grade

Purpose:
Stabilizing the site with seed and mulch or erosion control matting when it reaches final grade is the best way to prevent erosion while construction continues.

Requirements:
Within 48 hours of final grading, the exposed soil must be seeded and mulched or covered with erosion control matting.

How to comply:
Bring the site or sections of the site to final grade as soon as possible after construction is completed. This will reduce the need for additional sediment and erosion control measures and will reduce the total disturbed area.
For seeding and mulching rates, follow the specifications under Rule 8, Stabilizing Exposed Soil.

11. Dewatering Activities

Purpose:
Treat water pumped from dewatering activities so that it is clear when leaving the construction site.

Requirements:
Water from dewatering activities that flows off of the construction site must be clear. Water must not be pumped into storm sewers, lakes, or wetlands unless the water is clear.

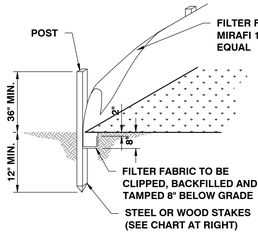
How to comply:
Using sock filters or sediment filter bags on dewatering discharge hoses or pipes, discharge water into silt fence enclosures installed in vegetated areas away from waterways. Remove accumulated sediment after the water has dispersed and stabilize the area with seed and mulch.

12. Inspect Your Site

Purpose:
Perform site inspections to ensure that all sediment and erosion control practices are functioning properly. Regular inspections and maintenance of practices will help to reduce costs and protect water quality.

Requirements:
Inspect the site at least once every 7 days and after every rainfall or snow melt that results in a discharge from the site. Perform maintenance to ensure that practices are functioning according to the specifications outlined in this handbook.

In the event of a noticeable sediment discharge from the construction site, you must take immediate action to inspect and maintain existing erosion prevention and sediment control practices. Any visibly discolored storm water runoff to waters of the State must be reported. Forms for reporting discharges are available at:
www.vtwaterquality.org/stormwater.htm



POST SPACING	
2½ X 2½ WOOD	2.5'
METAL POST	10'
4 x 4 WOOD	10'

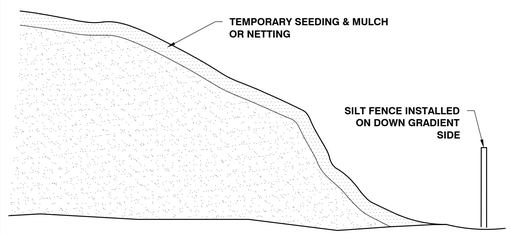
NOTES:

1. INSTALL MIRIFI ENVIROFENCE, OR APPROVED EQUAL OR AS DETAILED HEREIN.
2. INSTALL SILT FENCES AT TOES OF ALL UNPROTECTED SLOPES AND AS PARALLEL TO CONTOURS AS POSSIBLE. THIS INCLUDES ALL FILLED OR UNPROTECTED SLOPES CREATED DURING CONSTRUCTION, NOT NECESSARILY REFLECTED ON THE FINAL PLANS. CURVE THE ENDS OF THE FENCE UP INTO THE SLOPE. REMOVE SEDIMENT WHEN ACCUMULATED TO HALF THE HEIGHT OF THE FENCE. SILT FENCES ARE TO BE MAINTAINED UNTIL SLOPES ARE STABILIZED.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6", FOLDED AND STAPLED.

SILT FENCE DETAIL

N.T.S.

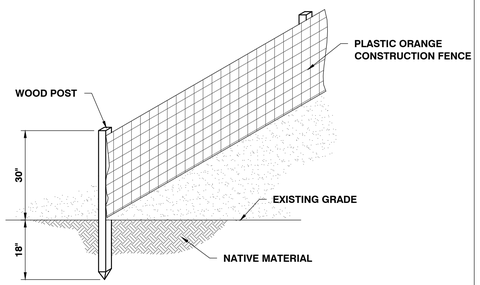
E-003 REVISED 08/01/2014



TEMPORARY STOCKPILE DETAIL

N.T.S.

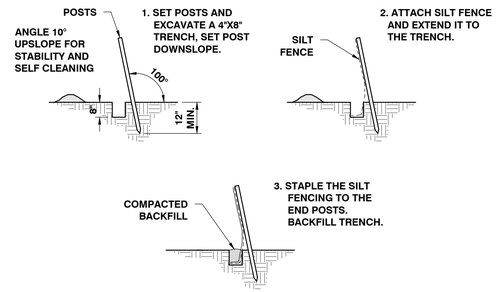
E-005 REVISED 01/08/2015



CONSTRUCTION FENCE DETAIL

N.T.S.

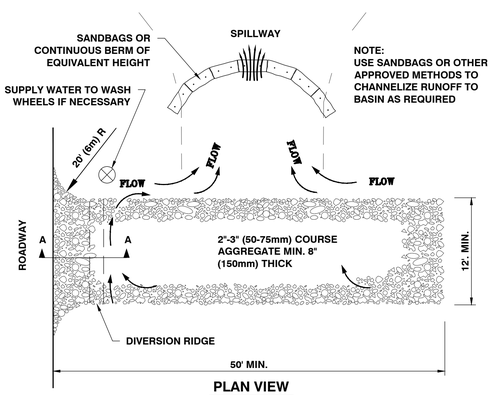
E-002 REVISED 08/01/2014



SILT FENCE CONSTRUCTION DETAIL

N.T.S.

E-007 REVISED 08/01/2014



PLAN VIEW

SECTION A-A

NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

STABILIZED CONSTRUCTION ENTRANCE

N.T.S.

E-004 REVISED 08/01/2014

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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DRAWN: PJM
CHECKED: BCE
APPROVED: BCE

OWNER:

STATE OF VERMONT

VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

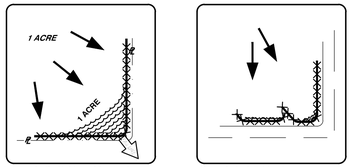
LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

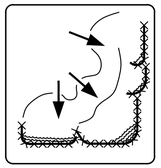
EROSION CONTROL NOTES and DETAILS

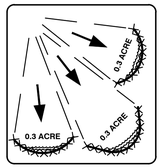
DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: C4.1



Incorrect - Do Not layout "perimeter control" silt fences along property lines. All sediment laden runoff will concentrate and overwhelm the system.

Correct - Install J-hooks



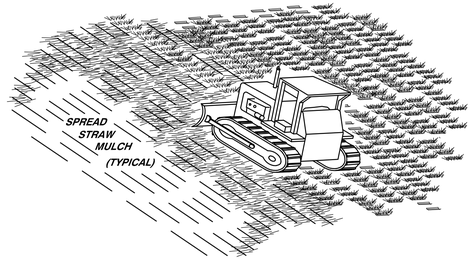


Discreet segments of silt fence, installed with J-hooks or 'smiles' will be much more effective.

SILT FENCE PLACEMENT FOR PERIMETER CONTROL

N.T.S.

E-010 REVISED 12/19/2014



'TRACKING' WITH MACHINERY ON SANDY SOIL PROVIDES ROUGHENING WITHOUT UNDUE COMPACTION.

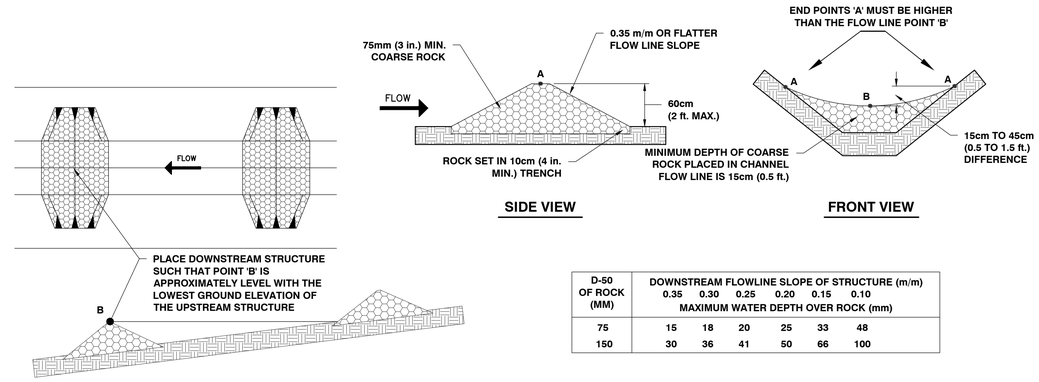
NOTES:

1. ROUGHEN SLOPE WITH BULLDOZER.
2. BROADCAST SEED AND FERTILIZER.
3. SPREAD STRAW MULCH 3" (2½ TONS PER ACRE)
4. PUNCH STRAW MULCH INTO SLOPE BY RUNNING BULLDOZER UP AND DOWN SLOPE.

STRAW ANCHORING

N.T.S.

E-012 REVISED 12/19/2014

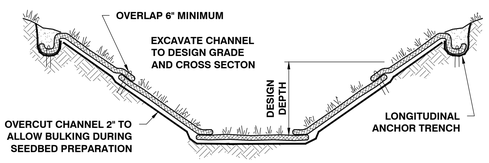


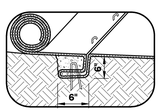
D-50 OF ROCK (MM)	DOWNSTREAM FLOWLINE SLOPE OF STRUCTURE (m/m) 0.35	0.30	0.25	0.20	0.15	0.10
	MAXIMUM WATER DEPTH OVER ROCK (mm)					
75	15	18	20	25	33	48
150	30	36	41	50	66	100

STONE CHECK DAM STRUCTURE

N.T.S.

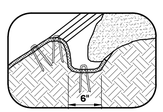
E-006 REVISED 08/01/2014



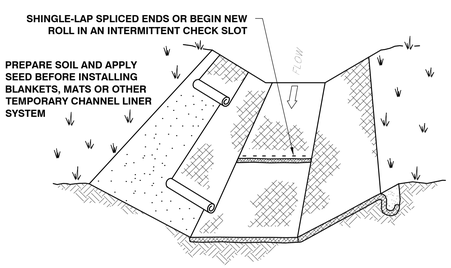


INTERMITTENT CHECK SLOT

TYPICAL INSTALLATION WITH EROSION CONTROL BLANKETS OR TURF REINFORCEMENT MATS



LONGITUDINAL ANCHOR TRENCH



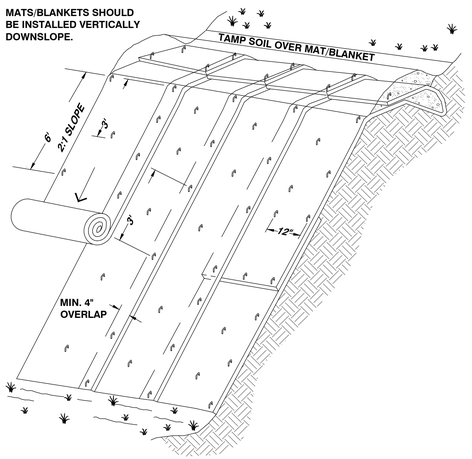
NOTES:

1. DESIGN VELOCITIES EXCEEDING 2 FT./SEC/ REQUIRE TEMPORARY BLANKETS, MATS OR SIMILAR LINERS TO PROTECT SEED AND SOIL UNTIL VEGETATION BECOMES ESTABLISHED.
2. GRASS-LINED CHANNELS WITH DESIGN VELOCITIES EXCEEDING 6 FT./SEC. SHOULD INCLUDE TURF REINFORCEMENT MATS.

GRASS-LINED CHANNEL TYPICAL INSTALLATION

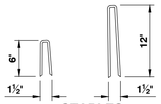
N.T.S.

E-011 REVISED 12/19/2014

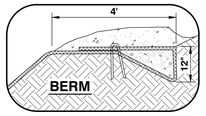


ISOMETRIC VIEW

TYPICAL SLOPE SOIL STABILIZATION



STAPLES



NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

N.T.S.

E-009 REVISED 08/01/2014

LANDSCAPE GRADING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Finish grading; bring rough grade in areas to design elevations as shown on the drawings.

2. Topsoil: Work shall consist of furnishing, placing and shaping topsoil, or placing, spreading, and shaping topsoil form stockpiles or stripped areas.

PART 2 – PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be loose, friable, reasonably free of admixtures of subsoil, free from refuses, stumps, roots, brush, weeds, rocks, and stones 1 1/4 inch in overall dimensions. The topsoil shall also be free from any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth. It shall contain not less than three (3) nor more than twenty (20) percent organic matter. Any material which has become mixed with undue amounts of subsoil during any operation at the source or during placing or spreading will be rejected and shall be replaced by the Contractor with acceptable material.

PART 3 – EXECUTION

3.01 SUBGRADE PREPARATION

A. Clean subgrade of all stumps, stones, roots, trash or other materials which might hinder proper tillage or spreading.

B. All surfaces on which topsoil is to be placed shall be graded to a reasonably true surface and scarified by raking, discing or other approved means to a minimum depth of two inches before placing topsoil.

3.03 PLACING TOPSOIL

A. Minimum final depth of topsoil shall be 4 inches.

B. Place topsoil when seeding operations can closely follow spreading operations. Use topsoil in relatively dry state.

C. Topsoil shall be spread and shaped to the lines and grades shown on the plans, or as directed by the Engineer. The depth stated in the contract to which the topsoil is to be placed is that required after final rolling of the material has taken place. All stones, roots and debris over 1¼ inch in diameter along with any sodding weeds and other undesirable material shall be removed.

D. After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled area to prevent excessive compaction. The Contractor shall perform such work as required to provide a friable surface for seed germination and plant growth prior to seeding.

E. It shall be the Contractor's responsibility to restore to the line, grade and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition until the completion of the work.

SEEDING

PART 1 – GENERAL

1.1 Section Includes:

A. Seeding.

1. Furnish all labor, materials and equipment to complete all seeding work as shown on the drawings and specified herein.

2. Except where otherwise shown or specified, the Contractor shall seed all areas where new contours are shown on the drawings and all areas where existing ground cover has been disturbed by the Contractor's operations.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

Planting Restrictions: Seeding and initial fertilizing shall be done between May 1st and September 15th unless otherwise authorized. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untillable. If seeding is done during July or August, additional mulch material may be required. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 SEED

A. Conservation Seed Mix:

Kind of Seed	Minimum Purity	Minimum Germination	Lbs/Acre
Creeping Red Fescue	98%	85%	22.5
Tall Fescue	95%	95%	22.5
Red Top	95%	90%	3
Birdsfoot Trefoil	98%	85%	9
Annual Ryegrass	95%	85%	3
		TOTAL =	60

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum of 85 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.

2.3 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium.

2.4 MULCHES

A. Mulch: Provide air-dry, clean, mildew- and seed-free, hay or threshed straw of wheat, rye, oats, or barley.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

PART 3 – EXECUTION .

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.

2. Protect grade stakes set by others until directed to remove them.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

1. Apply fertilizer directly to subgrade before loosening.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Mix lime with dry soil before mixing fertilizer.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.2 APPLICATION RATES

A. When a soil test is not available, the following minimum amounts should be applied:

1. Agricultural limestone: 2 tons/acre.

2. Nitrogen (N): 50 lbs./acre.

3. Phosphate: 100 lbs./acre.

4. Potash: 100 lbs./acre.

   a. This is the equivalent of 500 lbs./acre of 10-20-20 fertilizer or 1,000 lbs./acre of 5-10-10.

5. Hay mulch: 2 tons/acre.

3.3 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

C. Protect seeded areas with slopes exceeding 1:3 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

D. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a depth of 3/16 inch, and roll surface smooth.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.

2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.5 MAINTENANCE

A. Maintain and establish seeding by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

2. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

   a. Seeded Areas: 90 days from date of Substantial Completion.

   b. When initial maintenance period has not elapsed before end of planting season, or if seeding is not fully established, continue maintenance during next planting season.

3.6 SATISFACTORY CONDITIONS

A. Installations shall meet the following criteria as determined by Engineer/Owner:

1. Satisfactory Seeded Area: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish area that do not comply with requirements and continue maintenance until areas are satisfactory.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by work. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

C. Remove nondegradable erosion-control measures after grass establishment period.

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CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

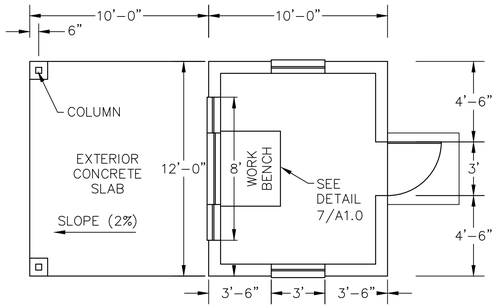
LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

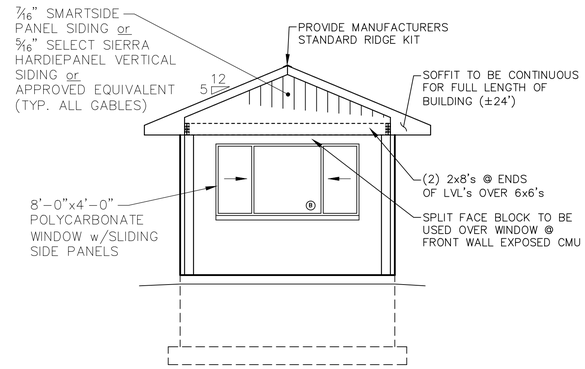
DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

EROSION CONTROL DETAILS

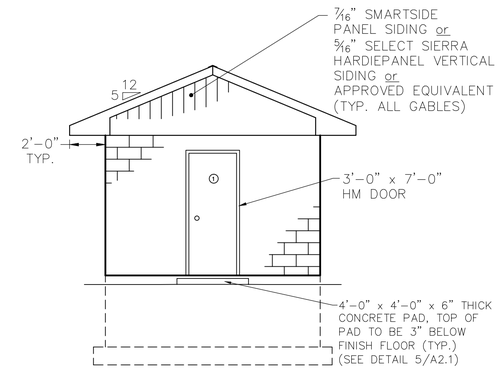
DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO. 13100.00
DRAWING NUMBER: C4.2



1 A1.0 FLOOR PLAN
1/4" = 1'-0"



3 A1.0 WEST ELEVATION
1/4" = 1'-0"



4 A1.0 EAST ELEVATION
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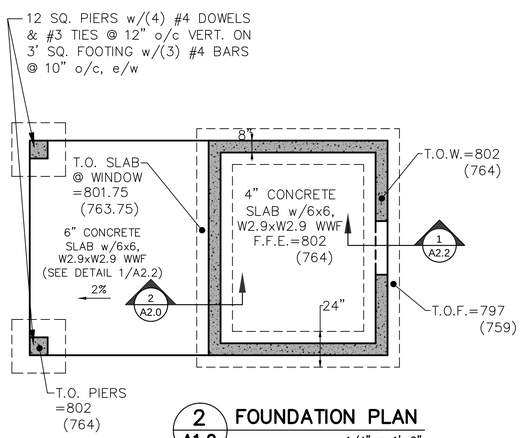
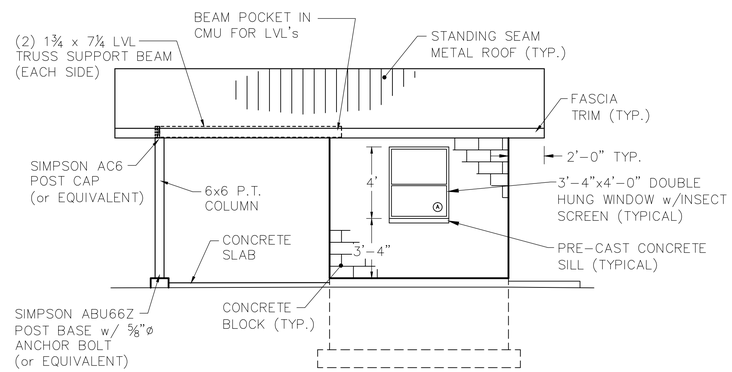


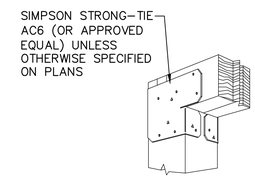
2 A1.0 FOUNDATION PLAN
1/4" = 1'-0"

(SEE FOUNDATION NOTES, CAST IN PLACE CONCRETE NOTES, AND REINFORCING STEEL NOTES ON SHEET A2.2)



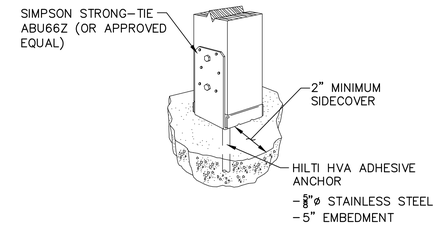
5 A1.0 SOUTH ELEVATION
(MIRROR OF NORTH ELEV.) 1/4" = 1'-0"

NOTE:
ONE ATTIC ACCESS HATCH SHALL BE INSTALLED AT THE AMMO BREAKDOWN BUILDING. VERIFY LOCATION IN FIELD WITH OWNER. SEE DETAIL 6/A1.4



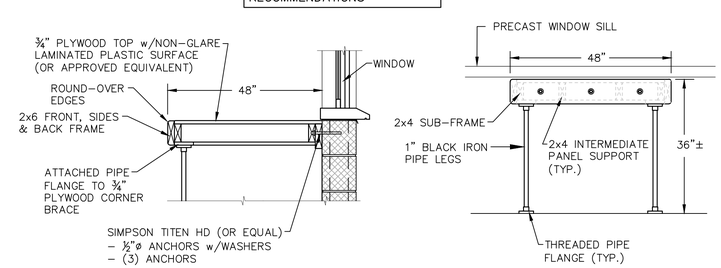
6A A1.0 TYPICAL POST CAP
N.T.S.

INSTALL PER MANUFACTURERS RECOMMENDATIONS



6B A1.0 TYPICAL POST BASE
N.T.S.

INSTALL PER MANUFACTURERS RECOMMENDATIONS



7 A1.0 WORKBENCH DETAILS
NTS

DOOR SCHEDULE

NO.	QTY.	SIZE	TYPE	DOOR MATERIAL	FRAME MATERIAL	LOCK SET	GLAZING REQUIRED	BUTTS	KICK PLATE	WTHR. STRIP	CLOSER	REMARKS
D1	1	3'-0"x7'-0"x 1¾"	F	INSULATED METAL (GALV.)	INSULATED METAL (GALV.)	ENTRY	NONE	4½" x 4½" BALL BEARING NON-REMOVABLE PINS	NONE	VINYL	HYDRAULIC	THERMAL BREAK FRAME, SWEEP

MANDOOR SCHEDULE NOTES:
1. ALL DOORS SHALL HAVE THE FOLLOWING HARDWARE: FIXED PIN HINGES/LOCKSET, WEATHERSTRIP, THERMAL BREAK THRESHOLD.
2. ALL MANDOOR AND FRAME FINISHES PER PAINT SPECIFICATION SECTION.
3. ALL FRAMES TO BE OF THERMALLY IMPROVED CONSTRUCTION.

STEEL DOORS: 1¾" THICK, FABRICATED FROM 16 ga NOMINAL THINKNESS, METALLIC-COATED STEEL FACE SHEETS;
- CORE CONSTRUCTION: COMPLETELY FILLED WITH A RIGID POLYURETHANE CORE CHEMICALLY BONDED TO ALL INTERIOR SURFACES
- THERMAL-RATED (INSULATED) DOORS: PROVIDE DOORS FABRICATED WITH THERMAL-RESISTANCE VALUE (R VALUE) OF NOT LESS THAN 12

STEEL FRAMES: FABRICATE 2 INCH WIDE FACE FRAMES FROM 16 ga NOMINAL THICKNESS, METALLIC-COATED STEEL SHEET

BUILDING COLORS

- ROOFING – DARK BRONZE
- WINDOW TRIM – DARK BRONZE
- SOFFIT/EAVES – LIGHT STONE
- CEILINGS – WHITE/OFF WHITE
- DOORS – DARK BRONZE

ROOM FINISH SCHEDULE

ROOM NAME	FLOOR	WALLS	CEILING
AMMO BREAKDOWN	CONCRETE w/ SEALER	CONCRETE BLOCK	½" A-C PLYWOOD 1⅜" LATTICE AT ALL JOINTS
EXTERIOR SLAB	CONCRETE w/ SEALER	---	½" A-C PLYWOOD 1⅜" LATTICE AT ALL JOINTS

WINDOW SCHEDULE

QUAN.	SYMBOL	SIZE (R.O.)	WINDOW CONST.	WINDOW FINISH	FRAME CONST.	FRAME FINISH	GLAZING
2	A	3'-4" x 4'-0" DOUBLE HUNG	ALUM. FRAME	BAKED ENAMEL	ALUM. FRAME	BAKED ENAMEL	¼" POLYCARBONATE
1	B	8'-0" x 4'-0" POLY. WINDOW w/SLIDING SIDE PANELS	ALUM. FRAME	BAKED ENAMEL	ALUM. FRAME	BAKED ENAMEL	¼" POLYCARBONATE

WINDOW SCHEDULE NOTES:
1. MANUFACTURED STANDARD WITH WINDOW LOCK AND INSECT SCREEN.

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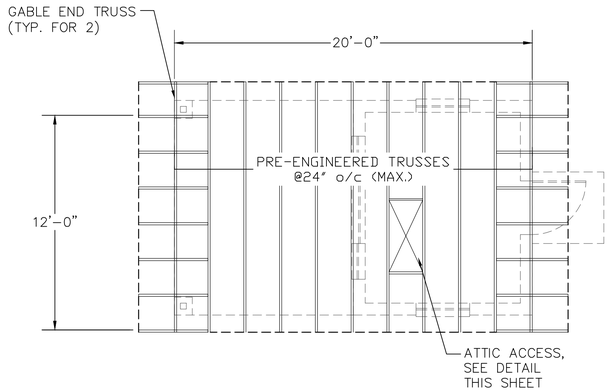
CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:
LIGHT DEMO RANGE
CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

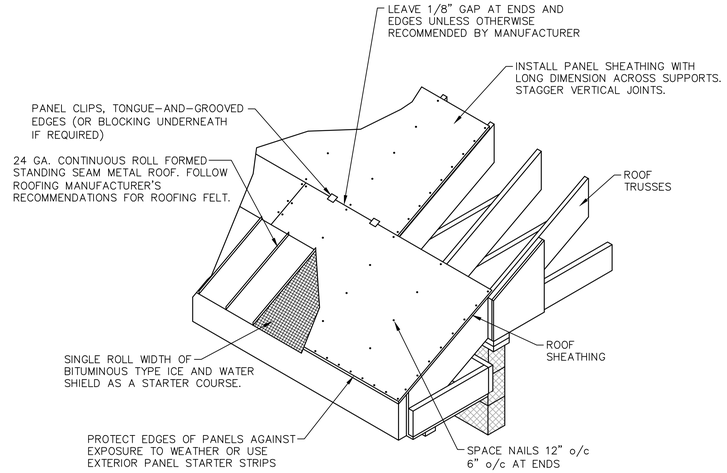
AMMO BREAKDOWN BUILDING PLANS and ELEVATIONS

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: A1.0



1 / A1.1 AMMO BREAKDOWN BUILDING

1/4" = 1'-0"



NOTE:
COVER SHEATHING AS SOON AS POSSIBLE WITH ROOFING FELT FOR EXTRA PROTECTION AGAINST EXCESSIVE MOISTURE PRIOR TO ROOFING APPLICATION.

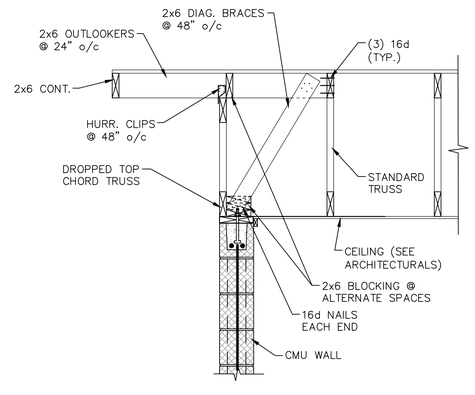
2 / A1.1 ROOF PANEL SHEATHING DETAIL

NTS

PRE-ENGINEERED WOOD TRUSSES

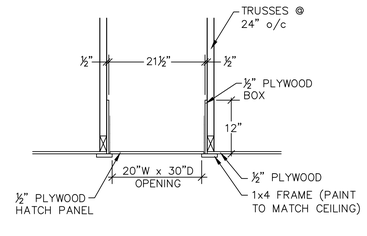
1. Wood trusses shall be designed by the Manufacturer to support the following loads:
   A. Gravity Loading Case
   - Top Chord Loading
     - Live Load – Ground Snow Load, Pg = 60 psf (on the horizontal projection)
       - Include drift and sliding snow loads
       - The resultant flat roof snow load of Pf shall not be less than 40 psf.
     - Dead Load – 15 psf (on the surface area)
       - Additional 5 psf at built-up framing areas
   - Bottom Chord Loading
     - Attic Live Load – 20 psf (per IBC 2012)
     - Dead Load – 10 psf

   B. Wind Loading Case
   - Per IBC 2012
2. Top and bottom chords shall be 2 x 6 minimum, and interior members shall be 2 x 4 minimum size.
3. Wood trusses shall be designed by the Manufacturer in accordance with the applicable provisions of the latest edition of the National Design Specification of the National Forest Products Association, and the Design Specification for Metal Plate Connected Wood Trusses of the Truss Plate Institute.
4. Wood materials shall be Southern Pine, Douglas Fir or Larch and shall be kiln dried and used at 19% maximum moisture content. Provide Grade No. 2 or as required to satisfy stress requirements.
5. Wood trusses shall be erected in accordance with the truss Manufacturer's requirements. This work shall be done by a qualified and experienced Contractor.
6. The Contractor shall provide all temporary and permanent bracing as required for safe erection and performance of the trusses. The guidelines set forth by the Truss Plate Institute Publication "H1B-91, Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses" shall be a minimum requirement.
7. Truss members and components shall not be cut, notched, drilled nor otherwise altered in any way without the written approval of the Manufacturer.
8. Submit complete shop drawings for all wood trusses showing member sizes, species, grade, moisture content, span, camber, dimensions, chord pitch, bracing requirements and loadings. Shop drawings shall be submitted to the Engineer and shall bear the seal of a Professional Engineer registered in Vermont.



3 / A1.1 GABLE END TRUSS

N.T.S.



4 / A1.1 ATTIC ACCESS HATCH

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PROJECT:

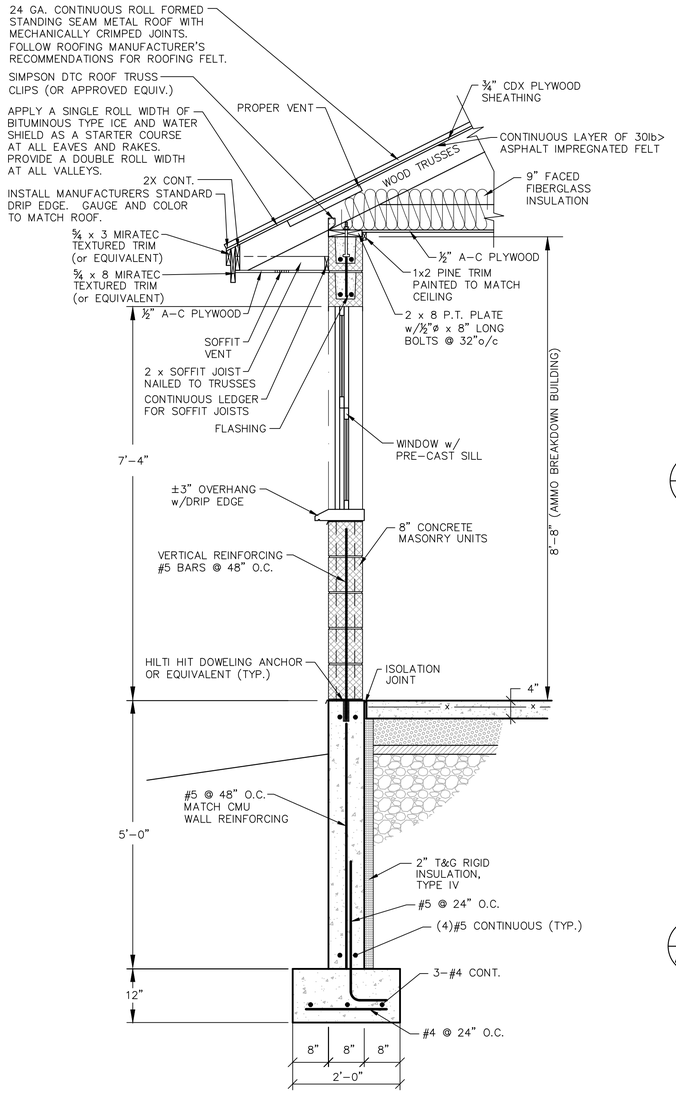
LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

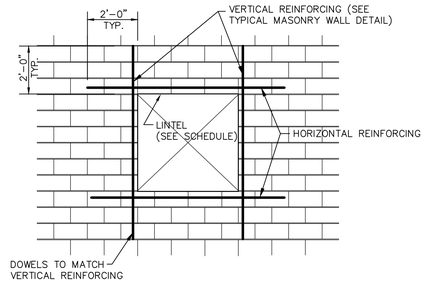
ROOF FRAMING and DETAILS

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: A1.1



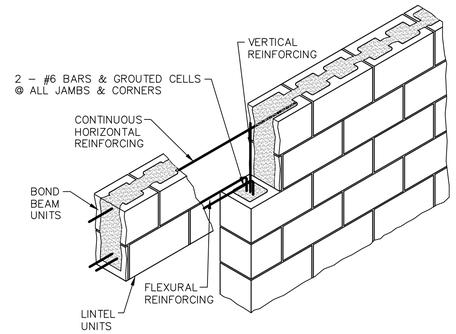
1 A2.0 TYPICAL WALL SECTION

3/4" = 1'-0"



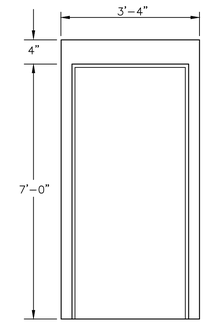
3 A2.0 TYPICAL MASONRY WINDOW OPENING

N.T.S.



5 A2.0 LINTEL AND BOND BEAM DETAIL @ DOORS

NTS



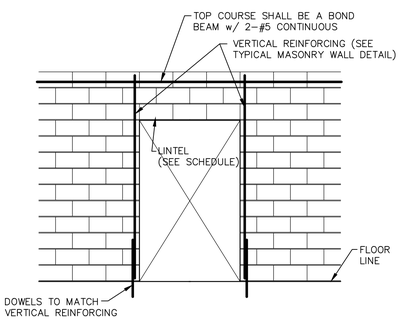
SINGLE

7 A2.0 DOOR FRAME ELEVATIONS

N.T.S.

* 1¾" 16 GAUGE H.M. GALVANIZED INSULATED DOORS 16 GAUGE 7¾" H.M. FRAME NO FIRE RATING. FIXED PIN HINGES/LOCKSET w/ENTRANCE FUNCTION, CLOSER, 0.050 METAL KICK PLATE, WEATHER STRIP, THRESHOLD

LINTEL SCHEDULE		
MAX M.O.	SECTION	SIZE (WIDTH x HEIGHT)
EXTERIOR WALLS UP TO 3'-4"		7⅝" x 7⅝" w/2 - #6 BARS
3'-4" TO 8'-0"		7⅝" x 15⅛" w/2 - #6 BARS



4 A2.0 TYPICAL MASONRY DOOR OPENING

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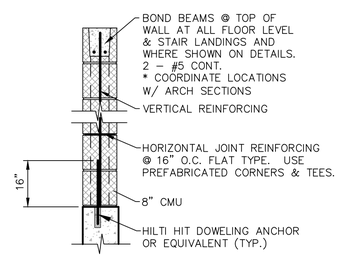

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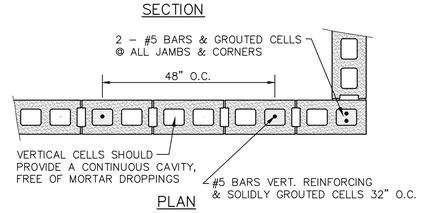
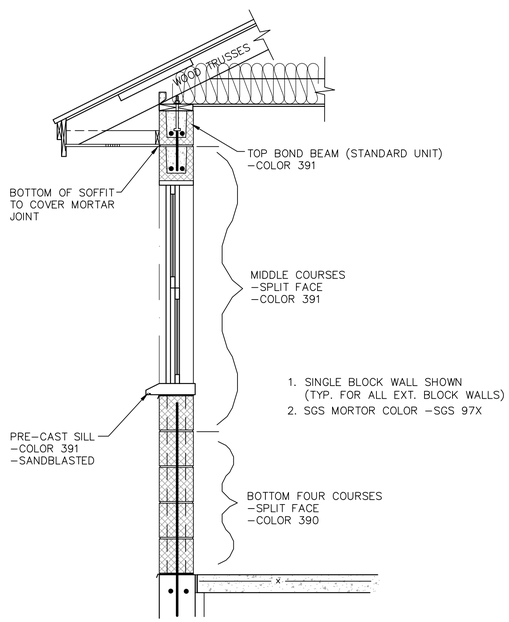


PLAN

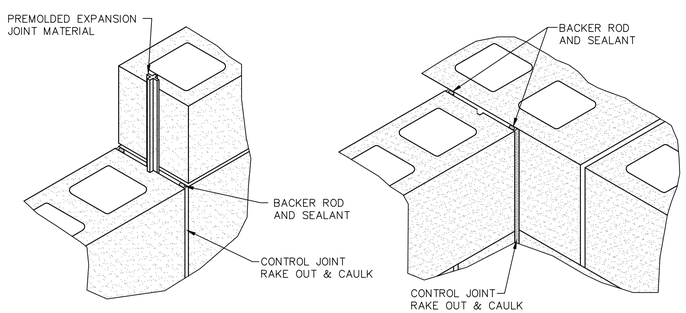
6 A2.0 TYPICAL MASONRY WALL DETAIL

N.T.S.



8 A2.0 BLOCK COLOR DETAIL

NTS



2 A2.0 CONTROL JOINT DETAILS

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COLCHESTER, VERMONT

PROJECT:

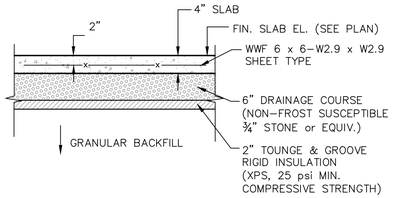
LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

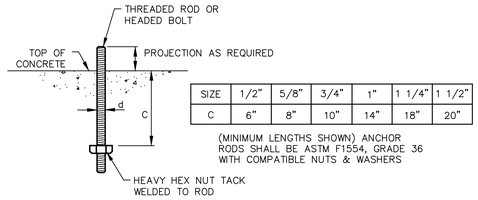
BUILDING SECTIONS and DETAILS

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: A2.0



1 / A2.1 TYPICAL SLAB SECTION

3/4" = 1'–0"

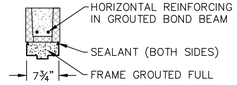


SIZE	1/2"	5/8"	3/4"	1"	1 1/4"	1 1/2"
C	6"	8"	10"	14"	18"	20"

(MINIMUM LENGTHS SHOWN) ANCHOR RODS SHALL BE ASTM F1554, GRADE 36 WITH COMPATIBLE NUTS & WASHERS

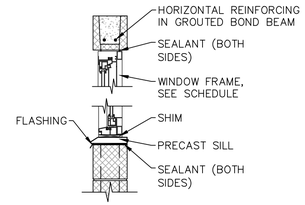
4 / A2.1 ANCHOR ROD SCHEDULE

N.T.S.



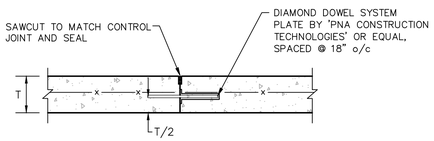
7A / A2.1 DOOR HEAD

NTS



8A / A2.1 WINDOW HEAD AND SILL

NTS



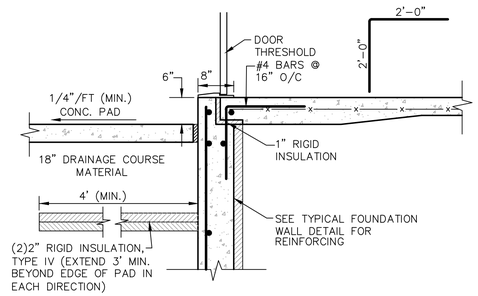
1. Joints shall be sealed w/semi–rigid epoxy. install as late as possible, preferably after building is under final temperature control, but in no case prior to 30 days after slab is placed.
   a. Epoxy Joint Filler: Two–component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D2240. (Submit shop drawings for review)
   b. Prepare, clean, and install joint filler according to manufacturer's written instructions.
2. Coat vertical surface with oil or curing compound before placing new pour
3. Sawcut the joint as soon as possible without raveling the concrete edges
4. Slab pours shall be placed in an alternating lane pattern to enable construction joints to be parallel to each other (avoid perpendicular construction joints)

2 / A2.1 DOWELED CONSTRUCTION JOINT

N.T.S.

DOWEL INSTALLATION NOTES

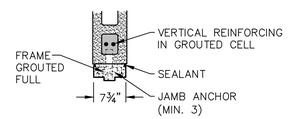
1. Install dowel frame baskets, dowels, and square dowel clips in accordance with manufacturers requirements.
2. Dowels must be carefully aligned and supported during concrete operations. Misaligned dowels cause cracking.
3. Dowels should not be placed closer than 12" from the intersections of any joints.
4. For doweled joints that are 90° to each other, square or diamond shaped dowels with sleeves cushioned on the vertical sides by a compressible material should be used. These shapes permit movement perpendicular and parallel to the joint.
5. Contractor may submit an alternate square or diamond shaped dowel system for approval.



w/EXTERIOR SIDEWALK (STEP)

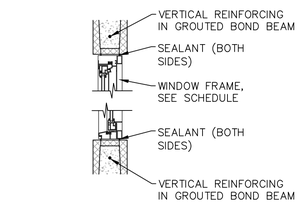
5 / A2.1 FOUNDATION WALL SECTION @ WALKWAY DOORS

N.T.S.



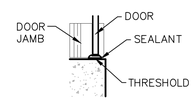
7B / A2.1 DOOR JAMB

NTS



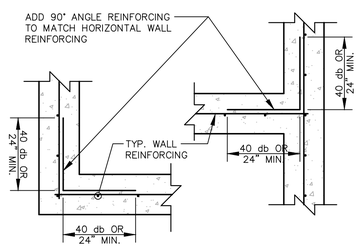
8B / A2.1 WINDOW JAMB

NTS



7C / A2.1 DOOR SILL

NTS

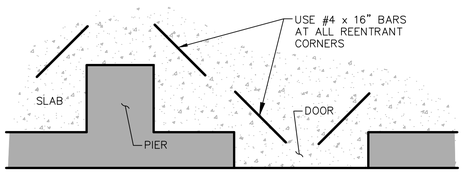


OUTSIDE 90° CORNER

INSIDE 90° CORNER

6 / A2.1 CORNER REINFORCING DETAIL

N.T.S.



3 / A2.1 REENTRANT BARS DETAIL

N.T.S.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
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CHECKED: BCE
APPROVED: BCE

OWNER:

STATE OF VERMONT

VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

BUILDING SECTIONS and DETAILS

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: A2.1

GENERAL NOTES

1. All work shall be in accordance with the International Building Code, 2012 edition, and the requirements of all local building codes.
2. Shop drawings and other items shall be submitted to the Engineer for review prior to fabrication. All shop drawings shall be reviewed by the General Contractor before submittal. The Engineer's review is to be for conformance with the design concept and general compliance with the relevant Contract Documents. The Engineer's review does not relieve the Contractor of the sole responsibility to review, check and coordinate the shop drawings prior to submission. The Contractor remains solely responsible for errors and omissions associated with the preparation of shop drawings as they pertain to member sizes, details, dimensions, etc.
3. The Contractor shall field verify all critical dimensions before fabrication of any materials.
4. All expansion bolts shall be as manufactured by Hilti, or approved equal. (See drawings for size and type.) Install in accordance with manufacturer's recommendations.
5. The structural drawings herein represent the finished structure. The Contractor shall provide all temporary guying and bracing required to erect and hold the structure in proper alignment until all structural work and connections have been completed. The investigation, design, safety, adequacy and inspection of erection bracing, shoring, temporary supports, etc. is the sole responsibility of the Contractor.
6. The Engineer shall not be responsible for the methods, techniques and sequences of the procedures to perform the work. The supervision of the work is the sole responsibility of the Contractor.
7. Contractors shall visit the site prior to bid to ascertain conditions which may adversely affect the work or cost thereof.

FOUNDATION NOTES

1. All footings have been designed based upon a soil bearing pressure of 3,000 psf. All footings shall bear on undisturbed, firm natural soil or compacted fill.
2. No unbalanced backfilling shall be done against foundation walls unless walls are securely braced against overturning, either by temporary bracing or by permanent construction.

CAST-IN-PLACE CONCRETE

1. Concrete shall be composed of Type I Portland Cement conforming to ASTM C150, fine and coarse aggregates conforming to ASTM C33, and mixing water free of oil, acid, or injurious amounts of alkalis and other salts. Air entraining admixtures shall conform to ASTM C260.
2. Concrete shall conform to the following compressive strength and slump requirements:

Concrete Location	Min. f'c (28 days)	Slump*	Air Entrainment	max w/c
Footings	3,000 psi	4" max.	Not Required	0.58
Foundation walls/Columns/Piers	3,000 psi	4" max.	Required (5% ±1)	0.58
Interior Floor Slabs	4,000 psi	4" max.	Not Required	0.50
Exterior Conc. Slab	4,000 psi	4" max.	Required (6% ±1)	0.45

* At Contractor's option, an approved admixture may be used to produce flowable concrete. Maximum slump shall not exceed 7 inches. If water reducing admixture is required for slabs, mid range admixture is recommended.

3. Chemical Admixtures: If used, provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   A. Water-Reducing Admixture: ASTM C494, Type A.
   B. Retarding Admixture: ASTM C494, Type B.
   C. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
   D. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
   E. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
   F. Plasticizing and Retarding Admixture: ASTM C1017, Type II.
3. All concrete work shall conform to the requirements of ACI 301, "Specifications for Structural Concrete Buildings". Hot weather concreting shall be in accordance with ACI 305. Cold weather concreting shall be in accordance with ACI 306.
4. All reinforcing steel shall be set and tied in place prior to pouring of concrete, except that vertical dowels for masonry wall reinforcing may be "floated" in place. Do not field bend bars partially embedded in hardened concrete unless specifically indicated or approved by the Engineer. Support for reinforcing shall be via protected metal spacers, chairs, bolsters, or ties.
5. All edges of permanently exposed concrete surfaces shall be chamfered 3/4" unless otherwise noted.
6. Slabs on Grade
   A. Support for reinforcing shall be via protected metal spacers, chairs, bolsters, or ties.
   B. Slabs to be permanently exposed to weather shall be air entrained to 6% (±1%) with an admixture that conforms to ASTM C-260.
   C. In order to avoid concrete shrinkage cracking, place concrete slabs in an alternating lane pattern. The maximum length of slab cast in any one continuous pour shall be less than 80 feet.
   D. The use of polypropylene fibers (in lieu of welded wire fabric) is prohibited without the written authorization of the Engineer.
   E. See the architectural drawings for exact locations of depressed slab areas and drains. Slope slab to drains where shown.
   F. Slab joints shall be filled with approved material. This should take place as late as possible, preferably 4 to 6 weeks after the slab has been cast. Prior to filling, remove all debris from the slab joints, then fill in accordance with the Manufacturer's recommendations.
   G. Walkways and other exterior slabs are not indicated on the structural drawings. See the site plan and architectural drawings for locations, dimensions, elevations, jointing details and finish details.
   H. Provide finish in accordance with Owner requirements. Ramps shall have a broom finish. All other floors shall have a steel trowel finish.
   I. All slabs shall be kept continuously moist for a minimum of seven (7) days with water in full compliance with ACI 308. Curing sheets shall be used and are to remain in place during this period.
7. Protect newly placed concrete against low and high temperature effects and against rapid loss of moisture. Cure all concrete for at least seven (7) days at a temperature of at least 50 degrees Fahrenheit by approved curing methods. Forms may be stripped when the concrete has attained sufficient strength to carry its own weight and any applied loads.
8. All floor areas shall receive two coats of a Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A. Apply according to manufacturers recommendations.

REINFORCING STEEL

1. All reinforcing steel shall be ASTM A615-Grade 60 and shall be detailed, fabricated and installed in accordance with the latest A.C.I. specifications.
2. Welded wire mesh (W.W.M.) shall be ASTM A185. Lap all splices 12" minimum. Securely fasten W.W.M. in place to prevent movement during concrete placement.
3. All horizontal rods are continuous. Lap all splices 30 diameters unless otherwise noted. Provide corner bars and dowel into existing walls.
4. Provide a clear cover from reinforcing steel to adjacent concrete surfaces as follows:
   A. Concrete cast against earth: 3"
   B. Formed concrete exposed to earth or weather:
      #5 and smaller – 1 1/2"
      #6 and larger – 2"
   C. Formed concrete not exposed to earth or weather:
      Slabs, walls – 3/4"

ROUGH CARPENTRY

1. Submittals: Statement of species and grade selected for each application. Lumber to include visible grade stamp of agency certified by National Forest Products Association (NFPA).
2. Materials
   A. Lumber: Any species listed in National Design Specification Supplement. Maximum moisture content of 19 percent of following grades:
      i. Structural Light Framing: No. 2 grade or better.
      ii. Typical Lumber shall be capable of meeting the Spruce Pine Fir design values, and where indicated in the plans, Douglas Fir shall be used:

Spruce Pine Fir	Douglas Fir
Fb = 1120 psi	Fb = 1450 psi
Fv = 70 psi	Fv = 95 psi
$F_{c\perp}$ = 1075 psi	$F_{c\perp}$ = 1250 psi
F_{c1} = 335 psi	F_{c1} = 625 psi
E = 1,100,000 psi	E = 1,800,000 psi

   B. Prefabricated "LVL" or "PSL" lumber headers and beams shall be as manufactured by "Trus Joist MacMillan Corp.", or approved equal. LVL material shall be 1.9E, Southern Pine, and PSL material shall be 2.0, Southern Pine. Do not cut or notch material without the Manufacturer's approval. Lumber shall be capable of meeting the following design values:

1.9E Microllam® LVL	2.0 Parallam® PSL
Fb = 2600 psi (for 12" depth)	Fb = 2900 psi (for 12" depth)
Fv = 285 psi	Fv = 290 psi
$F_{c\perp}$ = 2510 psi	$F_{c\perp}$ = 2900 psi
F_{c1} = 750 psi	F_{c1} = 650 psi
E = 1,900,000 psi	E = 2,000,000 psi

   C. Fasteners for Preservative Treated Wood: Hot-dip galvanized steel (ASTM A153).
   D. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application.
   E. Bolts, Nuts, Washers, Lags, Pins and Screws: Medium carbon steel sized to suit application galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.
   F. Joist Hangers: Sized and profiled to suit application; galvanized finish.
   G. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel.
   H.
      i. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1-07, Use Category UC3B (Exterior Construction, Above Ground, Uncoated).
      ii. Pressure treat timber with waterborne preservative according to AWPA U1-07, Use Category UC4A (Ground Contact, Non-critical components).
3. Structural steel plate connectors shall conform to ASTM A-36 specifications and be 1/4" thick unless otherwise indicated. Bolts connecting wood members shall be per ASTM A-307 and be 3/4" diameter unless otherwise indicated. Provide washers for all bolt heads and nuts in contact with wood surfaces.
4. Bolt holes shall be carefully centered and drilled not more than 1/16" larger than the bolt diameter. Bolted connections shall be snugged tight but not to the extent of crushing wood under washers.
5. Prefabricated metal joist hangers, hurricane clips, hold-down anchors and other accessories shall be as manufactured by "Simpson Strong-Tie Company" or approved equal. Install all accessories per the Manufacturer's requirements. All steel shall have a minimum thickness of 0.04 inches (per ASTM A446, Grade A) and be galvanized (Coating G60).
6. Beams, joists, rafters or studs shall not be notched, cut, or pierced in excess of the limitations permitted herein, unless suitably reinforced to transmit all calculated loads. Notches located at ends of the member shall not exceed 1/4 the depth. Notches not at ends shall not exceed 1/6 the depth of the members and shall not be located in the middle 1/3 of the span. Holes bored or cut into joists shall not be closer than 2 inches to the top or bottom of the joist and the diameter of the hole shall not exceed 1/3 the depth of the joist. In studs, notched or bored holes shall not be more than 1/3 the depth of the stud. When the stud is cut or bored in excess of 1/3 its depth, it shall be reinforced to be equal to the load carrying capacity of a stud notched or bored no more than 1/3 its depth.

PLYWOOD/GYPBOARD SHEATHING

1. All plywood construction shall be in accordance with The American Plywood Association (APA) specifications.
2. All roof panel sheathing shall be 3/4" APA rated sheathing, 40/20, Exposure I. Suitable edge support shall be provided by use of panel clips or blocking between framing. Unless otherwise noted connect roof sheathing with 8d common nails at 6" o/c at supported panel edges at 6" o/c at intermediate supports.
3. All wall panel sheathing shall be 5/8" APA rated sheathing, 24/16, Exposure I. Unless otherwise indicated, connect wall sheathing with 10d common nails spaced 6" o/c at supported panel edges and 12" o/c at intermediate supports.
4. Install all plywood sheathing with the long dimension of the panel across supports and with panel continuous over two or more spans. Stagger panel end joints. Allow 1/8" spacing at panel ends and edges unless otherwise recommended by the sheathing manufacturer.
5. All nailing shall be carefully driven and not over driven. The use of staples are prohibited from use.

STRUCTURAL STEEL

1. All structural steel shall be detailed, fabricated and erected in accordance with the latest A.I.S.C. specifications, "Manual of Steel Construction, Allowable Stress Design".
2. Materials:
   A. W shapes: comply with ASTM A992, Grade 50.
   B. M, S, HP shapes, angles, and plates: comply with ASTM A36.
   C. Steel pipe: comply with ASTM A53, Grade B (Fy = 35 ksi).
   D. Round HSS: in compliance with ASTM A500, Grade B (Fy=42 ksi).
   E. Square & Rectangular HSS: in compliance with ASTM A500, Grade B (Fy=46 ksi).
   F. High strength bolts: comply with ASTM A325 or A490.
   G. Anchor bolts: comply with ASTM F1554, Grade 55.
   H. Welding materials: AWS D1.1; type required for materials being welded.
   I. Shop and touch-up primer: SSPC Paint 15, Type 1, red oxide.
   J. Non-shrink, nonmetallic grout, Five Star Grout Company or approved equivalent.
3. Welded connections shall be made using E70XX electrodes. Welding shall comply with A.I.S.C. and A.W.S. specifications and shall be performed by certified welders.
4. Bolted connections shall be made using 3/4" diameter A-325 high strength bolts, unless otherwise noted.
5. All steel shall be shop primed (minimum 1.5 mils dry film thickness) with a rust-inhibitive primer.
   A. Complete the assembly, including welding of units, before start of finishing.
   B. Provide finish surfaces of members exposed in the final structure free from markings, burrs, and other defects.
   C. Touch-up all scratches, weld burns, and other marks in the field after steel is erected.
6. Do not use gas cutting torches for correcting fabricating errors in structural framing, except on secondary members where acceptable to the Engineer.

MASONRY NOTES

1. Masonry construction shall conform to the requirements of the "Specifications for Masonry Structures (ACI 530.1-95)" published by the American Concrete Institute, Detroit, Michigan. Cold Weather Requirements: IMIAC – Recommended Practices and Specifications for Cold Weather Masonry Construction
2. Hollow load-bearing masonry units shall conform to ASTM C-90, Grade. The minimum prism compressive strength (f'm) shall be 1,500 psi at an age of 28 days, as determined by the unit strength method of ACI 530.a.
3. Fill all bond beams and reinforced cells solidly with grout. Grout shall conform to ASTM C-476 and shall obtain a minimum 28 day compressive strength of 2,500 psi.
4. Reinforcing steel shall be in accordance with ASTM A-615, Grade 60. Shop fabricate reinforcing bars which are shown to be hooked or bent. Provide a minimum lap of 48 x bar diameters at all splices, unless indicated otherwise.
5. Mortar shall conform to ASTM C-270, Type S. All mortar shall meet the "Proportion Specification" of ASTM C-270 and be made with Portland Cement/Lime (non air-entrained).
6. Unless otherwise indicated, all walls shall be laid in running bond. Bond corners and intersections of load-bearing walls. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
7. Provide vertical reinforcing bars of the given size and spacing as indicated. Provide bars at all wall corners, intersections and opening edges. Masonry walls shall be constructed in accordance with the "low-lift" or "high-lift" details indicated. "High-lift" masonry construction is limited to specially qualified contractors meeting the following minimum requirements:
   A. Successful completion of at least 3 previous projects that utilized "high-lift" wall construction.
   B. Contractor shall submit a detailed "high-lift" wall construction procedure for approval, including the documentation of all personnel who have successfully been trained in "high-lift" masonry construction.
8. Provide rebar dowels from foundations to match vertical reinforcing size and spacing. Dowels shall have standard 90 degree hooks and lap with the first lift of reinforcing.
9. Provide horizontal bond beams with continuous reinforcing as indicated. Discontinue all horizontal reinforcing at control joints except for the bond beams at bearing elevations.
10. Provide standard 9 gauge horizontal joint reinforcing at 16" on center in all walls. Provide truss type joint reinforcing for all concrete masonry. Coordinate brick tieback requirements with the architectural drawings. Unless otherwise noted, stop all horizontal joint reinforcing at control joints.
11. Provide bond beam lintels and shelf angles (as required) above all wall openings per typical details. See the architectural drawings for locations of all door and window openings.
12. Provide steel joist and beam bearing plates and other accessories as indicated. Provide 3 courses of solidly grouted CMU below all beam bearings over a width of 2'-8", centered on the wall.
13. Provide CMU control joints as indicated with additional joints such that the spacing between joints does not exceed a spacing of 3 x wall height (35 feet maximum). Where beams or lintels bear at CMU control joints, offset and lap the vertical reinforcing as indicated.
14. The masonry contractor shall provide all required temporary wall bracing during construction (see "General Structural Notes").
15. Clean masonry after mortar is thoroughly set and cured.
   A. Scrape off adhered mortar particles by hand, using non-metallic tools.
   B. Comply with directions of concrete unit masonry manufacturer and NCMA" Tek Bulletin No. 45 for cleaning CMU.
   C. Protection: Institute protective measures as required to ensure that unit masonry work will be clean and undamaged at substantial completion.

Design Criteria – 2012 IBC/ASCE 7-05 Light Demo Range		
Building Occupancy Category	Table 1604.5	II
Deflection Limits – Table 1604.3	**Live**	**Dead + Live**
Roof Members – Plaster Ceiling	l/360	l/240
Roof Members – Nonplaster Ceiling	l/240	l/180
Roof Members – No Ceiling	l/180	l/120
Floor Members	l/360	l/240
Exterior Walls – Brittle Finishes	l/240	
Exterior Walls – Flexible Finishes	l/120	
Farm Buildings		l/180
Dead Loads – Section 1606	Uniform (psf)	Conc. (lbs.)
Roofs	15	
Floors	n/a	
Live Loads – Table 1607.1	Uniform (psf)	Conc. (lbs.)
Roofs – Also see snow loads		300
Light Storage	125	
Stairs & Exits	100	300 (4" sq. area)
Roof Snow Loads – ASCE 7		
Ground Snow Load	$P_g = 60$ psf	
Importance Factor – Table 7-4	I = 1.0	
Exposure Factor – Table 7-2	$C_e = 1.2$	
Slope Factor – Figure 7-2	$C_s = 1.0$	
Thermal Factor – Table 7-3	$C_t = 1.2$	
Flat roof snow load – Section 7.3	$P_f = 70$	**(P_f = 40 min. for slope < 5°)**
Sloped roof snow load – Section 7.4	$P_s = 70$	**($P_s = C_s$*40 psf minimum for slope < 5°)**
Wind Loads – ASCE 7 - 05		
Basic Wind Speed, 3 sec gust – Fig. 6.1	110 mph	
Importance Factor – Table 6-1	$I_W = 1.0$	
Exposure Category – Section 6.5	B	
Design Method	Simplified	
Enclosure Classification	Enclosed	
Internal Pressure Coefficients – GC_{Pi}	± 0.18	
Earthquake Loads – ASCE 7		
Seismic Occupancy Category – Table 1-1	II	
Importance Factor – Section 11.5.1	$I_e = 1.0$	
Mapped Spectral Response Acceleration at 0.2 sec Period	$S_S = 0.307$	
Mapped Spectral Response Acceleration at 1.0 sec Period	$S_1 = 0.099$	
Site Class – Chapter 20	D	
Site Coefficient – Table 11.4-1	$F_a = 1.554$	
Site Coefficient – Table 11.4-2	$F_v = 2.4$	
Spectral Response Acceleration at 0.2 sec Period	$S_{MS} = 0.477$	$S_{MS} = F_a S_S$
Spectral Response Acceleration at 1.0 sec Period	$S_{M1} = 0.239$	$S_{M1} = F_v S_1$
Spectral Response Coefficient at 0.2 sec Period	$S_{DS} = 0.318$	
Spectral Response Coefficient at 1.0 sec Period	$S_{D1} = 0.159$	
Seismic Design Category – Section 11.6	C	

SITE ENGINEER:

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CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
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DATE	CHECKED	REVISION
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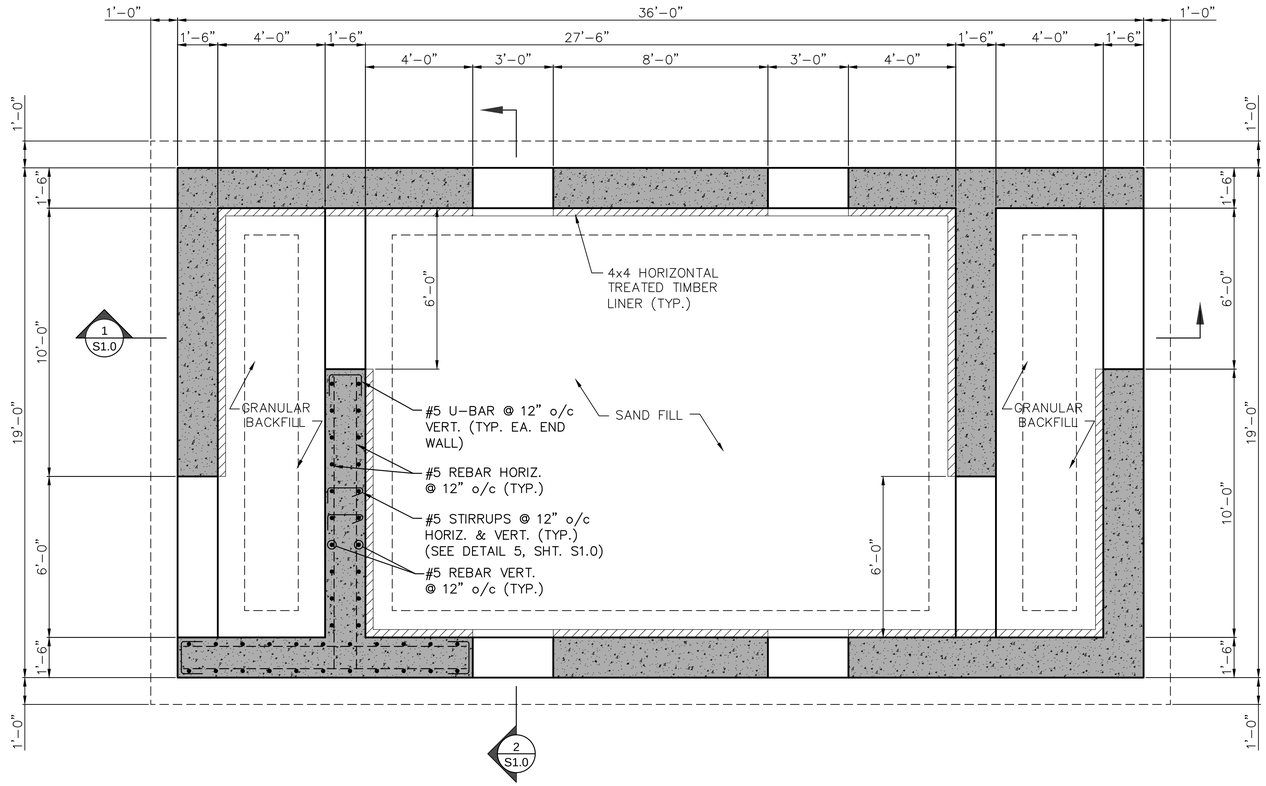
BUILDING NOTES

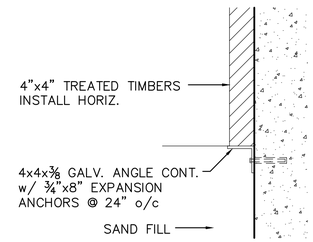
DATE: 3/24/2017
SCALE: NONE
PROJ. NO.: 13100.00

DRAWING NUMBER: A2.2



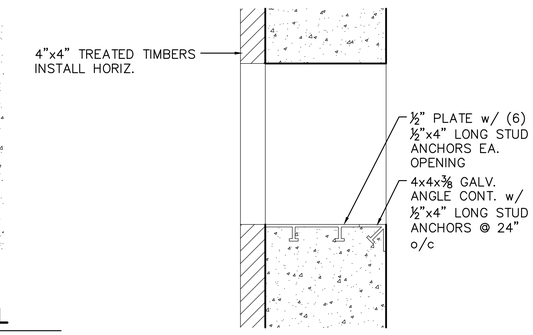
FLOOR PLAN

3/8" = 1'-0"



3 S1.0 **DETAIL**

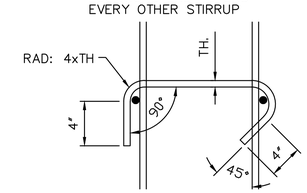
3/8" = 1'-0"



4 S1.0 **DETAIL**

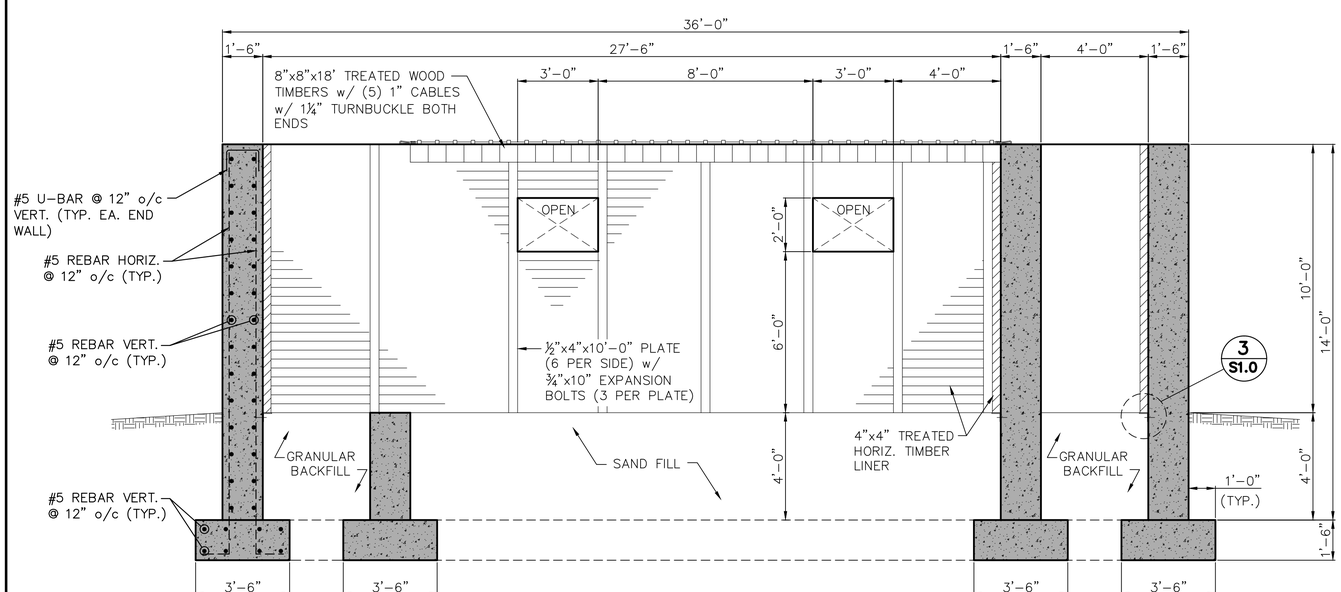
3/8" = 1'-0"

STIRRUPS TO NE INSTALLED TO HOOK AROUND HORIZONTAL AND VERTICAL BARS IN EACH FACE; ALTERNATE HOOK LOCATIONS END TO END EVERY OTHER STIRRUP



5 S1.0 **DETAIL**

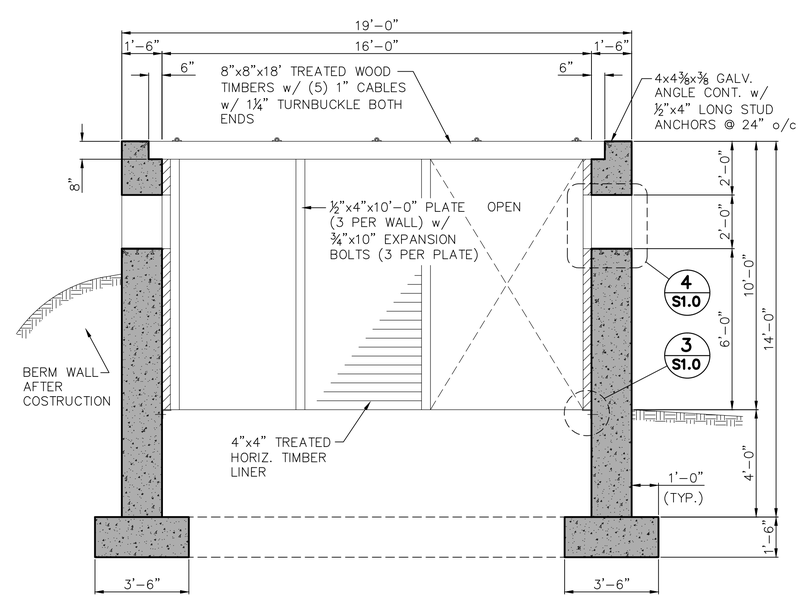
3/8" = 1'-0"



1 S1.0 **SECTION**

3/8" = 1'-0"

NOTE: 1" CABLE TO BE PLACED ON TOP OF 8"x8" TIMBERS AND SECURED USING 1" TWO HOLE STRAP PER CABLE PER TIMBER (TOTAL OF 5 STRAPS PER TIMBER)



2 S1.0 **SECTION**

3/8" = 1'-0"

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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DRAWN: PJM
CHECKED: BCE
APPROVED: BCE

OWNER:

STATE OF VERMONT

VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

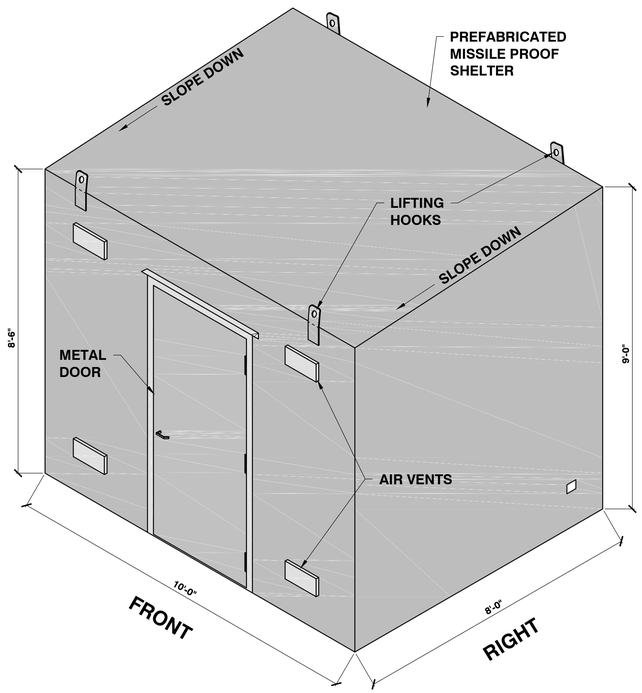
LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
03/24/17	BCE	EA PLAN SET

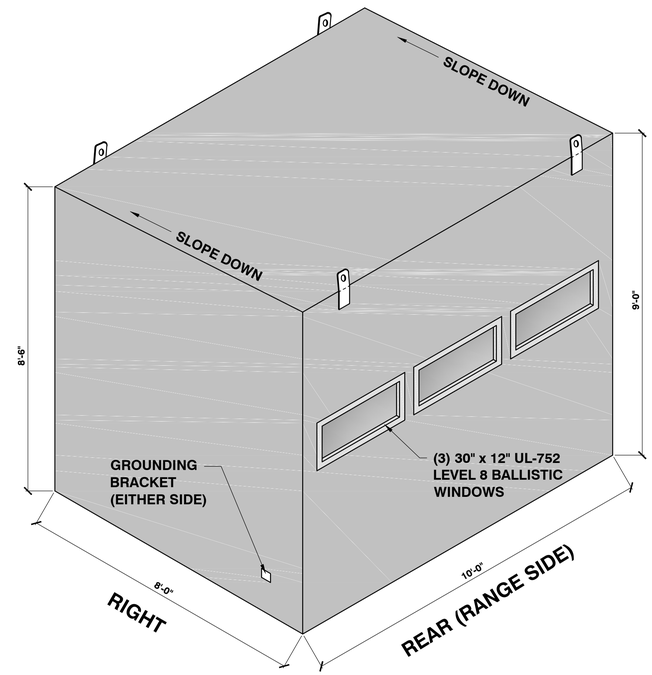
STEEL CUTTING CHAMBER

DATE: 3/24/2017
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: S1.0



FRONT ELEVATION

¼" = 1'-0"



REAR ELEVATION

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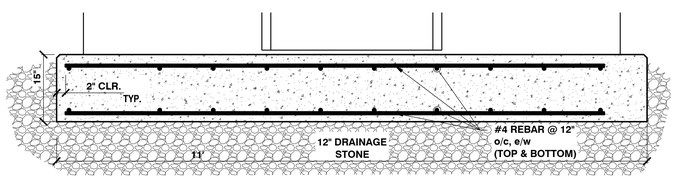

TYPICAL SLAB SECTION

¾" = 1'-0"

11' x 9' (MIN.) CONCRETE PAD, SHELTER CONNECTION TO PAD PER MANUFACTURERS RECOMMENDATIONS

PRE-FABRICATED MISSILE PROOF SHELTER CONSTRUCTED TO THE FOLLOWING SPECIFICATIONS

- 10'x8'x9' HIGH
- ½" (MIN.) A36 STEEL WALLS/FLOOR/ROOF
- COMMERCIAL METAL DOOR
- (3) NIJ LEVEL 8 BALLISTIC VIEWING WINDOWS
- PASSIVE AIR FLOW VENTS
- (4) METAL LIFTING HOOKS
- INTERIOR WALLS PAINTED WHITE
- FLOOR COATED WITH LINE-X
- EXTERIOR COMMERCIALLY SANDBLASTED AND COATED WITH 7 MILS (MIN) HIGH SOLIDS URETHANE COATING

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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DRAWN: PJM
CHECKED: BCE
APPROVED: BCE

OWNER:

VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

LIGHT DEMO RANGE

CAMP ETHAN ALLEN TRAINING SITE
JERICHO, VERMONT

DATE	CHECKED	REVISION
1/19/18	BCE	EA PLAN SET - REVISED AFTER REVIEW

MISSILE PROOF SHELTER

DATE: 1/19/2018
SCALE: AS SHOWN
PROJ. NO.: 13100.00
DRAWING NUMBER: S1.1

P:\AutoCADD Projects\2013\13100.0001-CADD Files - Light Demo\Dwg\13100 - Buildings.dwg, 2/13/2018 2:02:30 PM, pmead

Appendix B

U.S. ARMY PUBLIC HEALTH COMMAND
5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5403

OPERATIONAL NOISE CONSULTATION
No. WS.0030762-d-15
OPERATIONAL NOISE ASSESSMENT
PROPOSED LIGHT DEMOLITION RANGE
CAMP ETHAN ALLEN TRAINING SITE, VERMONT
7 JANUARY 2015

Distribution authorized to U.S. Government agencies only; protection of privileged information evaluating another command; January 2015. Other requests for this document shall be referred to Vermont Army National Guard (JFHQ-VT/MAJ Jacob Roy), Building 5, Camp Johnson, Colchester, VT 05446

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DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND, MD 21010-5403

MCHB-IP-EON

EXECUTIVE SUMMARY
OPERATIONAL NOISE CONSULTATION
No. WS.0030762-d-15
OPERATIONAL NOISE ASSESSMENT
PROPOSED LIGHT DEMOLITION RANGE
CAMP ETHAN ALLEN TRAINING SITE, VERMONT
7 JANUARY 2015

1. PURPOSE. To provide a noise assessment for the proposed light demolition range at Camp Ethan Allen Training Site (CEATS) and increased demolition expenditure as the Vermont Army National Guard (VTARNG) will gain an Engineer Battalion in Fiscal Year 2016. Additionally, CEATS anticipates the engineer battalions from the Maine National Guard and the Marine Reserves would use the light demolition range.

2. FINDINGS.

a. Noise Zones II and III from the baseline conditions remain within CEATS indicating that existing annual average noise levels from VTARNG activity are generally compatible with the surrounding environment.

b. The addition of the demolition range and the engineering units increases the size of the Noise Zones. Under the projected conditions, the Land Use Planning Zone extends beyond the northern, southern, and western boundaries. Zone II extends beyond the northern boundary approximately 0.34 mile and beyond the western boundary up to 0.12 miles. To the north, the off-post Zone II encompasses approximately 12 large residential lots which are considered pre-existing, non-conforming land uses. The western off-post Zone II does not contain residential structures. Zone III remains within CEATS.

c. Overall, complaint risk guidelines indicate a moderate probability of receiving noise complaints for both the existing and projected conditions. Under unfavorable weather conditions, there is a small area along the southern boundary (0.44 miles) in the high complaint risk area generated by artillery and mortar firing.

3. RECOMMENDATIONS. Include the consultation information in proposed action environmental analysis documentation. Insert this consultation as an Appendix to the 2013 Noise Plan. The baseline contours developed for this consultation are more representative of the current noise environment than those included in the 2013 Noise Plan, and as such, should be used to support future land use decisions.

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OPERATIONAL NOISE CONSULTATION
No. WS.0030762-d-15
OPERATIONAL NOISE ASSESSMENT
PROPOSED LIGHT DEMOLITION RANGE
CAMP ETHAN ALLEN TRAINING SITE, VERMONT
7 JANUARY 2015

1. REFERENCES. Appendix A contains references used in this consultation. A glossary of terms and abbreviations used are in Appendix B.

2. PURPOSE. To provide a noise assessment for the proposed light demolition range at Camp Ethan Allen Training Site (CEATS) and increased demolition expenditure as the Vermont Army National Guard (VTARNG) will gain an Engineer Battalion in Fiscal Year (FY) 2016. Additionally, CEATS anticipates the engineer battalions from the Maine National Guard and the Marine Reserves would use the light demolition range.

3. GENERAL. The proposed demolition range is adjacent to the existing demolition range (Range 5-3) (Figure 1).

4. LAND USE GUIDELINES.

a. Army Regulation (AR) 200-1 translates noise exposure on communities into Noise Zones (see Table 1) (U.S. Army 2007). Regulation guidelines state that for land use planning purposes, noise-sensitive land uses range from acceptable to not compatible within the Noise Zones. Examples of noise-sensitive land uses are housing, schools, and medical facilities. Within Noise Zones II and III, existing “noise-sensitive” land uses are considered as pre-existing, non-conforming land uses. The intent is to offer land use recommendations, which if adopted both on and off the installation, would facilitate future development that is minimally affected by military noise.

TABLE 1. NOISE LIMITS (AR 200-1)

Noise Zone	Demolition and Large Caliber Activity dB CDNL
LUPZ	57 – 62
I	< 62
II	62 – 70
III	> 70

Notes:
CDNL = C-weighted average Day Night Level, dB = decibel,
LUPZ = Land Use Planning Zone

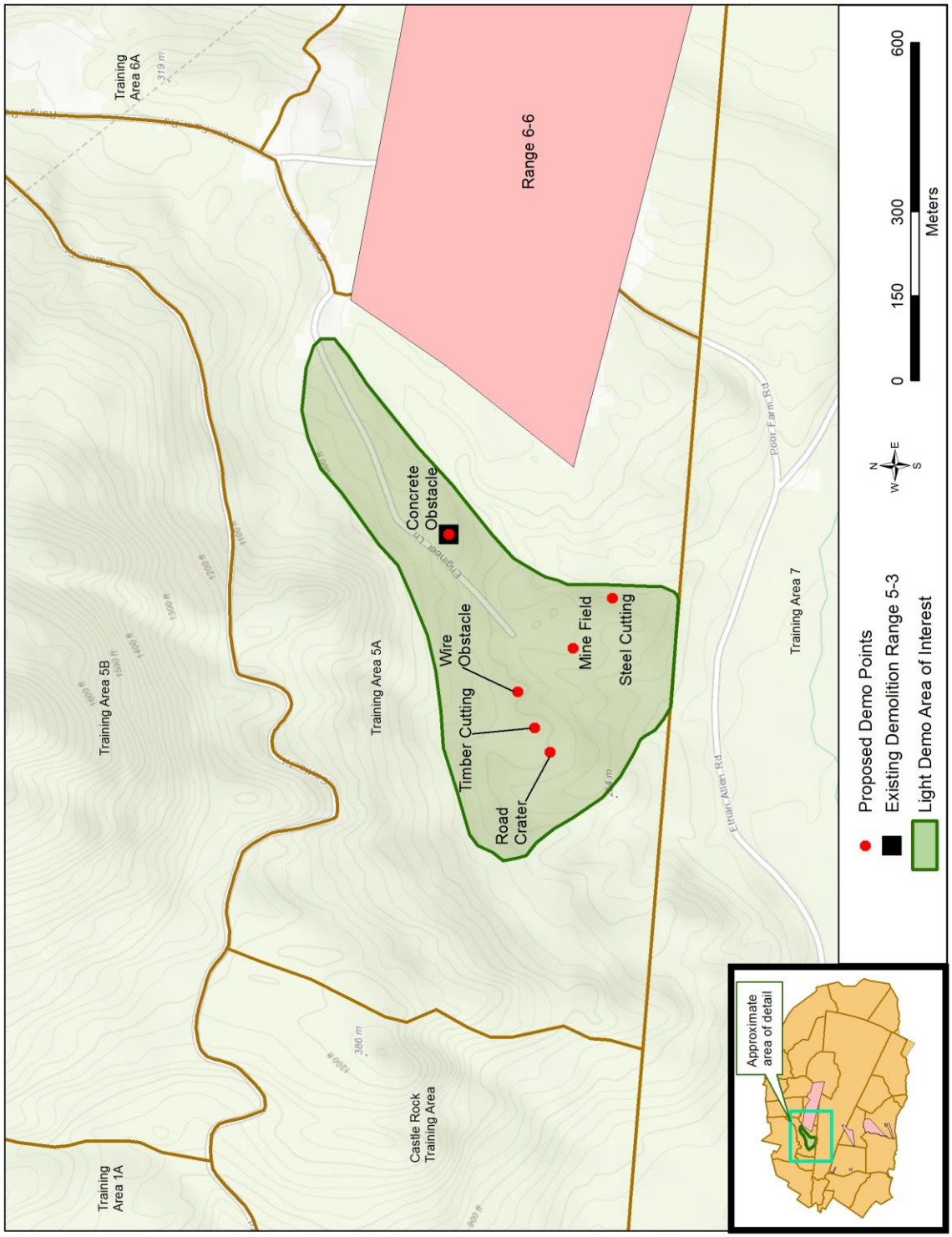


FIGURE 1. PROPOSED DEMOLITION RANGE LOCATION

b. Per AR 200-1 guidelines:

- Zone III - Noise-sensitive land uses are not recommended (incompatible).
- Zone II - Although local conditions such as availability of developable land or cost may require noise-sensitive land uses in Zone II, this type of land use is generally not compatible and is strongly discouraged on the installation and in surrounding communities. All viable alternatives should be considered to limit development in Zone II to non-sensitive activities such as industry, manufacturing, transportation and agriculture.
- Zone I - Noise-sensitive land uses are generally acceptable within the Zone I. However, although an area may only receive Zone I levels, military operations may be loud enough to be heard. Zone I is not one of the contours shown on the map; rather it is the entire area outside of the Zone II contour.
- The Land Use Planning Zone (LUPZ) is a subdivision of Zone I. The LUPZ is 5 dB lower than Zone II. Within this area, noise-sensitive land uses are generally acceptable. However, communities and individuals often have different views regarding what level of noise is acceptable or desirable. To address this, some local governments have implemented land use planning measures out beyond the Zone II limits. Additionally, implementing planning controls within the LUPZ can develop a buffer to avert future noise conflicts.

c. Average noise levels are the standard for long-term land use planning, but do not adequately assess community noise complaint risk. This assessment uses supplemental metrics to identify where individual events may reach levels high enough to generate complaints.

(1) Peak noise levels correlate to complaint risk for demolition and large caliber activity as follows:

- Low Risk of Complaints: < 115 dB Peak
- Moderate Risk of Complaints: 115-130 dB Peak
- High Risk of Complaints: > 130 dB Peak

(2) Peak levels and are highly dependent on weather conditions. Therefore, two sets of contours are presented:

- Unfavorable Weather Conditions: The PK15(met) is the peak sound level, factoring in the statistical variations caused by weather, likely to be exceeded only 15% of the time (i.e., 85% certainty that sound will be within this range). These levels occur under weather conditions that enhance sound propagation.

- Neutral (Favorable) Weather Conditions: The PK50(met) is the peak level that would be expected 50% of the time. The levels would be seen during neutral weather conditions.

5. NOISE CONTOURING PROCEDURES.

a. The BNOISE2 modeling program calculates noise levels generated by the firing of large arms (20mm and greater) and high-explosive charges. The sounds from large arms, demolitions, and other impulsive sounds generally create the largest complaint issues because the sound can travel so far, it is so difficult to mitigate and it can be accompanied by vibration that may increase the public's annoyance. The CDNL contours were developed based on an assessment period used of 104 days.

b. The demolition and large caliber (20mm and greater) noise contours were developed based on the VTARNG ammunition utilization tables located in Appendix C. Not all of the CEATS firing points and ranges are used over the course of year. Which ranges are utilized varies from year to year depending upon training mission requirements, such as the type of training to be completed; the unit being trained; and deployment status. Due to deployments during the past few years, a single annual ammunition expenditure would not be considered representative of the normal/routine or baseline operating tempo. Therefore, an amalgamation of the activity occurring was created using FYs 2012 - 2014. This three-year period provides the routine training, pre-deployment training, the recertification training, and return to routine training activity.

c. The proposed demolition activity is based on Department of the Army Pamphlet 350-38 Standards in Training Commission FY 2015 demolition information for Reserve Component engineer units and Brigade Combat Teams (U.S. Army 2015).

6. NOISE ASSESSMENT.

a. Baseline Conditions.

(1) Figure 2 contains the baseline (existing) demolition and large caliber weapons Noise Zones. Although the Noise Zones are larger than those presented in the 2013 VTARNG Noise Plan (U.S. Army 2013), annual average noise levels are still compatible with the surrounding land uses. The LUPZ extends beyond the northern boundary approximately 600 meters (0.37 mile). The increased Howitzer expenditure (791 rounds) in FYs 2012 – 2014 is the primary driver of the increased Noise Zones. In FYs 2009 – 2011 there were only 80 Howitzer rounds fired.

(2) Table 2 lists the total acreage for each Noise Zone, as well as the acreage of the portion extending off the installation boundary. The LUPZ extends beyond the northern boundary approximately 600 meters (0.37 miles) encompassing residential and agricultural land uses in the Town of Underhill (Figure 3).

TABLE 2. BASELINE CONDITIONS NOISE ZONE ACREAGE

Noise Zone	Total Acreage	Off-Post Acreage
LUPZ	2,129	252
Zone II	1,988	0
Zone III	1,131	0

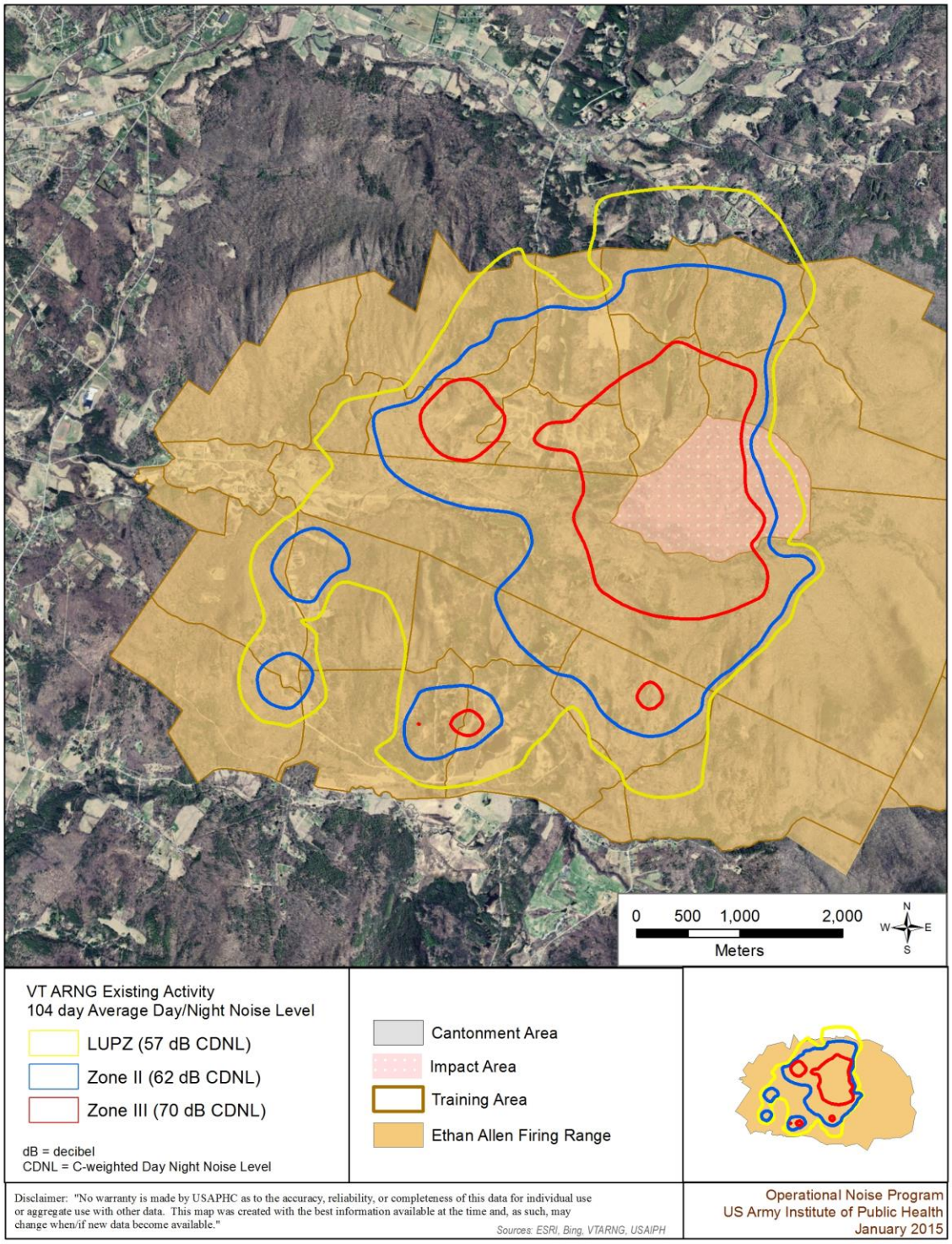


FIGURE 2. BASELINE CONDITIONS NOISE ZONES

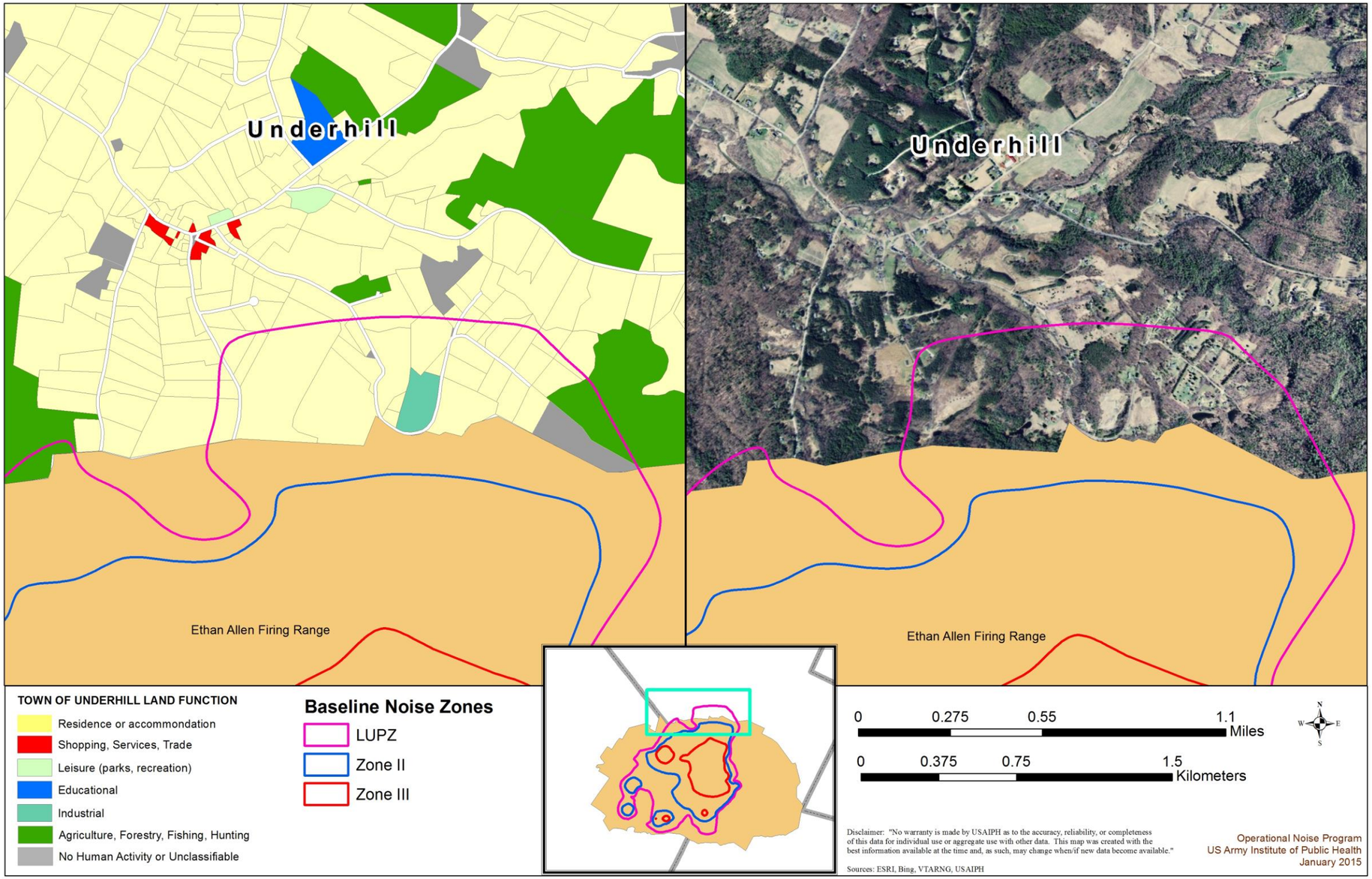


FIGURE 3. DETAILED VIEW OFF-POST BASELINE CONDITIONS NOISE ZONE

b. Projected Conditions.

(1) Figure 4 contains the Noise Zones for the existing activity and the proposed demolition range. The addition of the demolition range and additional engineering units increases the size of the Noise Zones. The LUPZ extends beyond the northern boundary approximately 1,900 meters (1.18 mile), beyond the southern boundary 1,100 meters (0.68 miles), and beyond the western boundary up to 1,600 meters (0.99 miles). Zone II extends beyond the northern boundary approximately 550 meters (0.34 mile) and beyond the western boundary up to 200 meters (0.12 miles).

(2) Table 3 lists the total acreage for each Noise Zone, as well as the acreage of those portions extending off the installation boundary. Table 4 lists the off-post acreage and the general land use within. Figures 5 – 7 depict the off-post acreage and general land uses.

TABLE 3. PROJECTED CONDITIONS NOISE ZONE ACREAGE

Noise Zone	Total Acreage	Off-Post Acreage
LUPZ	3,525	2,082
Zone II	2,524	155
Zone III	2,655	0

TABLE 4. PROJECTED CONDITIONS OFF-POST NOISE ZONE ACREAGE AND GENERAL LAND USE

Town	Noise Zone	Off-Post Acreage	Off-Post Land Uses/Functions
Bolton	LUPZ	551	Agricultural, Commercial, Industrial, Residential, Wooded
	Zone II	0	n/a
	Zone III	0	n/a
Jericho	LUPZ	497	Primarily Residential, Agricultural, Industrial, Wooded
	Zone II	9	Primarily Wooded, Small Residential Portion (no structures)
	Zone III	0	n/a
Underhill	LUPZ	1,034	Primarily Residential, Agricultural, Commercial
	Zone II	146	Land Function Primarily Residential (large lots with < 12 structures), Industrial, Wooded
	Zone III	0	n/a

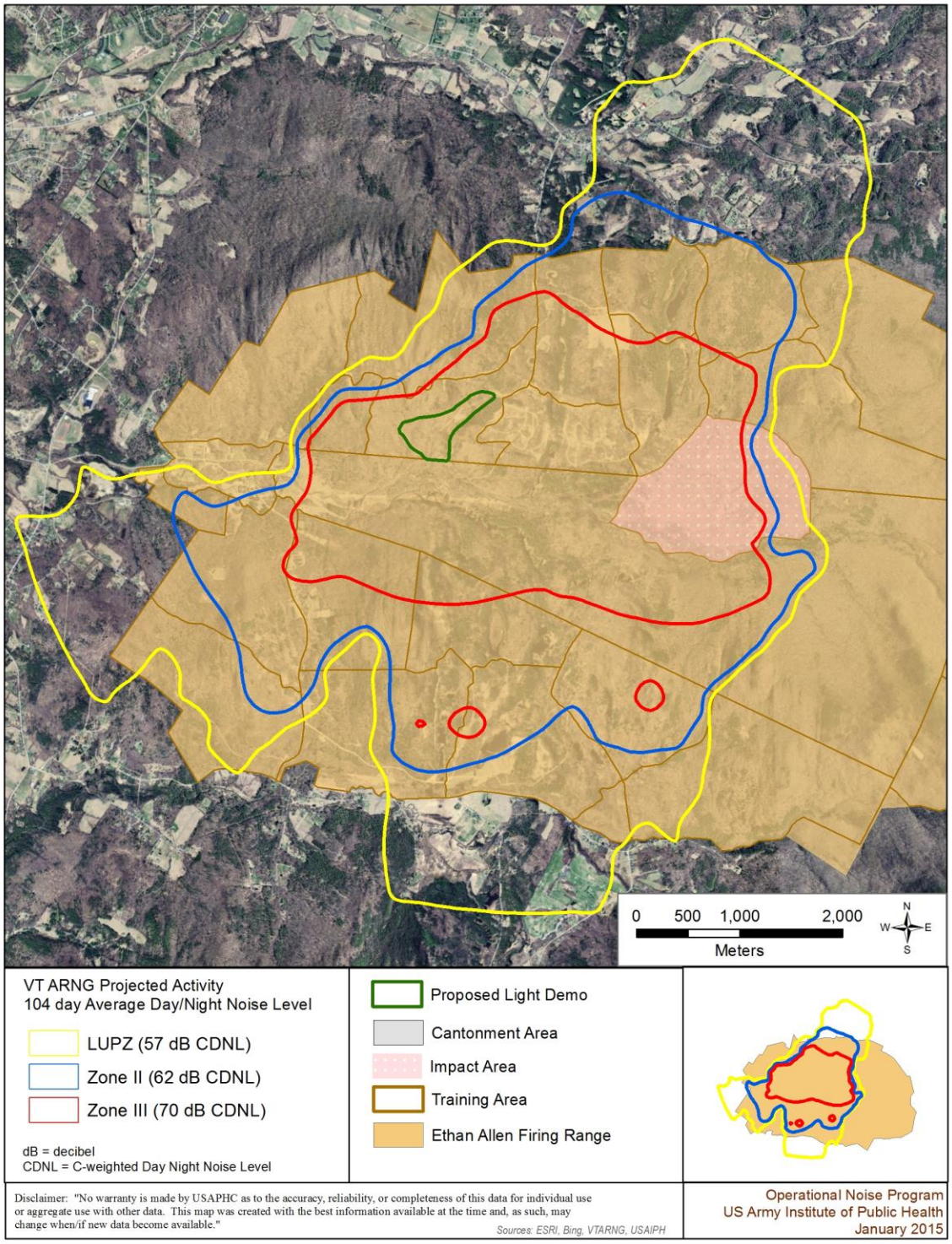


FIGURE 4. PROJECTED CONDITIONS NOISE ZONES

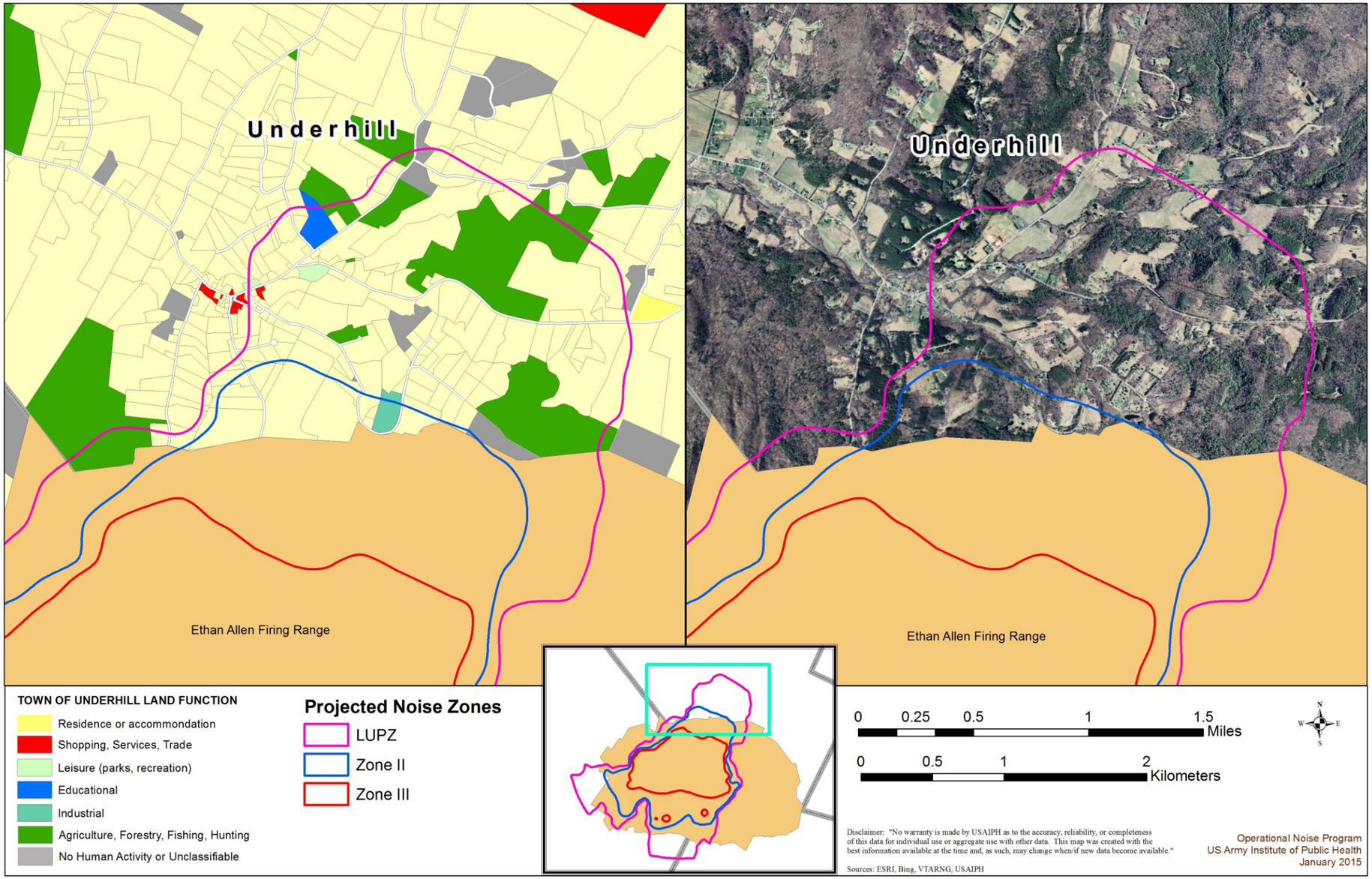


FIGURE 5. DETAILED VIEW NORTHERN OFF-POST PROJECTED CONDITIONS NOISE ZONES

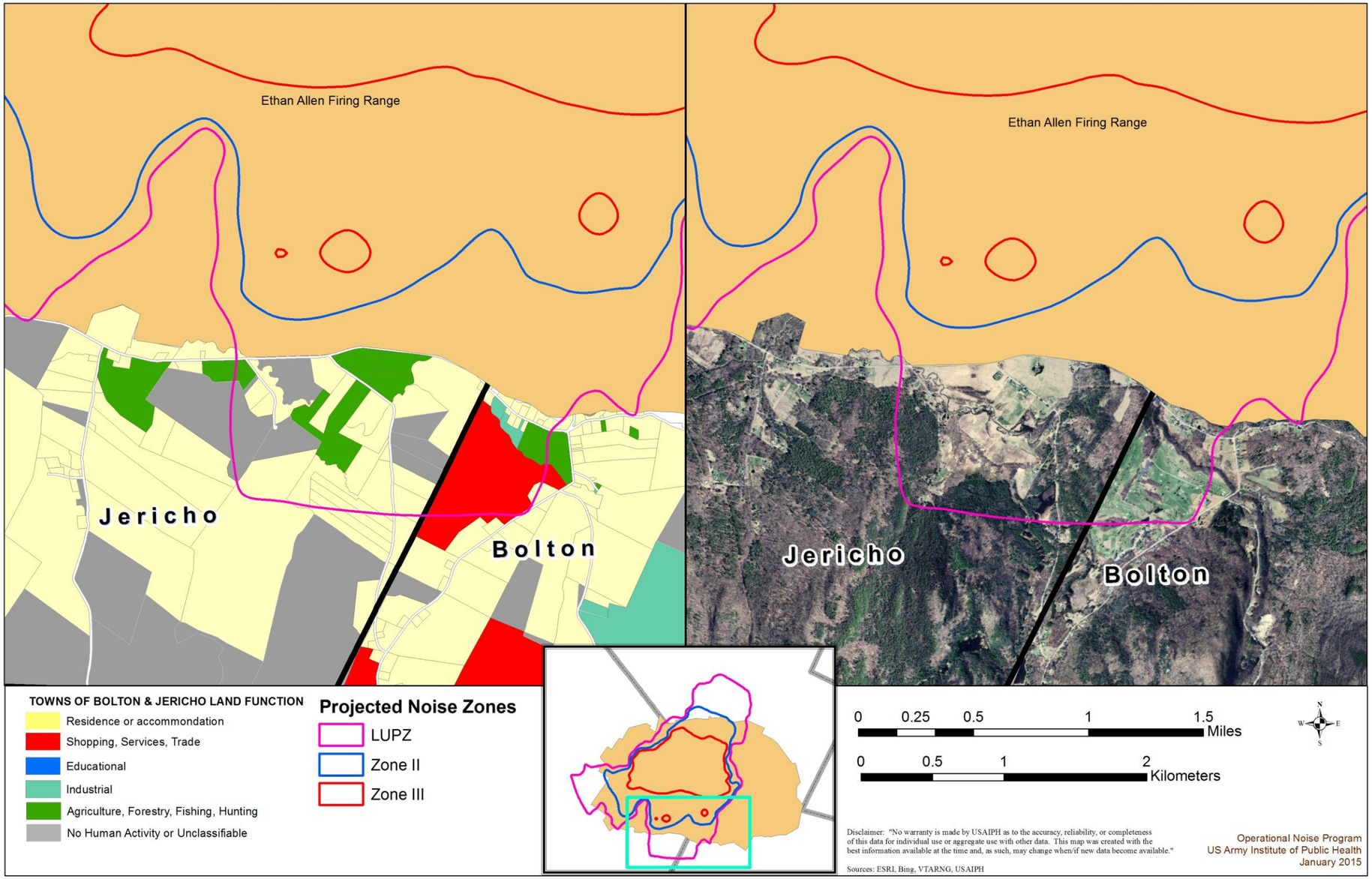


FIGURE 6. DETAILED VIEW SOUTHERN OFF-POST PROJECTED CONDITIONS NOISE ZONES

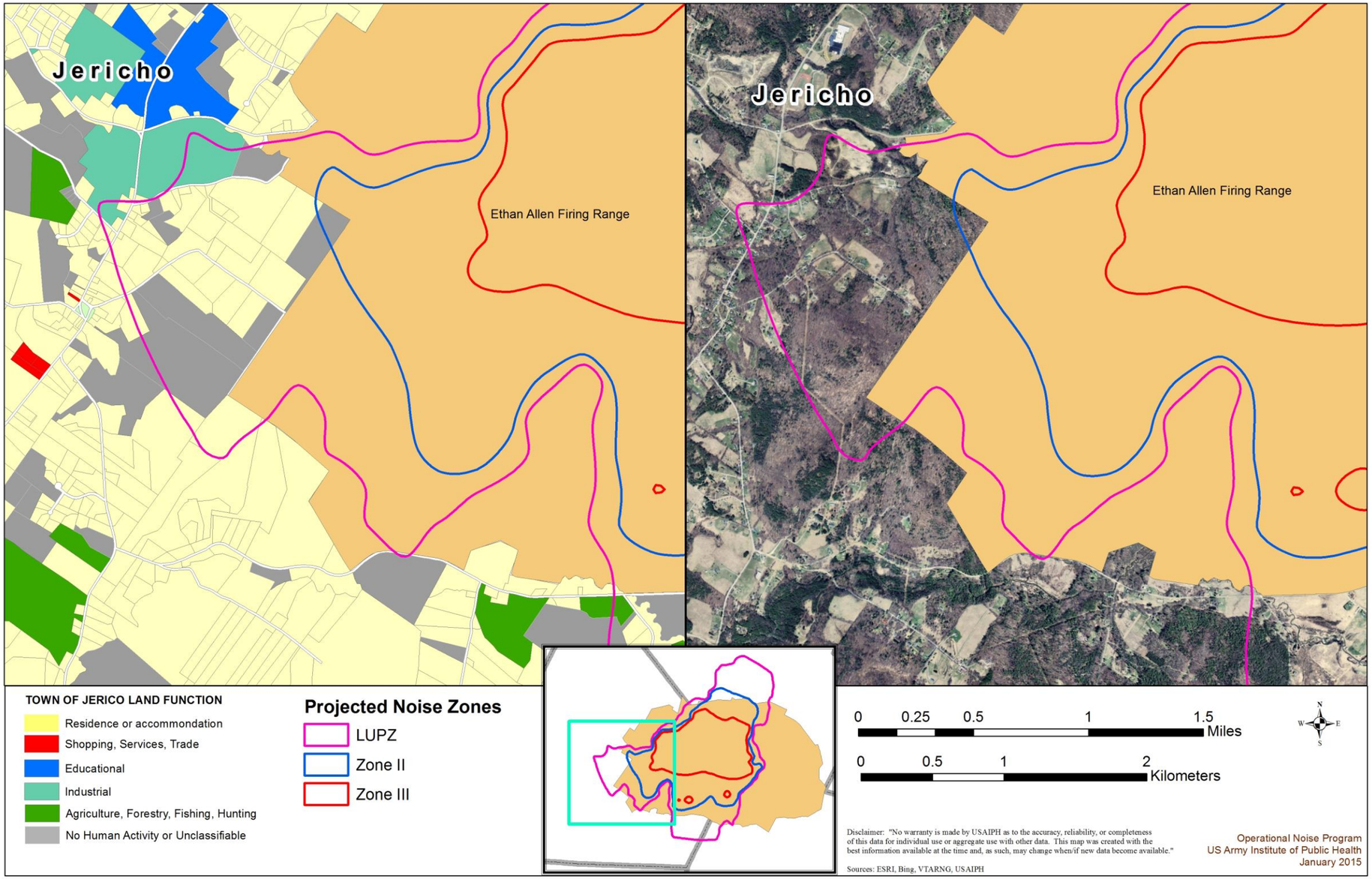


FIGURE 7. DETAILED VIEW WESTERN OFF-POST PROJECTED CONDITIONS NOISE ZONES

c. Complaint Risk Baseline Conditions. Figure 8 depicts peak noise levels for the baseline large caliber and demolition activity.

(1) Under unfavorable weather conditions [PK15(met)] the moderate complaint risk area encompasses the Towns of Underhill to the north and Bolton to the south. The moderate complaint risk levels extend less than 800 meters (0.5 miles) beyond the western boundary; this area is primarily undeveloped. The high complaint risk area extends approximately 700 meters (0.44 miles) beyond the southern boundary encompassing approximately three dozen homes. The off-post high complaint risk area is driven by artillery and mortar firing.

(2) Under neutral weather conditions [PK50(met)], there is a moderate risk of generating noise complaints along the northern and southern boundaries. The high complaint risk areas remain limited to the area surrounding the firing points and ranges.

d. Complaint Risk Projected Conditions. Figure 9 depicts peak noise levels for the baseline large caliber and demolition activity. The addition of the larger demolition charges increases the moderate complaint risk area to the west.

(1) Under unfavorable weather conditions, the moderate complaint risk area encompasses the Towns of Underhill to the north, Bolton to the south, and Jericho to the west. The high complaint risk area extends approximately 700 meters (0.44 miles) beyond the southern boundary. The off-post high complaint risk area is driven by artillery and mortar firing.

(2) Under neutral weather conditions, there is a moderate risk of generating noise complaints along the northern, southern, and western boundaries. The high complaint risk areas remain limited to the area surrounding the firing points and ranges.

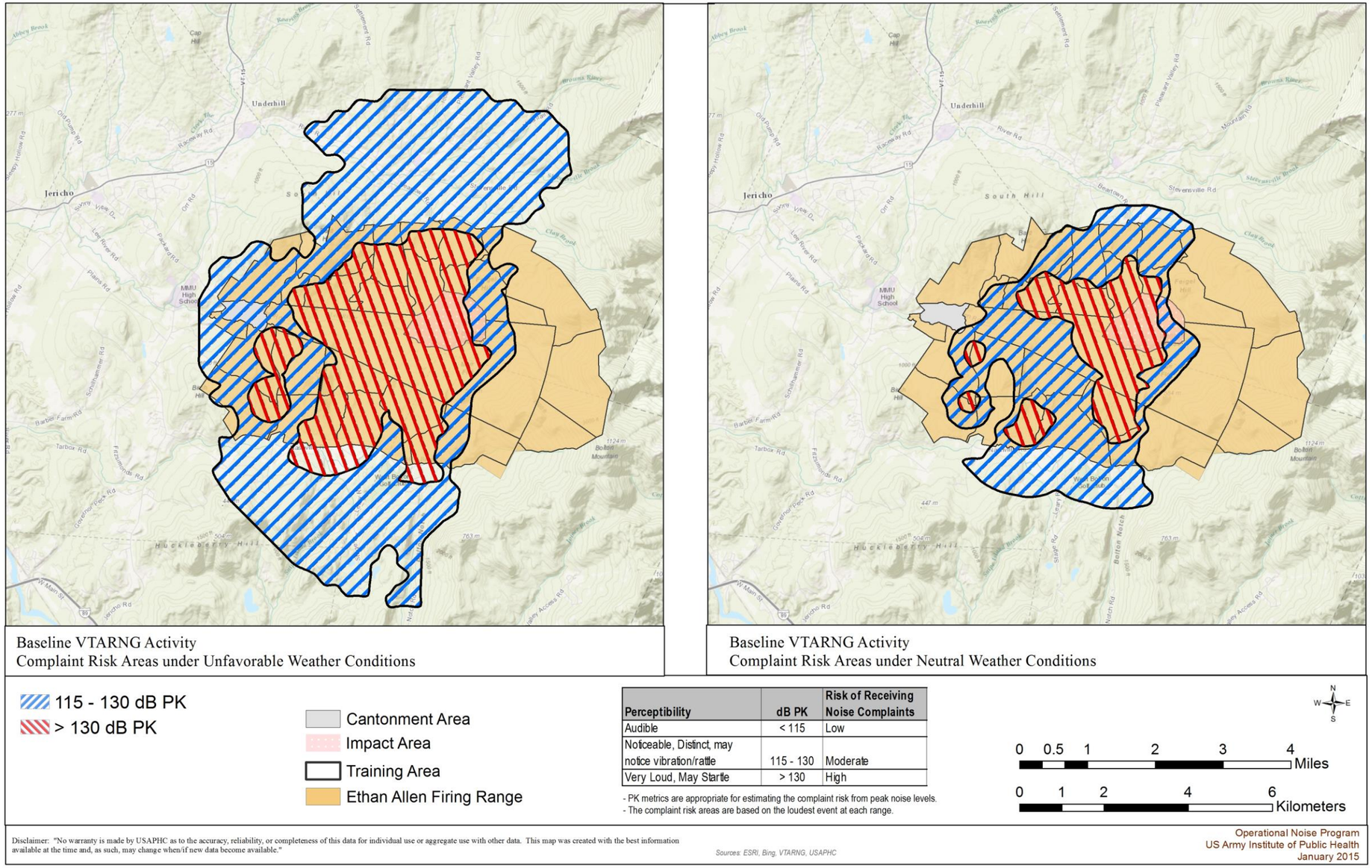


FIGURE 8. BASELINE CONDITIONS COMPLAINT RISK

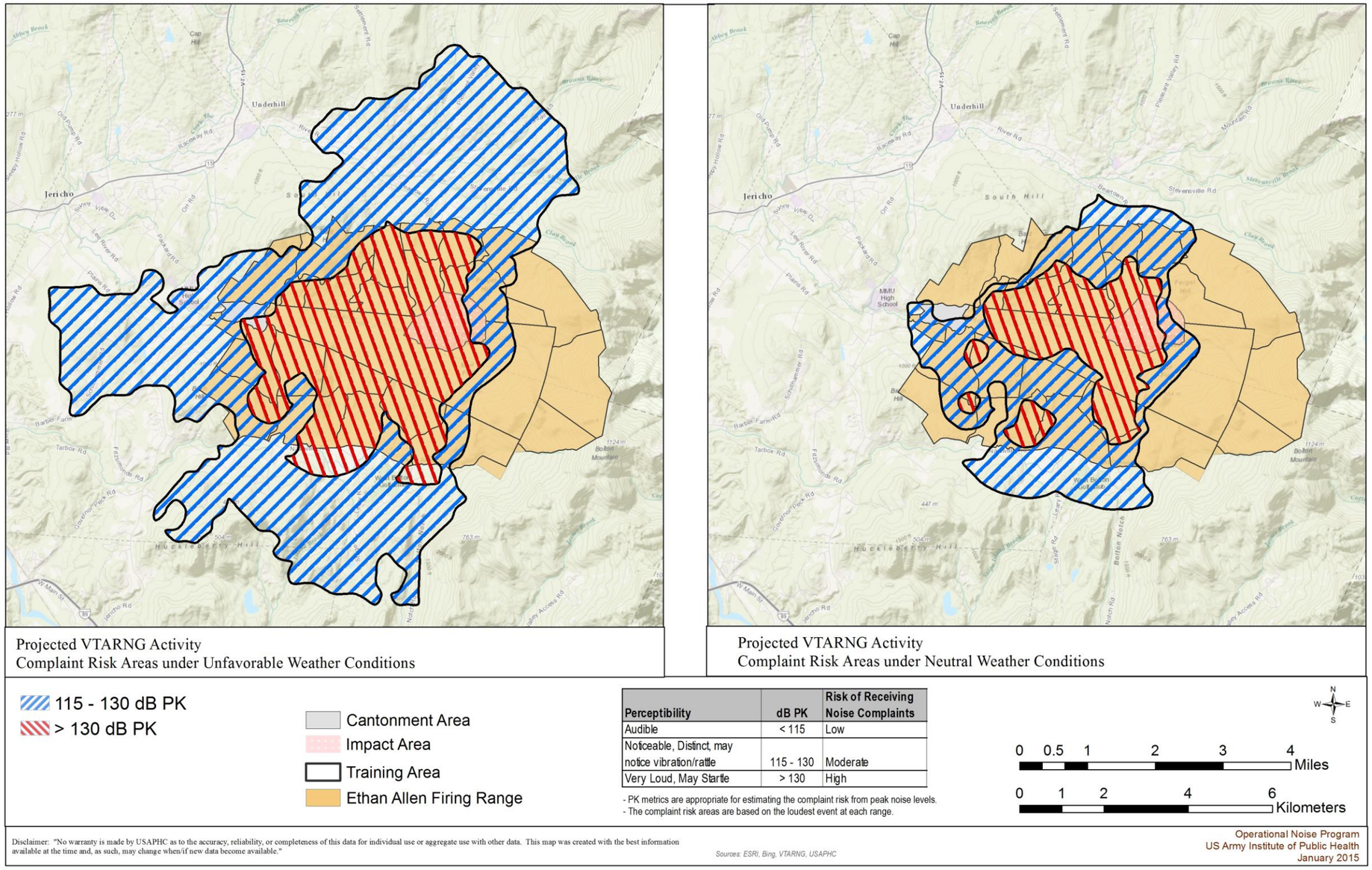


FIGURE 9. PROJECTED CONDITIONS COMPLAINT RISK

7. FINDINGS.

a. Noise Zones II and III from the baseline conditions remain within CEATS indicating that existing annual average noise levels from VTARNG activity are generally compatible with the surrounding environment.

b. The addition of the demolition range and the engineering units increases the size of the Noise Zones. Under the projected conditions, the LUPZ extends beyond the northern, southern, and western boundaries. Zone II extends beyond the northern boundary approximately 550 meters (0.34 mile) and beyond the western boundary up to 200 meters (0.12 miles). The northern off-post Zone II encompasses approximately 12 residential properties which are considered pre-existing, non-conforming land uses. The western off-post Zone II does not contain residential structures. Zone III remains within CEATS.

c. Overall, complaint risk guidelines indicate a moderate probability of receiving noise complaints for both the existing and projected conditions. Under unfavorable weather conditions, there is a small area along the southern boundary (0.44 miles) in the high complaint risk area generated by artillery and mortar firing.

8. RECOMMENDATIONS. Include the consultation information in proposed action environmental analysis documentation. Insert this consultation as an Appendix to the 2013 Noise Plan. The baseline contours developed for this consultation are more representative of the current noise environment than those included in the 2013 Noise Plan, and as such, should be used to support future land use decisions.

For: KRISTY BROSKA
Environmental Protection Specialist
Operational Noise

APPROVED:

CATHERINE STEWART
Program Manager
Operational Noise

APPENDIX A

REFERENCES

1. U.S. Army, 2007, Army Regulation 200-1, Environmental Protection and Enhancement, Chapter 14 Operational Noise.

2. U.S. Army, 2009, Construction Engineering Research Laboratories, BNOISE2 Computer Model, Version 2009-11-30.

3. U.S. Army 2013, Army Institute of Public Health, Vermont Army National Guard Statewide Operational Noise Management Plan, May 2013.

4. U.S. Army 2015, Department of the Army Pamphlet 350-38 Standards in Training Commission, October 2015.

APPENDIX B

GLOSSARY OF TERMS, ACRONYMS & ABBREVIATIONS

B-1. GLOSSARY OF TERMS.

Average Sound Level – the mean-squared sound exposure level of all events occurring in a stated time interval, plus ten times the common logarithm of the quotient formed by the number of events in the time interval, divided by the duration of the time interval in seconds.

C-Weighted Sound Level – a quantity, in decibels, read from a standard sound level meter with C-weighting circuitry. The C-scale incorporates slight de-emphasis of the low and high portion of the audible frequency spectrum. It is used when measuring low frequency sound such as those from large arms, demolitions, and sonic booms.

Day-Night average sound Level (DNL) – the 24-hour average frequency-weighted sound level, in decibels, from midnight to midnight, obtained after addition of 10 decibels to sound levels in the night from midnight up to 7 a.m. and from 10 p.m. to midnight (0000 up to 0700 and 2200 up to 2400 hours).

Decibels (dB) – a logarithmic sound pressure unit of measure.

Land Use Planning Zone (LUPZ) – DNL noise contours represent an annual average that separates the Noise Zone II from the Noise Zone I for demolition and large caliber activity.

Noise – any sound without value.

PK15(met) – the maximum value of the instantaneous sound pressure for each unique sound source, and factoring in the statistical variations caused by weather, that is likely to be exceeded only 15% of the time (i.e., 85% certainty that sound will be within this range). The PK15(met) levels would occur under weather conditions that enhance sound propagation.

PK50(met) – the maximum value of the instantaneous sound pressure for each unique sound source, and factoring in the statistical variations caused by weather, that would be expected 50% of the time. These levels would be seen during weather conditions that neither enhance nor diminish sound propagation.

B-2. GLOSSARY OF ACRONYMS AND ABBREVIATIONS.

AR	Army Regulation
BNOISE2	Blast Noise Impact Assessment
CEATS	Camp Ethan Allen Training Site
CDNL	C-weighted Day Night average sound Level
dB	decibel
FY	Fiscal Year
LUPZ	Land Use Planning Zone
PK15(met)	Unweighted Peak, 15% Metric
PK50(met)	Unweighted Peak, 50% Metric
STRAC	Standards in Training Commission
VTARNG	Vermont Army National Guard

APPENDIX C

DEMOLITION AND LARGE CALIBER EXPENDITURE

C-1. REFERENCE. U.S. Army 2015, Department of the Army Pamphlet 350-38 Standards in Training Commission, October 2015.

C-2. Not all of the CEATS firing points and ranges are used over the course of year. Which ranges are utilized varies from year to year depending upon training mission requirements, such as the type of training to be completed; the unit being trained; and deployment status. Due to deployments during the past few years, a single annual ammunition expenditure would not be considered representative of the normal/routine or baseline operating tempo. Therefore, an amalgamation of the typical unit activity occurring was created using Fiscal Years (FY) 2009 – 2011 (Table C-1). This three year period provides the routine training, pre-deployment training, the recertification training, and return to routine training activity. Pyrotechnic simulators that produce little to no noise (i.e. flash bang, illum, smoke) were not included in the land use noise analysis.

C-3. The projected Noise Zones are based on the baseline expenditure listed in Table C-1 (minus the existing Range 5-3 demolition activity) and the proposed activity listed in Table C-2. The proposed demolition activity is based on Department of the Army (DA) Pamphlet (PAM) 350-38 Standards in Training Commission (STRAC) FY 2015 demolition information for Reserve Component engineer units and Brigade Combat Teams (U.S. Army 2015). The expenditure listed is based 100% STRAC allocation in DA PAM 350-38:

- *Table 6-53: Annual Ammunition Requirements for Combat Engineer/Bridge Units (RC/NG BCT) (4)*
- *Table 6-57: RC BCT Annual Individual Training for Light Engineer Units (1, 2, 3)*
- *Table 6-58: RC Annual Ammunition Requirements for LID EN (1, 2, 3).*

TABLE C-1. BASELINE CONDITIONS NOISE ZONE INPUTS

		Quantity Fired			FY12-FY14 Average	
Facility	Nomenclature	FY12	FY13	FY14	Daytime (0700-2200)	Nighttime (2200-0700)
FP-4	155mm Howitzer, HE		197	402	200	0
	105mm Howitzer, HE	103	66	120	96	0
FP-6	120mm Mortar, HE		60	390	150	0
	120mm Mortar, Inert		36	317	118	0
	155mm Howitzer, HE			72	24	0
	105mm Howitzer, HE	167	51	211	143	0
FP-8	120mm Mortar, HE	24		104	43	0
	120mm Mortar, Inert	8		272	93	0
	105mm Howitzer, HE	180	117	282	193	0
FP-15	120mm Mortar, HE	66			22	0
	Demolition, TNT, 0.5 lb, M031	2			1	0
	81mm Mortar, HE	78	12		30	0
	81mm Mortar, Inert		82		27	0
FP-43	60mm Mortar, Inert		30		10	0
	81mm Mortar, Inert		106		35	0
	120mm Mortar, HE		15	140	52	0
	120mm Mortar, Inert		203		68	0
FP-60	60mm Mortar, HE	22	228	375	208	0
	60mm Mortar, Inert		370	266	212	0
	81mm Mortar, HE			36	12	0
	81mm Mortar, Inert		33	190	74	0
FP-93	81mm Mortar, HE		66	121	62	0
	81mm Mortar, Inert		298		99	0
	155mm Howitzer, HE			58	19	0
	105mm Howitzer, HE	152	89	107	116	0
RANGE 5-3	Demolition, Booster, 0.0254 lb, MN69			10	3	0
	Demolition, C-4, 1.25 lbs, M023	29	114	285	143	0
	Demolition, Cutter, 0.2855 lb, ML04		1	2	1	0
	Demolition, TNT, 0.25 lb, M030		2	12	5	0
	Dynamite, Military, 0.39 lb, M591	1	1	1	1	0
RANGE 6-6	Demolition, C-4, 1.25 lbs, M023		18	4	7	0
TA-03B	Demolition, C-4, 1.25 lbs, M023	18			6	0
TA-04B	Demolition, C-4, 1.25 lbs, M023			3	1	0
	Demolition, Shape Charge, 15 lbs			6	2	0
	Demolition, TNT, 1 lb M032			6	2	0

Notes:
Expenditure is rounded to prevent fractional round counts.
Inert is defined as any round that does not make noise upon impact (i.e. illumination, target practice, smoke, etc...)

TABLE 2 - PROJECTED ANNUAL DEMOLITION ACTIVITY

	DODIC	VTARNG Units	Other Units	Total
Demolition CHG, DEMO BLK 1-1/4# C4	M023	3,400	3,400	6800
Demolition CHG, DEMO 40LB CRATERING	M039	78	78	156
Demolition CHG, DEMO SHAPED 40LB M3 SERIES	M421	72	72	144
Demolition CHG, DEMO SHAPED 15LB M2 SERIES	M420	24	24	48
Demolition DEMO KIT BANGALORE M1A2E1	MP03	13	13	26
Demolition DEMO KIT ANTI-PERS OBSTL BREECH SYS MK7-1 (APOBS)	MN79	3	3	6
Demolition TRAINER, SELECTABLE LTWT ATK MUNITION (SLAM) M320A1	MZ40	3	3	6

Appendix C

PO Box 39, Westford, VT 05494 • Tel (802)-849-6629 • Fax (802)-849-6689 • Email: glforestry@aol.com

Rare, Threatened & Endangered Plants and Natural Communities inventory for the Proposed Light Demolition Range-Vermont National Guard-Ethan Allen Firing Range-Jericho, Vermont

Findings are based on observations from site visits on November 19, 2014 and May 26, 2015 conducted by Brett Engstrom, ecologist & botanist.

This report accompanies Figure 1.1. "Proposed Light Demolition Range Rare, Threatened & Endangered Plant and Natural Communities Inventory", Produced by Greenleaf Consulting, Inc.

Overview:

The study area encompasses 60 acres which have been broken down into two sections. These are the proposed infrastructures (i.e. roads & buildings) and the project area of interest. The proposed infrastructure area consists of +/-9.7 acres. This area has been delineated by Civil Engineering Associates on their "Light Demo: Progress Plan" dated May 21, 2015. The proposed project area of interest consists of +/-50.3 acres and surrounds the areas where infrastructure is proposed. This area has been delineated by Civil Engineering Associates on their "Light Demo: Progress Plan" dated October 27, 2014.

Methods:

A series of documents were reviewed prior to site visits. These include: Plant lists of potential rare, threatened or endangered species known to occur within the project area, and; Historical management documents including past forest management plans, correspondence pertinent to the site and other qualitative and quantitative reports and descriptions. Two botanical field inventories were conducted by Brett Engstrom on November 19, 2014 and May 26, 2015. Herbaceous plant data and observations were collected in both the proposed infrastructure and proposed project area of interest by means of walking through the extent of each.

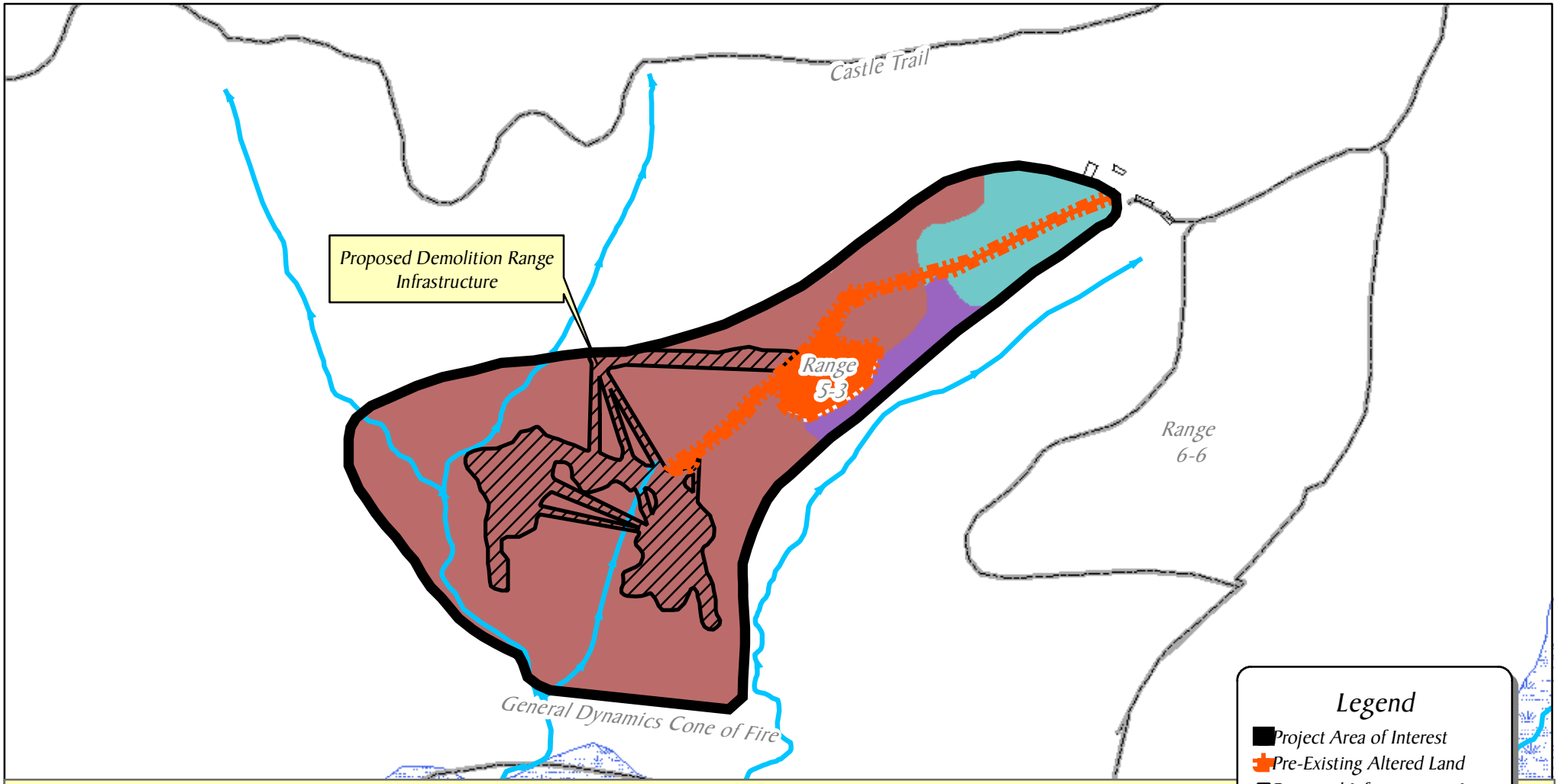
Results:

Plant lists, historical data, qualitative & quantitative descriptions and the two botanical field inventories revealed no federally or state-listed rare, threatened, or endangered plants or natural communities as having occurred or currently occupying the +/- 9.7-acre proposed infrastructure area or the +/-50.3-acre proposed project area of interest.

The proposed infrastructure is situated entirely within the Northern Hardwood Forest Natural Community (State Ranking-5: Very Common). The proposed project area of interest is situated within Hemlock Forest (State Ranking-4: Common) and Hemlock-Northern Hardwood Forest (State Ranking-4: Common). The Natural Community delineations were previously produced by Brett Engstrom.

Conclusion/Discussion:

Two botanical field visits were conducted at the proposed Light Demolition Range at the Vermont National Guard- Ethan Allen Firing Range facility in Jericho, Vermont in November, 2014 and May, 2015. No federally or state-listed rare, threatened or endangered plants' or natural communities' locations were known prior to the botanical site visits. Their absence was confirmed and no federally or state-listed rare, threatened or endangered plants or natural communities were found during the botanical field visits within the project area. Future surveys should be conducted to continually monitor for the establishment of rare, threatened or endangered plants, many of which prefer disturbed ground conditions.



Total Project Area: +/- 60 Acres

Scale=1:7,000
June, 2015

N
W E
S

Meters
0 50 100 200
1 centimeter = 70 meters

Feet
0 400 800 1,600
1 inch = 583 feet

Figure 1.1: Proposed Light Demolition Range

Botanical Environmental Assessment
Proposed Light Demolition Range

Military Department
State of Vermont
Ethan Allen Firing Range
Army National Guard

Lead Consultant
Civil Engineering Associates, Inc.

Natural Community data provided
by Brett Engstrom

Legend

- Project Area of Interest
- Pre-Existing Altered Land
- Proposed Infrastructure Area
- EAFR Streams
- Existing Buildings
- EAFR Roads
- VSWI

Natural Community Type

- Hemlock-N Hardwood Forest
- Hemlock Forest
- Northern Hardwood Forest

This map was produced by Greenleaf Consulting, Inc. Data provided herein is derived from sources with varying levels of accuracy. Greenleaf Consulting, Inc. disclaims all responsibility for the accuracy or completemess of information contained herein.

Appendix D

OFFICE OF THE ADJUTANT GENERAL
789 Vermont National Guard Road
Colchester, Vermont 05446-3099

NGVT-LOG-EJ 24 JUL 2019

MEMORANDUM FOR Record

SUBJECT Endangered Species Act, Section 7 Consultation

1. The Vermont Army National Guard (VTARNG) Environmental Office has conducted surveys and consultation to meet the Endangered Species Act Section 7 requirements. A current list of Rare, Threatened, or Endangered Species is obtained at both the State of Vermont Fish and Wildlife website,http://www.vtfishandwildlife.com/wildlife_nongame.cfm. and the U.S. Fish and Wildlife website, http://www.fws.gov

2. It was determined after field surveys and historical data review by Northern Stewards, that there may be an impact to the Northern long-eared bat (NLEB). Consultation was completed and concurrence of not likely to adversely affect determination was received in a letter dated October 2015 from USFWS.

3. Besides the NLEB, there are no other Listed State or Federal Species present at the Ethan Allen Firing Range. Surveys were conducted by Vesper Environmental and Northern Stewards.

4. With the concurrence letter from USFWS dated October 2015 and the other Threatened and Endangered Species list review and surveys from Northern Stewards, the VTARNG considers section 7 consultation for this project to be complete.

Sincerely

Mike O'Hara
Natural Resource Manager
State of Vermont Military Dept.

Impacts to Wildlife and Wildlife Habitat from the Light Demolition Range

Completed June 2015
By Allan Thompson
Certified Wildlife Biologist
Of Northern Stewards LC

Waterbury, VT
802-244-8131
northernstewards@gmail.com

Summary

Northern Stewards assessed the impacts of the Light Demolition Range on wildlife and wildlife habitat considered to be rare, state or federally threatened or endangered and those considered species of greatest conservation need (SGCN) and collectively referred to as R, T or E's. Bat surveys, including acoustic surveys for the northern long-eared bat, were complete may/June 2015. Bat surveys concluded with having recorded calls that are considered possible northern long eared bats. Follow up trapping surveys is recommended. The northern long-eared bat may be impacted by the construction of the Light Demo Range and the use of explosives, if the noise impacts differ from those in the past. Details of this survey can be found in an addendum (2015 LDR Bat Acoustic Survey) There are no significant impacts to other R,T, or E wildlife species or habitats from the creation, proposed activities, or the future management of the LDR. No R,T,E species were observed, reported, or potentially using these areas. The loss forest will have displaced common species that require the mid to late successional forests that were removed to create the LDR. Some uncommon birds and mammals that require these forests will avoid the newly created young forest/field conditions of the Range, without negative impact to populations.

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Summary of Impact

3. Introduction to the site, species and habitat present
6. Methods
9. Impacts to Amphibians
11. Impacts to Reptiles
12. Impacts to Mammals
16. Impacts to Birds

Appendices

i. List of species observed
ii. VT Fish and Wildlife list of Rare and Uncommon Animals (2012)

Intro

The proposed Light Demolition Range (LDR) is a live fire demolition and explosive facility. The facility is a multi-station facility that will allow units to train on the use and employment of explosives in various applications such as timber cutting, steel cutting, and obstacle reduction. Nested in the heart of the Ethan Allen Firing Range, the LDR uses the natural mountainous landscape to establish each station. Each station has a specific mission tasks that can be applied in either rural or urban settings.

The LDR area of interest (AOI) encompasses 60 acres and includes associated forests, training stations, facilities, and support buildings. Within this AOI is a roughly 10 acre area footprint where roads, buildings, training sites or forest clearings associated with the LDR is located. Habitat associated with the AOI consists of mid-late successional Northern Hardwoods with oak and birch components and includes small two small streams and associated seeps. Forest openings offer foraging areas for birds, bats and small insects.

Vermont is home to a suite of state or federally listed species found below. Of these only a few have been observed on the EAFR. The timber rattlesnake was likely present historically but has since been extirpated from the area. The state endangered little brown bat and Federally Endangered northern long-eared bat were observed during a 2007 acoustic and trapping survey. Since then, trapping surveys occurring in various locations within the range have not observed the Northern long-eared bat or little brown bat. Acoustic surveys performed annually have observed little brown bats. The state threatened eastern whip-poor-will, common nighthawk and grasshopper sparrow have all been observed utilizing the open field conditions of range 6-6. The last report of the whip-poor-will and nighthawks were reported in the late 90's. The most recent grasshopper sparrow report comes from 2012 and is assumed to be present.

Vermont is home to the following state and federally threatened and endangered species.

Scientific Name	Common Name	State Status	Federal Status
Amphibians			
Pseudacris maculata	Boreal Chorus Frog	E	
Reptiles			
Clemmys guttata	Spotted Turtle	E	
Apalone spinifera	Spiny Softshell turtle	T	
Plestiodon fasciatus	Common Five-lined Skink	E	
Coluber constrictor	North American Racer	T	
Pantherophis alleghaniensis	Eastern Ratsnake	T	
Crotalus horridus	Timber Rattlesnake	E	
Mammals			
Myotis leibii	Eastern Small-footed Bat	T	
Myotis lucifugus	Little Brown Bat	E	
Myotis septentrionalis	Northern Long-eared Bat	E	LE
Myotis sodalis	Indiana Bat	E	LE
Perimyotis subflavus	Tri-colored Bat	E	
Canis lupus	Wolf	Extirpated	LE
Lynx canadensis	Canadian Lynx	E	LT
Puma concolor	Eastern Mountain Lion	Extirpated	LE
Martes americana	American Marten	E	
Birds			
Falcipennis canadensis	Spruce Grouse	E	
Haliaeetus leucocephalus	Bald Eagle	E	
Bartramia longicauda	Upland Sandpiper	E	
Chlidonias niger	Black Tern	E	
Sterna hirundo	Common Tern	E	
Chordeiles minor	Common Nighthawk	E	
Caprimulgus vociferus	Eastern Whip-poor-will	T	
Lanius ludovicianus	Loggerhead Shrike	E	
Cistothorus platensis	Sedge Wren	E	
Ammodramus henslowii	Henslow's Sparrow	E	
Ammodramus savannarum	Grasshopper Sparrow	T	

Listed Species possibly or historically using the EAFR

Scientific Name	Common Name	Presence Confirmed	Presence Likely
Crotalus horridus	Timber Rattlesnake	Likely Historically	No
Myotis sodalis	Indiana bat	No	No
Myotis leibii	Eastern Small-footed Bat	No	?
Myotis lucifugus	Little Brown Bat	Yes	Yes
Myotis septentrionalis	Northern Long-eared Bat	Yes (not since 2007)	Yes
Perimyotis subflavus	Tri-colored Bat	No	?
Haliaeetus leucocephalus	Bald Eagle	No	No
Chordeiles minor	Common Nighthawk	Historically	No
Caprimulgus vociferus	Eastern Whip-poor-will	Historically	No
Ammodramus savannarum	Grasshopper Sparrow	Yes	Yes

Of the Federally listed species, the Indiana bat (*Myotis sodalis*) is restricted to Champlain Valley towns and has not been observed north or east of Hinesburg, VT. There are no known populations of the federally endangered eastern Mountain Lion (*Puma concolor cougar)* in Vermont, despite the frequent reports. Canada Lynx, the Federally threatened cat, is now regularly being observed in the Northeast kingdom and New Hampshire spruce fir lowlands. Current (2012-2015) surveys are underway by Vermont Fish and Wildlife to determine extent of use. It is assumed that these populations are established in the State of Vermont but are restricted by low numbers and preferred habitats and do not exist at the EAFR.

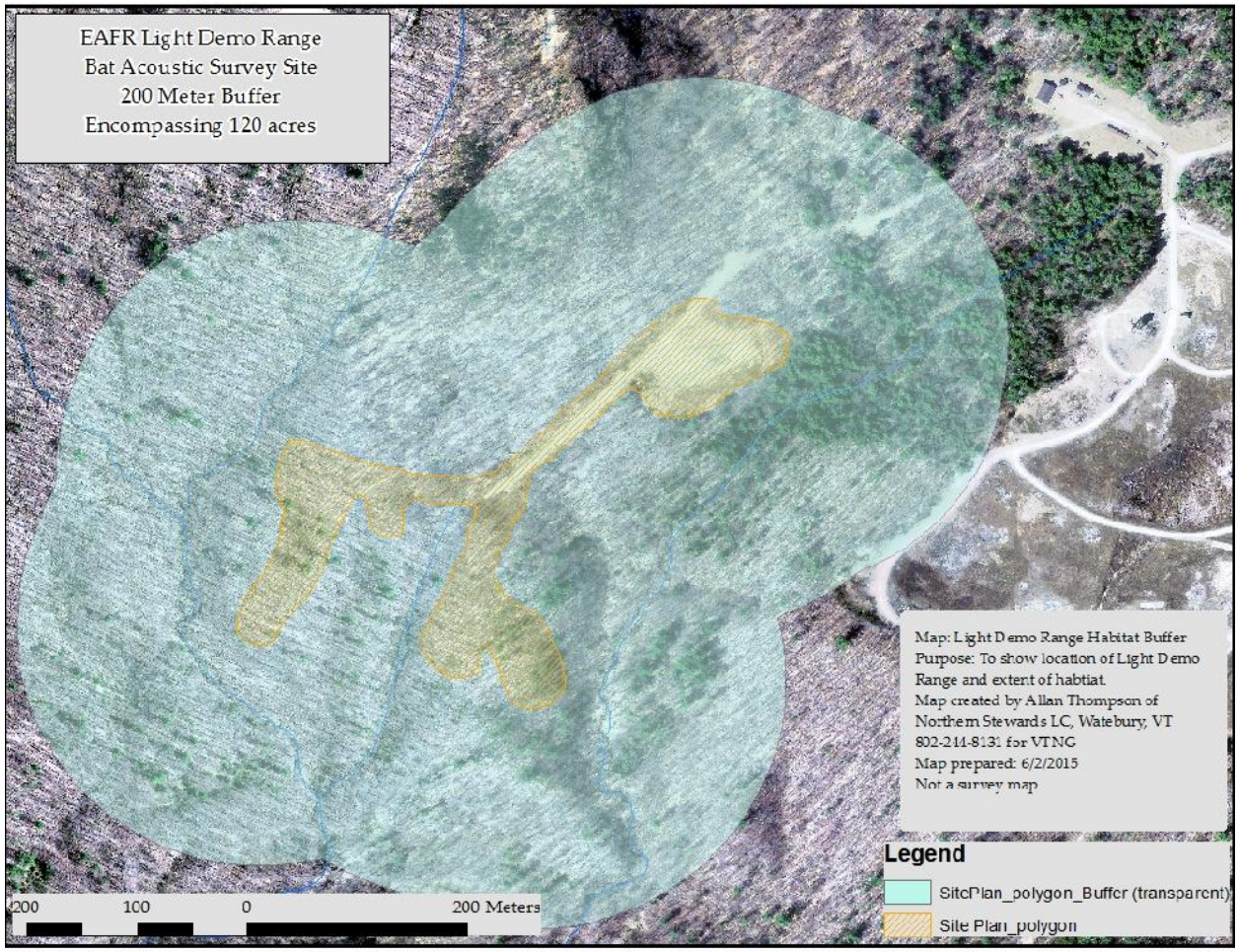
The Federally Endangered northern long-eared bat (*Myotis septentrionalis)* was observed in summer 2007 during summer trapping sessions and acoustic surveys. Since then trapping efforts or acoustics survey efforts have not observed the northern long-eared bat.

Methods

I identified the footprint of the LDR as encompassing a 10 acre footprint along with a 200 meter buffer from this footprint. This Habitat AOI (HAOI) is a roughly 120 acre area that includes habitats similar to the AOI: mid to late successional northern hardwood forests with two streams. These hardwood forests provide habitat for forest interior species typical of central Vermont northern hardwood landscapes. The Lee River wetland complex is about 500 meters from the HAOI survey site, the 6 Range series is roughly 1000 meters away and offers open field conditions. To the north and west are cliffs and ledges used for climbing, some with associated talus slope

In order to document the impact of the creation, proposed activities and the management of the LDR on state and/or federally listed as threatened, or species considered medium or high priority Species of Greatest Conservation Need (SGCN) amphibians, reptiles, mammals, or birds (see wildlife list appendix 1), previous studies and literature were reviewed, habitat assessments were made, and wildlife inventories were conducted during 2015.

The previous work occurred in areas throughout the EAFR; vernal pools were mapped and species present were documented in the eastern portion of the EAFR in ~2007. Previous general wildlife observation reports from Upland Forestry were reviewed and previous Northern Stewards studies of small mammals, birds, amphibians and reptiles, bats and tracking surveys were reviewed.


EAFR Light Demo Range
Bat Acoustic Survey Site
200 Meter Buffer
Encompassing 120 acres
Map: Light Demo Range Habitat Buffer
Purpose: To show location of Light Demo Range and extent of habtiat.
Map created by Allan Thompson of Northern Stewards LC, Watebury, VT 802-244-8131 for VTNG
Map prepared: 6/2/2015
Not a survey map
Legend
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200
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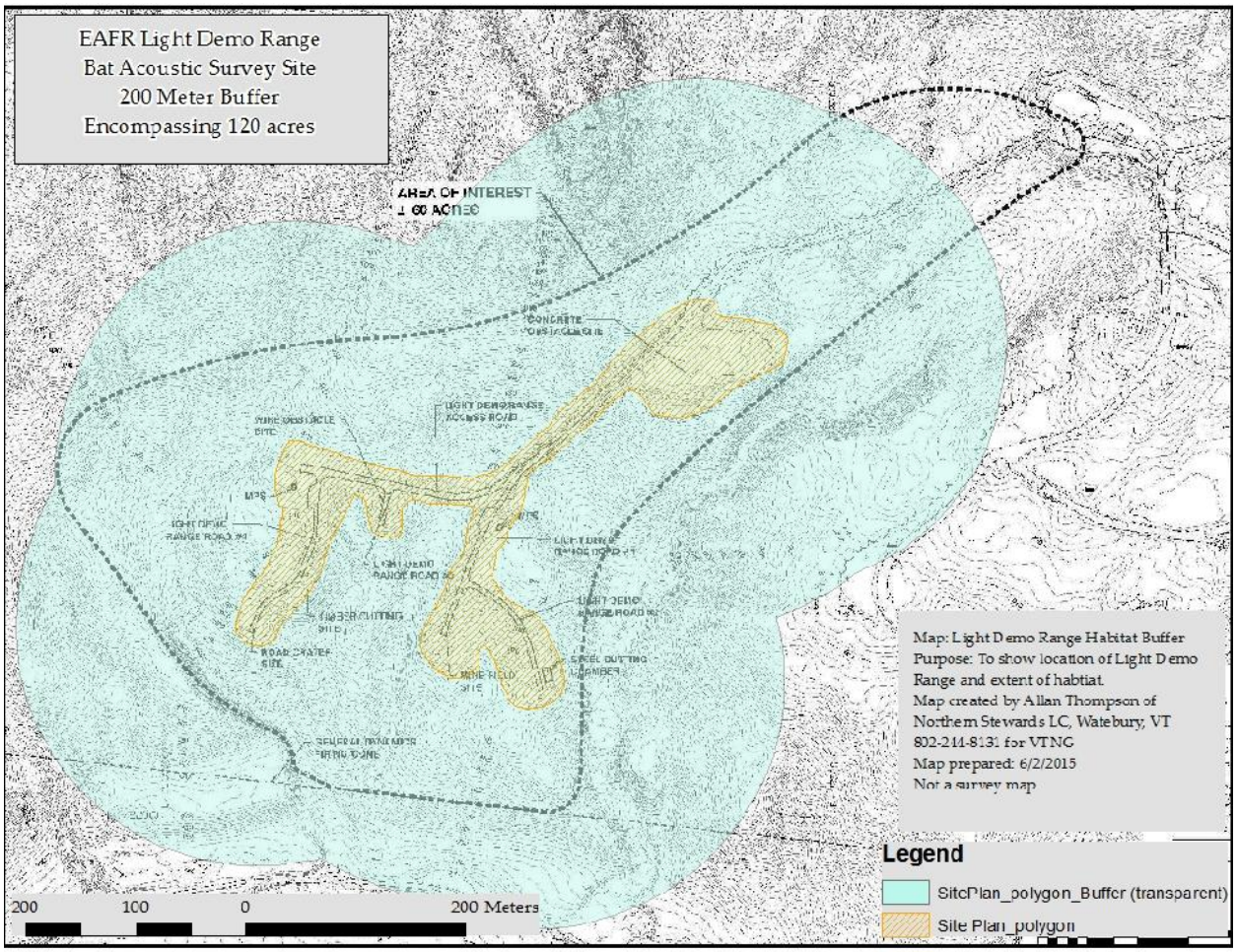
200 Meters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200 Meter Buffer
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802-244-8131 for VTNG
Map prepared: 6/2/2015
Not a survey map
Legend
SitePlan_polygon_Buffer (transparent)
Site Plan_polygon
200
100
0
200 Meters

Amphibians

The HAOI includes three small streams. The eastern stream holds water longest and likely year round. The western most streams are both perennial and dry during May 2015. No vernal pools are present within the AOI or HAOI. No other wetlands are present suitable for amphibians. Of the rare, threatened or endangered amphibians of Vermont, none have been known to occur within the HAOI, using wetlands in or near the HAOI, or within the EAFR. A mudpuppy record exists for LEE River in the 1980's outside of the EAFR. Mudpuppy surveys during 2012 did not observe any mudpuppies (Northern Stewards LC 2012). This lies well outside of the HAOI and would not be impacted by the LDR. The Jefferson salamander and blue spotted salamanders are known to utilize habitats similar to those found on the EAFR; vernal pools and wetlands like those associated with Lee River, but have not been observed or are likely to be present within EAFR.

Streams were visited for 2 hours to turn cover objects for quick survey of stream breeding salamanders. Common stream breeding salamanders such as the northern two-lined salamander and dusky salamander were observed using streams and associated wetlands. These species and populations will not be impacted. By the LDR

Habitat impacts

The creation of and proposed activities that would occur on the LDR will have no impact on any R, T, or E amphibian species. There will be minimal impact to loss of terrestrial habitats to common species such as red-backed salamander, wood frog, American toad, and stream breeding salamanders.

Conclusion

Common Name	State Status	Federal Status	Impact Findings
Fowler's Toad	SC		No impact; Habitat does not occur on site
Boreal Chorus Frog	E		No impact; Habitat does not occur on site
Mink Frog			No impact; Habitat does not occur on site
Jefferson Salamander	SC		No impact; Habitat does not occur on site

Blue-spotted Salamander	SC	No impact; Habitat does not occur on site
Four-toed Salamander	SC	No impact; Habitat does not occur on site
Mudpuppy	SC	No impact; Habitat does not occur on site

Reptiles

LDR

The LDR is primarily forested and supports no rocky outcrops and talus slopes. Reptile habitat within or near the HAOI includes cover objects like downed logs or foraging habitat along streams. Previous surveys have been conducted along Castle Trail Rd that targeted talus slopes. Of the rare, threatened or endangered reptiles of Vermont, only the ring-necked snake has been. Further, during the May of 2015 the HAOI and streams were visited to inventory reptile activity. Areas were visited to search for reptiles. Cover objects were turned within the HAOI and within 100′ of streams. A total of 6.0 hours during two days to survey target habitat conditions were conducted. Surveys supported previous efforts; only garter snakes and red-bellied snakes were observed.

Habitats for reptiles, primarily snakes, are impacted both positively and negatively. The creation of a open area between possible denning areas (Rock cliffs to the north and west) slopes) and foraging areas (Lee River and series wetlands) conducive to basking, cover and additional foraging is excellent. This area is anticipated to support an increased number of snakes, primarily garter.
The creation of the LDR and the proposed activities for the LDR has an overall, positive impact on snakes and no impact on turtles.

Common Name	State Status	Federal Status	Impact findings
Spotted Turtle	E		No impact; Habitat and individuals do not occur on site
Wood Turtle	SC		No impact; Habitat and individuals do not occur on site
Northern Map Turtle	SC		No impact; Habitat and individuals do not occur on site
Stinkpot (Eastern musk turtle)	SC		No impact; Habitat and individuals do not occur on site
Spiny Softshell turtle	T		No impact; Habitat and individuals do not occur on site
Common Five-lined Skink	E		No impact; individuals do not occur on site; to far north
North American Racer	T		No impact; Habitat and individuals do not occur on site
Ring-necked Snake			Positive impact; increased foraging and basking opportunities
Northern Watersnake			No impact; Habitat and individuals do not occur on site
Smooth Greensnake			Positive impact; increased foraging and basking opportunities
Eastern Ratsnake	T		No impact; individuals do not occur on site; to far north
Eastern Ribbonsnake	SC		No impact; habitat present, individuals do not occur on site; populations restricted to west and south
Timber Rattlesnake	E		No impact; habitat present, individuals do not occur on site; populations restricted to west and south

Mammals

Habitat conditions for mammals are primarily forested and within a large forest ecosystem that can offer habitat conditions suitable for many of Vermont's mammals. Forest habitats include mid to late successional forests and include many trees with cavities, roost characteristics, or down woody debris. Habitats are not the only limiting factor for mammal occurrence. Rare mammals are often limited by small populations. For example the eastern mountain lion can find suitable habitat conditions with the EAFR were it not for the limited number available individuals for colonization in the Northeast.

Small mammal habitats are limited to forests or edge habitats. Of Vermont's R, T, and E mammals it is unlikely that habitat conditions are available for many. These sites are drier and lower in elevation than the rock vole or long-tailed shrew would prefer and lack sufficient down woody debris. However, little is known about these species habitat requirements. The roughly 10 acre clearcut to support the LDR is now a unique habitat in itself and will offer edge habitat like productive soft mast, quality cover and high amounts of coarse woody debris. Lastly, the forest conditions within the HAOI offer mature forest conditions, forage and nut production, and cover objects.

Habitats that support long-ranging mammals such as lynx, marten or cougar are typically thought of in a landscape setting, for example, throughout the EAFR. Indeed, conditions with the EAFR are suitable for the American marten, or Canada lynx, though less so. Areas of higher elevation that offer the softwood conditions typical of marten and lynx habitat preferences are present. Hare and grouse populations are abundant along the upper ridges and western facing slopes of the eastern EAFR. In addition, habitats that support deer populations as prey for cougars are equally suitable and ideal within this large forest ecosystem. However, suitable habitat conditions within the LDR overlap only with cougar habitat requirements. If populations exist or overlap with the EAFR, they would be expected to utilize areas within the LDR, but they do not and are therefore not expected to be present.

Vermont's bats require roosting habitat; where they spend the nights and more importantly raise their young. These roosting sites are typically found within 1 mile of water and foraging areas. At least four types of roosting sites are used by Vermont bats. The highest numbers of individuals of typically, the big brown and little brown, use buildings or other man-made structures. Tree boles with exfoliating bark, cracks or crevices where bats can crawl under and colonize and raise young are used by northern long-eared bats, Indiana bats, to a lesser extent little brown bats. Canopies of softwoods or red oaks are used by canopy roosting bats like red, hoary and silver-haired bats. And lastly, rocky cliffs and talus slopes are used as well by eastern

small footed bats. Keeping in mind that there is some overlap with roosts used by a given species. All bats will use wetlands, fields, and forests during a foraging bout but have specific within-site foraging niches based on form and function. These niches are not important here.

Previous reports

Throughout the range a variety of surveys have been conducted to observe and monitor mammals. In addition, the EAFR has many reports of R,T,and E's or SGCN's using the Range. The pygmy shrew and the long-tailed shrew have been observed in upper elevations and western slopes of Bolton Mtn in the eastern part of the EAFR. It is likely that the American water shrew, woodland vole, and southern bog-lemming are present on the EAFR as well, in higher elevations associated with water. Their habitat preferences and behavior makes detection difficult. With the exception of the Indiana bat, and tri-colored bat, all of Vermont's bats have been observed on and throughout the EAFR. There have been anecdotal reports of wolf, Canada lynx and cougar over the years by staff and personnel on the range. Few of these reports have been followed up on, none have been confirmed and none have been substantiated with any evidence.

Surveys throughout the EAFR for mammals include 2010 small mammal surveys at the Otter Bog occurred Winter track surveys that include areas north of the HAOI have occurred annually since 2008 detecting small mammals, bobcat, fox, coyote, deer, moose, and other common mammals. Bat surveys during 2014 observed big brown bats and little brown bats, with possible northern long-eared bats observed during acoustic surveys.

Impacts on Bats

Bat habitats within HAOI are limited to northern hardwood forest, stream habitats and forest openings. Bats may be using trees within these forests for roosts. Impact to these habitats occur through the clearing of the habitat, noise associated with construction and proposed explosives. Noise from construction and explosives will impact bats, especially noise that deviates from previous exposures, like changes in noise intensity, duration, frequency, or time. Bats outside of the HAOI will not be impacted by noise associated with the construction activities. It is unclear to what extent new ranges, new noises will impact bats within the HAOI or outside.

The clearing of the LDR occurred during winter 2014/2015 during inactive periods. Any impacts from the clearing would have been from the loss of roost trees used during the summer. No direct impacts to bats would have occurred as a result of this clearing.

Wolf, cougar, lynx, marten;

No effort was made to survey for wolf, cougar, lynx or marten. No credible evidence suggests their presence within the EAFR. Canada lynx populations are beginning to colonize the northeast Kingdom of Vermont suggesting potential for lynx to move into the EAFR. The EAFR does not support ideal habitat conditions but it is possible. Martens are periodically reported with the northeast kingdom and southern high elevation spots through trapping records but little is known about the extent to which they have been reported. It is not likely that lynx or marten are present with the EAFR. No known populations of wolves or cougars exist within the state of Vermont.

Impact on Mammals

Bats

2015 bat acoustic surveys (see addendum; 2015 LDR Bat Acoustic Surveys for details) reported possible northern long-eared bats. These and other bats may be impacted by the construction associated with the LDR. These bats will also be impacted by noise associated with the demolition, if these noises are considered to deviate from historic use.

- Recommendations:
- Consult with USFWS
- Conduct trapping surveys
- If bats are found during trapping surveys
    - Consult with USFWS
- If bats are not found during trapping surveys
    - Commit to daylight (dawn-dusk) construction hours
    - Commit to daylight use (explosion hours)

Other species

No other R,T,E's are considered to be impacted by the proposed LDR. Ongoing activities will have no significant impact. The creation of the LDR will increase small mammal abundance due to increase food resources and available cover objects. Species, typically shrews, that require moist conditions will not utilize these habitats and may have been pushed out. With the exception of bats, whose surveys are currently underway, there is no loss of suitable habitat for Vermont's Mammals on site that will impact local populations.

Common Name	State Status	Federal Status	Impact findings
Woodland Vole			Minimal impact possible from loss of forest habitat; no observations of individuals anywhere on EAFR
Southern Bog Lemming			Minimal impact possible from loss of forest habitat; no observations of individuals anywhere on EAFR
New England Cottontail	SC	C	No impact: no populations recognized in VT
Long-tailed or Rock Shrew	SC		No impact; habitat and individuals not on site
American Pygmy Shrew			No impact; habitat and individuals not on site
American Water Shrew			Minimal impact possible from loss of forest habitat; no observations of individuals anywhere on EAFR
Silver-haired Bat			Impact, presence probable
Hoary Bat			Impact, presence probable
Eastern Small-footed Bat	T		Impact, presence possible
Little Brown Bat	E		Impact, presence probable
Northern Long-eared Bat	E	E	Impact, presence possible
Indiana Bat	E	LE	No impact; habitat and individuals not on site
Tri-colored Bat	E		No impact; habitat and individuals not on site
Wolf	G4	LE	No impact; populations not recognized in VT
Canadian Lynx	E	LT	No impact: populations not recognized on site.
Eastern Mountain Lion	E	LE	No impact; populations not recognized in VT
American Marten	E		No impact: populations not recognized on site.
Long-tailed Weasel			No impact: the generalist predator utilizes diverse conditions, possibly improved by the creation of the LDR.

Birds

LDR Bird Habitat

Bird habitat within and around the LDR is a primarily homogeneous mid to late successional hardwood forest. Oak, hemlock, pine and aspen would be notable associates. Some large diameter oak, pine or hemlock is present however, little old growth conditions are present.

The following R,T, and E birds have been observed using the EAFR.

Scientific Name	Common Name	State Status	Federal Status	SGCN Priority	Location
Botaurus lentiginosus	American Bittern			High	4-1
Ardea herodias	Great Blue Heron			Medium	Wetlands
Cathartes aura	Turkey Vulture				Throughout
Accipiter cooperii	Cooper's Hawk			Medium	Throughout
Accipiter gentilis	Northern Goshawk			Medium	Throughout
Accipiter striatus	Sharp-shinned Hawk				Throughout
Buteo jamaicensis	Red-tailed Hawk				Throughout
Caprimulgus vociferus	Eastern Whip-poor-will	T		High	6-6
Corvus corax	Common Raven				High elevations
Catharus bicknelli	Bicknell's Thrush	SC		High	High elevations
Ammodramus savannarum	Grasshopper Sparrow	T		High	6-6

Survey and Results

During the May 2015 two days of general bird observations was conducted. During these surveys no R,T, or E's were detected. It is highly unlikely that any R,T or E species require habitats within or near the LDR. The grasshopper sparrow was observed last in 2012 in Range 6-6 1000 meters to the east and will likely not be impacted by the LDR.

Impacts on Birds

The creation of the LDR and the proposed activities will alter species use of the forest interior and birds requiring forest conditions will be impacted, slightly. The LDR will have no significant impact on birds or bird habitats within or near the LDR.

Conclusion

Common Name	State Status	Federal Status	Impact Findings
Northern Pintail			No Impact; populations not present
American Wigeon			No Impact; populations not present
Green-winged Teal	SC		No Impact; populations not present
Blue-winged Teal	SC		No Impact; populations not present
American Black Duck	SC		No Impact; populations not present
Gadwall			No Impact; populations not present
Ring-necked Duck			No Impact; populations not present
Greater Scaup			No Impact; populations not present
Common Goldeneye			No Impact; populations not present
Barrow's Goldeneye			No Impact; populations not present
Red-breasted Merganser			No Impact; populations not present
Spruce Grouse	E		No Impact; populations not present
Common Loon			No Impact; populations not present
Pied-billed Grebe	SC		No Impact; populations not present
American Bittern			No Impact; habitat not within site
Least Bittern	SC		No Impact; populations not present
Great Egret			No Impact; populations not present
Great Blue Heron			No Impact; nesting sites not within site
Cattle Egret			No Impact; populations not present
Black-crowned Night-heron	SC		No Impact; populations not present
Turkey Vulture			No Impact; populations not present
Osprey			No Impact; populations not present
Bald Eagle	E		No Impact; populations not present
Northern Harrier	SC		No Impact; populations not present
Cooper's Hawk			No Impact, habitat not within site
Northern Goshawk			Minimal impact; goshawks will avoid, but not be impacted by absence of mature forests
Sharp-shinned Hawk			Minimal impact; hawks will avoid, but not be impacted by absence of mature forests
Red-tailed Hawk			No impact; species are generalists
Red-shouldered Hawk			No Impact; populations not present
Merlin			No Impact; habitat not within site
Peregrine Falcon			No Impact; populations not present
Sora		SC	No Impact; populations not present
American Coot			No Impact; populations not present

Sandhill Crane		No Impact; populations not present
Upland Sandpiper	E	No Impact; populations not present
Herring Gull		No Impact; populations not present
Great Black-backed Gull		No Impact; populations not present
Caspian Tern		No Impact; populations not present
Black Tern	E	No Impact; populations not present
Common Tern	E	No Impact; populations not present
Yellow-billed Cuckoo		No Impact; populations not present
Barn Owl		No Impact; populations not present
Eastern Screech-Owl		Possible impact; populations not known. Screech Owls prefer forest conditions
Great Horned Owl		Possible impact; populations not known. Great Horned Owls prefer forest conditions
Short-eared Owl		No Impact; populations not present
Long-eared Owl		No Impact; populations not present
Northern Saw-whet Owl		Possible impact; populations not known. Saw-whet owls prefer forest conditions
Common Nighthawk	E	No Impact; populations not present
Eastern Whip-poor-will	T	No Impact; field habitat not on site
Red-bellied Woodpecker		No Impact; populations not present
Red-headed Woodpecker	SC	No Impact; populations not present
Black-backed Woodpecker	SC	No Impact; populations not present
American Three-toed woodpecker		No Impact; populations not present
Yellow-bellied Flycatcher		No Impact; populations not present
Northern Shrike		No Impact; populations not present
Loggerhead Shrike	E	No Impact; populations not present
Philadelphia Vireo		No Impact; populations not present
Gray Jay	SC	No Impact; populations not present
Common Raven		No Impact; populations not present
Fish Crow		No Impact; populations not present
Horned Lark		No Impact; populations not present
Purple Martin	SC	No Impact; populations not present
Boreal Chickadee	SC	No Impact; populations not present
Sedge Wren	E	No Impact; populations not present
Blue-gray Gnatcatcher		No Impact; populations not present
Bicknell's Thrush	SC	No Impact; populations not on site
Bohemian Waxwing		No Impact; populations not present
Lapland Longspur		No Impact; populations not present
Golden-winged Warbler	SC	No Impact; populations not present

Common Name	State Status	Federal Status	Impact Findings
Blue-winged Warbler	SC		No Impact; populations not present
Tennessee Warbler			No Impact; populations not present
Bay-breasted Warbler			No Impact; populations not present
Cerulean Warbler	SC		No Impact; populations not present
Prairie Warbler	SC		No Impact; populations not present
Palm Warbler			No Impact; populations not present
Cape May warbler			No Impact; populations not present
Wilson's Warbler			No Impact; populations not present
Clay-colored Sparrow			No Impact; populations not present
Vesper Sparrow	SC		No Impact; populations not present
Henslow's Sparrow	E		No Impact; field habitat not present
Grasshopper Sparrow	T		No Impact; field habitat not present
Rusty Blackbird	SC		No Impact; populations not present
Orchard Oriole			No Impact; populations not present
Pine Grosbeak			No Impact; populations not present
Red Crossbill			No Impact; populations not present
White-winged Crossbill			No Impact; populations not present
Pine Siskin			No Impact; populations not present

Wildlife observed during 2015 surveys Alphabetical.

Amphibians and Reptiles
Eastern newt
Northern two-lined salamander
Northern dusky salamander
Wood frog
Gartersnake
Red bellied snake

Mammals
Eastern chipmunk
Red squirrel
Porcupine
Bats TDB

American black bear (clawmarks on oak
White-tailed deer (tracks, scat)
Moose (striped maple browse)
Raccoon (tracks)

Birds
American Crow
American goldfinch
American Robin
Black and white warbler
Blackburnian warbler
Black-capped chickadee
Black-throated blue warbler
Black-throated green warbler
Blue jay
Chestnut-sided warbler
Chipping sparrow
Common yellowthroat
Dark-eyed junco
eastern wood-pewee
Gray catbird
Great crested flycatcher
Hairy woodpecker
Hermit thrush
Indigo bunting
Least flycatcher
Northern parula
Ovenbird
Pileated woodpecker
Red breasted grosbeak
Red-eyed vireo
Rose-breasted grosbeak
Ruby-throated Hummingbird
Scarlet tanager
Veery
Warbling vireo
White-breasted nuthatch
Wild turkey
Wood thrush
Yellow-bellied sapsucker

Scientific Name	Common Name	State Rank	State Status	Federal Status	SGCN	Priority
Amphibians						
Anaxyrus fowleri	Fowler's Toad	S1	SC		SGCN	High
Pseudacris maculata	Boreal Chorus Frog	S1	E		SGCN	High
Lithobates septentrionalis	Mink Frog	S3				
Ambystoma jeffersonianum	Jefferson Salamander	S2	SC		SGCN	High
Ambystoma laterale	Blue-spotted Salamander	S3	SC		SGCN	Medium
Hemidactylium scutatum	Four-toed Salamander	S2	SC		SGCN	Medium
Necturus maculosus	Mudpuppy	S2	SC		SGCN	High
Reptiles						
Clemmys guttata	Spotted Turtle	S1	E		SGCN	High
Glyptemys insculpta	Wood Turtle	S3	SC		SGCN	High
Graptemys geographica	Northern Map Turtle	S3	SC			
Sternotherus odoratus	Stinkpot (Eastern musk turtle)	S2	SC		SGCN	Medium
Apalone spinifera	Spiny Softshell turtle	S1	T		SGCN	High
Plestiodon fasciatus	Common Five-lined Skink	S1	E		SGCN	High
Coluber constrictor	North American Racer	S1	T		SGCN	High
Diadophis punctatus	Ring-necked Snake	S3				
Nerodia sipedon	Northern Watersnake	S3			SGCN	High
Opheodrys vernalis	Smooth Greensnake	S3			SGCN	Medium
Pantherophis alleghaniensis	Eastern Ratsnake	S2	T		SGCN	High
Thamnophis sauritus	Eastern Ribbonsnake	S2	SC		SGCN	High
Crotalus horridus	Timber Rattlesnake	S1	E		SGCN	High
Mammals						
Microtus chrotorrhinus	Rock Vole	S2	SC		SGCN	High
Microtus pinetorum	Woodland Vole	S3			SGCN	High
Synaptomys cooperi	Southern Bog Lemming	S2			SGCN	High
Sylvilagus transitionalis	New England Cottontail	SH	SC	C	SGCN	High
Sorex dispar	Long-tailed or Rock Shrew	S2	SC		SGCN	High
Sorex hoyi	American Pygmy Shrew	S2			SGCN	High
Sorex palustris	American Water Shrew	S3			SGCN	High
Lasionycteris noctivagans	Silver-haired Bat	S2B			SGCN	High
Lasiurus cinereus	Hoary Bat	S3B			SGCN	High
Myotis leibii	Eastern Small-footed Bat	S1	T		SGCN	High
Myotis lucifugus	Little Brown Bat	S1	E		SGCN	Medium
Myotis septentrionalis	Northern Long-eared Bat	S1	E	LE	SGCN	Medium
Myotis sodalis	Indiana Bat	S1	E	LE	SGCN	High
Perimyotis subflavus	Tri-colored Bat	S1	E		SGCN	High

Canis lupus	Wolf	SX	G4	LE	SGCN	Medium
Lynx canadensis	Canadian Lynx	S1	E	LT	SGCN	High
Puma concolor	Eastern Mountain Lion	SH	E	LE	SGCN	Medium
Martes americana	American Marten	S1	E		SGCN	High
Mustela frenata	Long-tailed Weasel	S3S4			SGCN	Medium
Birds						
Anas acuta	Northern Pintail	S1B				
Anas americana	American Wigeon	S1B				
Anas crecca	Green-winged Teal	S1B	SC			
Anas discors	Blue-winged Teal	S2B	SC		SGCN	Medium
Anas rubripes	American Black Duck	S3B,S5N	SC		SGCN	High
Anas strepera	Gadwall	S1B				
Aythya collaris	Ring-necked Duck	S1B				
Aythya marila	Greater Scaup	S3N				
Bucephala clangula	Common Goldeneye	S2B,S5N				
Bucephala islandica	Barrow's Goldeneye	S3N				
Mergus serrator	Red-breasted Merganser	S1B				
Falcipennis canadensis	Spruce Grouse	S1	E		SGCN	High
Gavia immer	Common Loon	S3B			SGCN	High
Podilymbus podiceps	Pied-billed Grebe	S2S3B	SC		SGCN	High
Botaurus lentiginosus	American Bittern	S3B			SGCN	High
Ixobrychus exilis	Least Bittern	S2B	SC		SGCN	High
Ardea alba	Great Egret	S1B				
Ardea herodias	Great Blue Heron	S3S4B			SGCN	Medium
Bubulcus ibis	Cattle Egret	S1B				
Nycticorax nycticorax	Black-crowned Night-heron	S1B	SC		SGCN	Medium
Cathartes aura	Turkey Vulture	S3S4B				
Pandion haliaetus	Osprey	S3B			SGCN	Medium
Haliaeetus leucocephalus	Bald Eagle	S1B,S4N	E		SGCN	High
Circus cyaneus	Northern Harrier	S3B	SC		SGCN	High
Accipiter cooperii	Cooper's Hawk	S3B,S3N			SGCN	Medium
Accipiter gentilis	Northern Goshawk	S2B,S3N			SGCN	Medium
Accipiter striatus	Sharp-shinned Hawk	S3B,S3N				
Buteo jamaicensis	Red-tailed Hawk	S3S4B,S5N				
Buteo lineatus	Red-shouldered Hawk	S2B			SGCN	Medium
Falco columbarius	Merlin	S2B				
Falco peregrinus	Peregrine Falcon	S3B			SGCN	High
Porzana carolina	Sora	S3B		SC	SGCN	Medium
Fulica americana	American Coot	SUB				
Grus canadensis	Sandhill Crane	S1B				
Bartramia longicauda	Upland Sandpiper	S2B	E		SGCN	High

Larus argentatus	Herring Gull	S1B,S5N			
Larus marinus	Great Black-backed Gull	S1B,S5N			
Hydroprogne caspia	Caspian Tern	S1B			
Chlidonias niger	Black Tern	S1B	E	SGCN	High
Sterna hirundo	Common Tern	S1B	E	SGCN	High
Coccyzus americanus	Yellow-billed Cuckoo	S3B			
Tyto alba	Barn Owl	S1B		SGCN	Medium
Megascops asio	Eastern Screech-Owl	S3			
Bubo virginianus	Great Horned Owl	S3			
Asio flammeus	Short-eared Owl	S1B,S1N		SGCN	Medium
Asio otus	Long-eared Owl	S1B		SGCN	Medium
Aegolius acadicus	Northern Saw-whet Owl	S3B,S3N			
Chordeiles minor	Common Nighthawk	S1B	E	SGCN	High
Caprimulgus vociferus	Eastern Whip-poor-will	S2B	T	SGCN	High
Melanerpes carolinus	Red-bellied Woodpecker	S3			
Melanerpes erythrocephalus	Red-headed Woodpecker	S1B	SC		
Picoides arcticus	Black-backed Woodpecker	S2	SC	SGCN	Medium
Picoides dorsalis	American Three-toed woodpecker	S1			
Empidonax flaviventris	Yellow-bellied Flycatcher	S3B			
Lanius excubitor	Northern Shrike	S3N			
Lanius ludovicianus	Loggerhead Shrike	SH	E		
Vireo philadelphicus	Philadelphia Vireo	S1B			
Perisoreus canadensis	Gray Jay	S2	SC	SGCN	Medium
Corvus corax	Common Raven	S3			
Corvus ossifragus	Fish Crow	S1B			
Eremophila alpestris	Horned Lark	S2B,S5N			
Progne subis	Purple Martin	S3B	SC	SGCN	High
Poecile hudsonicus	Boreal Chickadee	S2	SC		
Cistothorus platensis	Sedge Wren	S2B	E	SGCN	High
Polioptila caerulea	Blue-gray Gnatcatcher	S3B			
Catharus bicknelli	Bicknell's Thrush	S2B	SC	SGCN	High
Bombycilla garrulus	Bohemian Waxwing	S3N			
Calcarius lapponicus	Lapland Longspur	S3N			
Vermivora chrysoptera	Golden-winged Warbler	S3B	SC	SGCN	High
Vermivora cyanoptera	Blue-winged Warbler	S3B	SC	SGCN	Medium
Oreothlypis peregrina	Tennessee Warbler	S1B			
Setophaga castanea	Bay-breasted Warbler	S2B		SGCN	Medium
Setophaga cerulea	Cerulean Warbler	S1S2B	SC	SGCN	Medium
Setophaga discolor	Prairie Warbler	S3B	SC	SGCN	Medium
Setophaga palmarum	Palm Warbler	S1B			

Setophaga tigrina	Cape May warbler	S1B			
Cardellina pusilla	Wilson's Warbler	S1B			
Spizella pallida	Clay-colored Sparrow	S2B			
Pooecetes gramineus	Vesper Sparrow	S2S3B	SC	SGCN	High
Ammodramus henslowii	Henslow's Sparrow	S1B	E	SGCN	Medium
Ammodramus savannarum	Grasshopper Sparrow	S1B	T	SGCN	High
Euphagus carolinus	Rusty Blackbird	S3B	SC	SGCN	Medium
Icterus spurius	Orchard Oriole	S2B			
Pinicola enucleator	Pine Grosbeak	S3N			
Loxia curvirostra	Red Crossbill	S1B,S2N			
Loxia leucoptera	White-winged Crossbill	S3B,S3N			
Spinus pinus	Pine Siskin	S3B,S4N			

Explanation of Legal Status and Information Ranks

State Rank and Global Rank - Value that best characterizes the relative rarity (abundance) or endangerment of a native taxon within Vermont's geographic boundary or throughout its range, respectively. Ranks are as follows:

1 - Very rare (Critically imperiled): At very high risk of extinction or extirpation due to extreme rarity (often 5 or fewer populations or occurrences), very steep declines, or other factors

2 - Rare (Imperiled): At high risk of extinction or extirpation due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors

3 - Uncommon (Vulnerable): Moderate risk of extinction\extirpation due to restricted range, relatively few populations or occurrences (often 80 or fewer), recent and widespread declines, or other factors

4 - Common to uncommon (Apparently secure): locally common or widely scattered to uncommon, but not rare; some cause for long-term concern due to declines or other factors; or stable over many decades and not threatened but of restricted distribution or other factors

5 - Common (Secure): widespread and abundant

H - Possibly extinct/extirpated: Missing; known from only historical occurrences but hope of rediscovery

X - Presumed extinct/extirpated: Not located despite intensive searches, little likelihood of rediscovery

U - Unrankable: Currently unrankable due to lack of information or substantially conflicting information about status or trends

NR - Not ranked: Not yet assessed

NA - Not applicable. Element is not a suitable target for conservation for one of the following reasons: Hybrid, Exotic Origin, Accidental/Nonregular, Not Confidently Present, No Definable Occurrences

The following may follow a numeric rank to provide further information:

? - indicates uncertainty about the rank; may also be expressed in the form of a range rank (e.g. S1S3)

B - Indicates the preceding rank is for breeding populations

N - Indicates the preceding rank is for nonbreeding populations

M - Indicates the preceding rank is for migratory populations

T - For global ranks only, indicates an infraspecies.

Q - For global ranks only, indicates questionable taxonomy.

State Status - Legal protection under Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E = Endangered: in immediate danger of becoming extirpated in the state

T = Threatened: with high possibility of becoming endangered in the near future

SC = Special Concern: status should be watched (does not denote legal protection)

Federal Status - Designation under the federal Endangered Species Act, U.S. Fish & Wildlife Service

LE = Listed Endangered

LT = Listed Threatened
SC = Species of Concern (does not denote legal protection)
C = Candidate for Listing (does not denote legal protection)
SGCN - Species of Greatest Conservation Need as identified in the Vermont Wildlife Action Plan; does not denote legal protection.

Appendix E

OFFICE OF THE ADJUTANT GENERAL
789 Vermont National Guard Road
Colchester, Vermont 05446-3099

August 3, 2015

John Warner
Assistant Supervisor, Federal Activities/Endangered Species
Susi von Oettingen, Endangered Species Biologist
New England Field Office
U.S. Fish and Wildlife Service
70 Commercial St., Suite 300
Concord, NH 03301

Dear Mr. Warner and Ms. Von Oettingen:

The Vermont Army National Guard (VTARNG) is proposing a construction project at the Ethan Allen Firing Range in Underhill and Jericho Vermont that contains habitat for the newly listed Northern Long-eared Bat (NLEB). The project is the construction of a Light Demolition Range (LDR), which will expand the current LDR to support increased training requirements and is described fully later in the document. We have spoken to Susi on a number of occasions concerning our project and described our NLEB survey efforts.

We have completed both acoustic and mist-netting surveys in our efforts to locate presence of NLEB and any roost trees that may be in the project area. I have attached our survey report and will summarize them briefly here. The acoustic surveys were conducted in early June, 2015, and included 9 detector nights in roughly a 60 acre habitat area of interest (HAOI), and an additional 200 meter buffer for a total area of 120 acres. 619 acoustic files were recorded. Files were classified by Kaleidoscope Pro and Sonobat 3.2.2. Twenty seven files were classified as NLEB. Of these 27, 4 were considered to be of high quality, offering call characteristics of MYSE /MYLE after manual vetting. The conclusion of the biologist was that the 4 calls were ambiguous enough to not rule out the possibility of NLEB at the project site, although he could not say for certainty, that they were indeed NLEB.

Mist netting was conducted in the first week of July, 2015 at the same HAOI as the acoustic surveys. A total of 26 trap nights were conducted by Vesper Environmental and Allan Thompson, our contracted range biologist. No NLEBs were trapped in this effort.

In making our effect determination, we also consulted with the recently completed *Programmatic Informal Consultation on Impacts of Operations on Army National Guard*

Property on the Northern Long-eared Bat, April 28, 2015 and the USFWS Concurrence Letter from the Midwest Region, May 4, 2015. The VTARNG was a party to that agreement, and as such, will abide by all the listed conservation measures in the agreement. This will include the proposed project construction timelines including the tree clearing guidelines and winter tree clearing only. All other construction activity including road construction, site grading, etc., would only occur during the daylight hours. Since netting surveys did not find any NLEBs, no roost trees were identified. In addition, outdoor lighting minimization guidelines will be followed. We believe that by following these established conservation measures, that the not likely to adversely affect determination is warranted.

In conclusion, the VTARNG has determined that construction of the Light Demolition Range at the Ethan Allen Firing Range, are not likely to adversely affect the NLEB. We would like to ask your concurrence of this determination under Section 7(a)(2) of the Endangered Species Act.

We will continue to monitor and survey for the NLEB in the coming years and will implement bat conservation measures and habitat improvement projects when possible. We look forward to hearing from you.

Sincerely,

Jacob B. Roy
Major, Vermont Army National Guard
Supervisor, Environmental Protection

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

REF: Ethan Allen Firing Range Project,
Vermont Army National Guard

October 21, 2015

Major Jacob B. Roy
Office of the Adjutant General
789 Vermont National Guard Road
Colchester, Vermont 05446-3099

Dear Major Roy:

This responds to your email and letter attachment, dated August 3, 2015, requesting our concurrence with a not likely to adversely affect determination for the federally threatened northern long-eared bat (*Myotis septentrionalis*) in relation to the construction of the proposed Light Demolition Range (LDR) at the Ethan Allen Firing Range in Underhill and Jericho, Vermont. We also received emails from Mr. Mike O'Hara (Military Lands Administrator) that provided additional information relative to the project, including reports documenting the bat survey effort undertaken at the project site. Our comments are provided in accordance with the Endangered Species Act (87 Stat. 884, as amended: 16 U.S.C. 1531, *et seq.*).

The proposed construction of the LDR consists of an upgrade to the existing gravel roadway and construction of various LDR training sites, including a breakdown building, concrete and wire obstacle sites, a mine field site, a road crater site, and timber cutting and steel cutting sites. In order to construct the LDR training sites and upgrade the existing roadway, approximately 7 acres of trees will be cleared and an additional 70 acres will be selectively thinned. The Vermont Army National Guard will incorporate the conservation measures to minimize and avoid adverse effects that were outlined in the April 28, 2015 Programmatic Informal Consultation on Impacts of Operations on Army National Guard Property on the Northern Long-eared Bat. These measures include a tree clearing time-of-year restriction to avoid cutting trees during the active season when bats may be present, construction occurring during daylight hours, and minimizing outdoor lighting.

Acoustic surveys were conducted in June of 2015. Four northern long-eared bat calls were confirmed during the acoustic surveys. Mist-netting was subsequently conducted in the vicinity of the confirmed northern long-eared bat calls. Three distinct sites were sampled for a total of 36 net nights of effort at 21 different net set locations. No northern long-eared bats were captured. During the mist-net survey, additional acoustic surveys were conducted to determine background levels of bat activity. No northern long-eared bats were detected.

There are no known hibernacula within 1 mile of the project site. Therefore, we do not anticipate any impacts to hibernating bats. Although a few calls identified as possible northern long-eared bat calls were detected, intensive mist-netting in the vicinity of the acoustic detections did not capture any northern long-eared bats. We anticipate that this species may be present on the Ethan Allen Firing Range property in very low numbers or as infrequent residents. Adverse effects to northern long-eared bats could occur as a result of direct take if tree removal is undertaken while a bat is roosting in it. Indirect effects could occur if an extensive area of forested habitat were permanently converted to non-forested habitat, thereby significantly reducing the core roosting habitat for an individual bat or a maternity colony.

Your letter stated that tree clearing would occur in the winter, but did not detail months in which tree clearing might occur. Because it is likely that northern long-eared bats may be present in the project area, albeit in very low numbers, we recommend clearing trees between October 1 and April 15 to avoid direct take. With the inclusion of our recommended time-of-year restriction, direct adverse effects to northern long-eared bats will be avoided. Indirect effects to roosting habitat are not likely because the amount of area proposed for clearing (7 acres) will result in only a small amount of forest clearing relative to the available habitat in the immediate surrounding area. The selective tree thinning is anticipated to have limited impact to an individual bat or maternity colony since the thinning will retain sufficient forest cover to maintain roosting habitat. Therefore, impacts to potential roosting habitat will be insignificant (effects will never reach the scale where take occurs).

Further consultation with us under section 7 of the Endangered Species Act is not required at this time. Should project plans or additional information on listed species becomes available, this determination may be reconsidered. Thank you for your cooperation, and please contact Ms. Susi von Oettingen at (603) 227-6418 if you need any further assistance.

Sincerely yours,

Eric L. Dorrette
Acting for
Thomas R. Chapman
Supervisor
New England Field Office

2015 Bat Acoustic Survey at the Ethan Allen Firing Range Light Demo Range Jericho, VT

Submitted June 2015
by Allan Thompson CWB®

Of Northern Stewards
224 Michigan Ave
Waterbury VT 05676
802-244-8131
northernstewards@gmail.com

Summary

Ultrasonic acoustic surveys were conducted to inventory bat species using the area proposed for the Light Demo Range (LDR) at the Ethan Allen Firing Range (EAFR) in Jericho, Vt. Surveys were designed specifically to sample for the northern long-eared bat (*Myotis septentrionalis* or MYSE*)* and conducted end of beginning June 2015. 495 bat passes were recorded. Acoustic results of computer programs (MLE <.05) indicate presence of MYSE. Qualitative analysis of files shows bat calls with overlapping characteristics of MYSE. Of these bat passes, 27 files were considered by acoustic programs to be MYSE, and 4 were considered by programs and surveyor to be MYSE/MYLE calls. The presence of MYSE within the LDR is possible.

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19. Other tables: programs used, data flow

Light Demo Range Site

> I identified the footprint of the LDR as encompassing a 10 acre footprint along with a 200 meter buffer from this footprint. This Habitat AOI (HAOI) is a roughly 120 acre area that includes habitats similar to the AOI mid to late successional northern hardwood forests with two streams. These hardwood forests provide habitat for forest interior species typical of central Vermont northern hardwood landscapes. The Lee River wetland complex is about 500 meters from the HAOI survey site, the 6 Range series is roughly 1000 meters away and offers open field conditions. To the north and west are cliffs and ledges used for climbing, some with associated talus slopes. Many potential roost trees are present for the northern long-eared bat (*Myotis septentrionalis*) (NLEB).

In order to document the impact of the creation, proposed activities and the management of the LDR on the NLEB, bat acoustic surveys were conducted during spring 2015. Because the LDR and HAOI consisted of a calculated 120 acres, one site was surveyed. A site consisted of two locations thought to represent habitat and bat flyways within the HAOI.

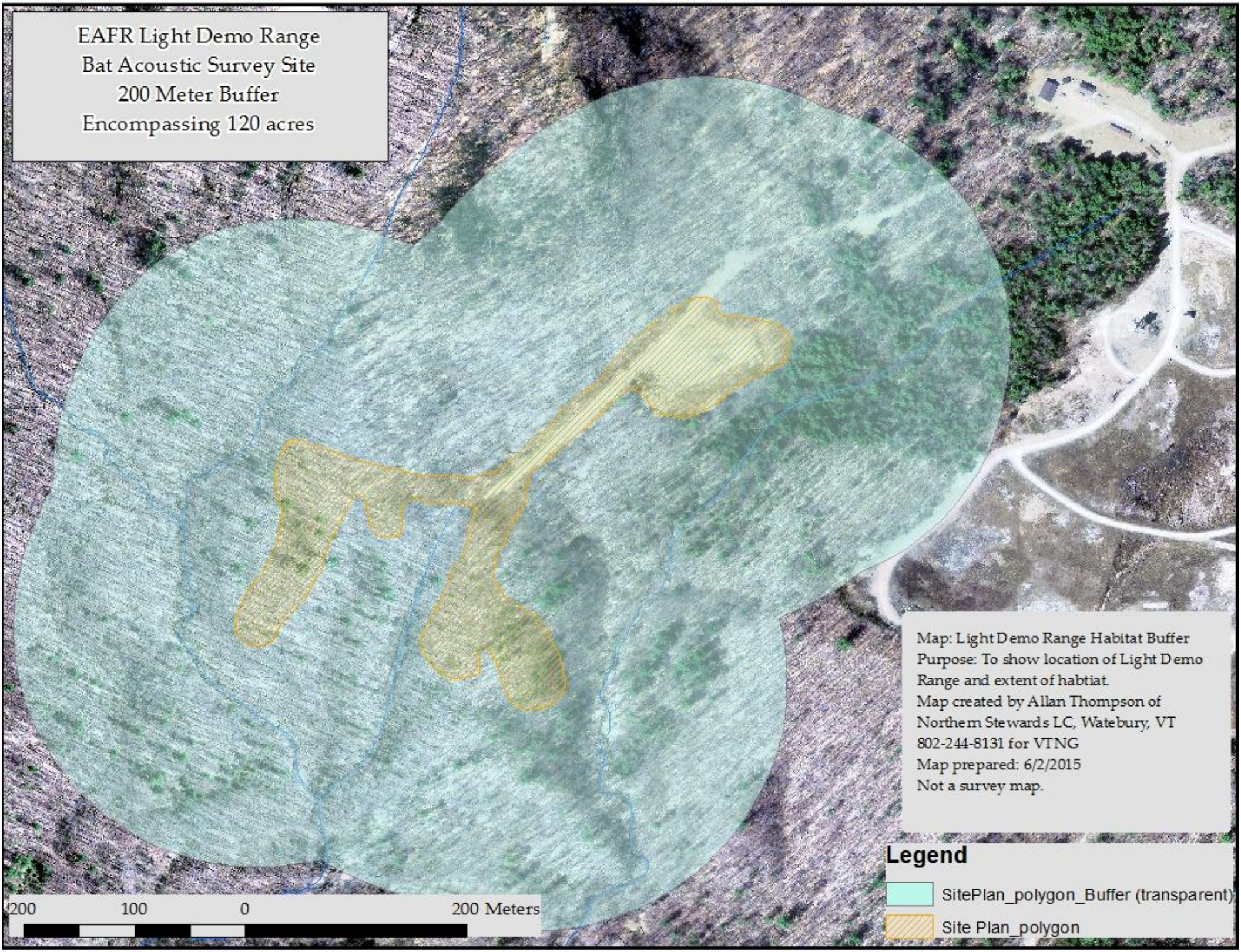
Acoustic Survey Sites: 1 - 120 acre site was identified. Within this site, two locations were surveyed for a total of 9 Detector nights, and an additional 8.5 survey nights that were inadequate conditions.

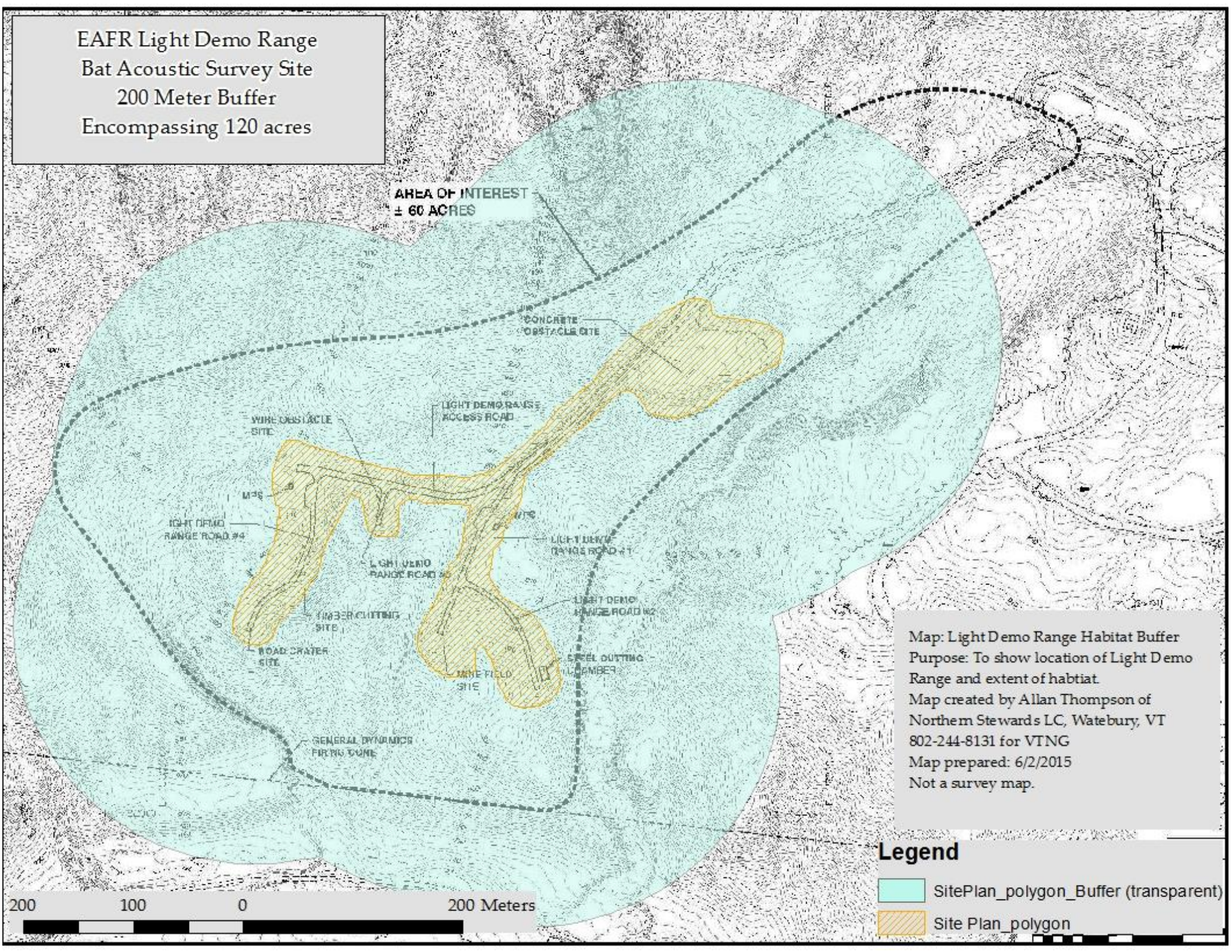
Survey Dates

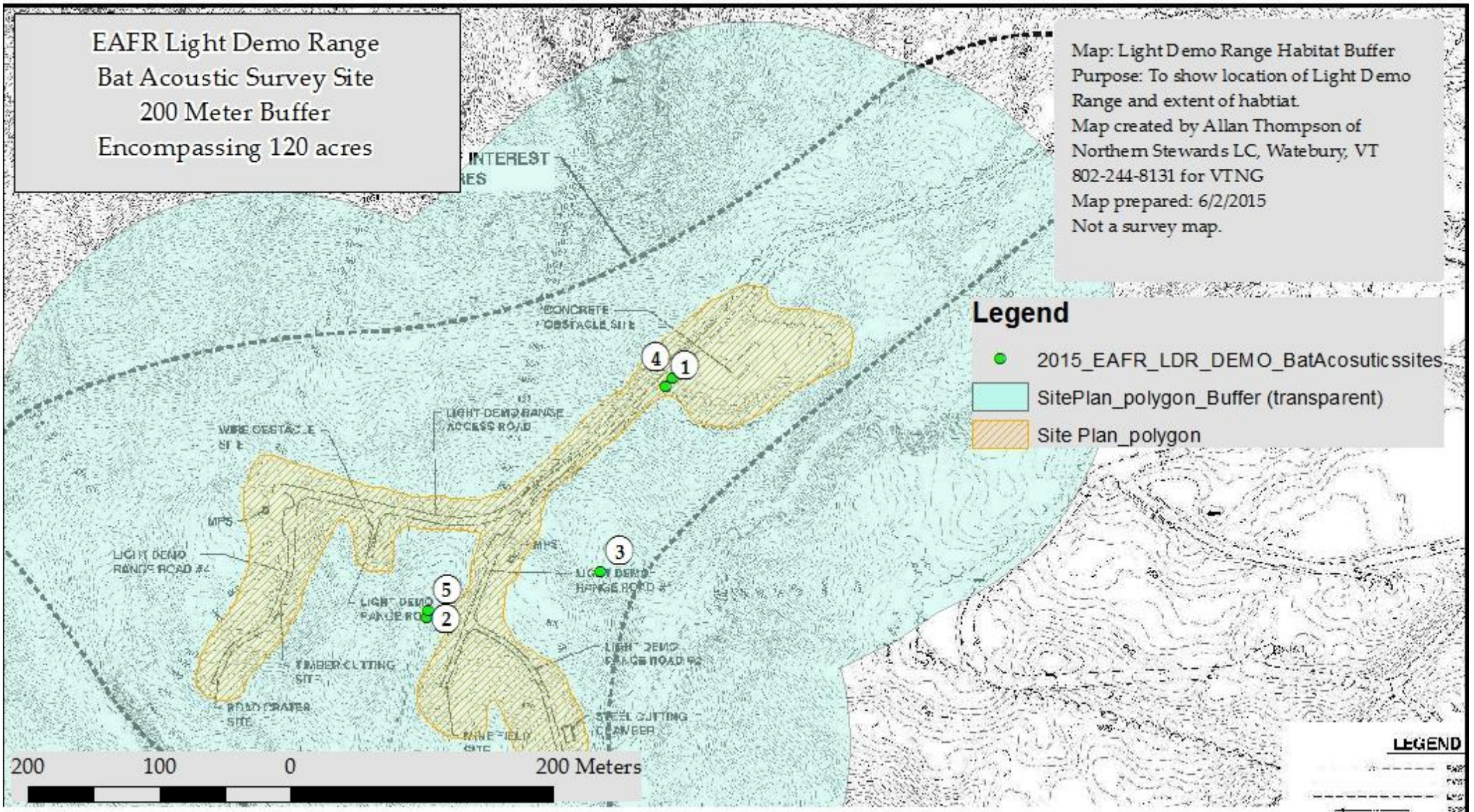
Table 1								
Survey dates ranged from 5/17/2015-6/12/2015.								
Detector	Detector type	Site	Survey Start	Time Start	Date Stop	Time Stop	Detector Nights	Conditions
1	SM2	Wood Road	5/15/2015	Sunset	5/19/2015	Sunrise	4	Cold
2	SM2	Forest opening	5/15/2015	Sunset	5/19/2015	Sunrise	4	Cold
3	SM3	5-3 road	5/30/2015	Sunset	5/30/2015	Midnight	0.5	Detector Malfunction
4	SM3	Wood Road	5/30/2015	Sunset	6/6/2015	Sunrise	6	Good
4	SM3	5-3 Road	6/6/2015	Sunset	6/9/2015	Sunrise	3	Good

Table 2				
Survey Conditions by Survey Night (blue indicates weather conditions that may reduce call quality or bat activity).				
Survey Night	Sunrise	Sunset	Low Temp (F)	Rain (in)
	From NOAA Daily Climate Summary: Burlington	From NOAA Daily Climate Summary: Burlington	From NOAA Daily Climate Summary: Burlington	From NOAA Daily Climate Summary: Burlington
5/15	5:23	8:15pm	58	0.10
5/16			57	0.00
5/17			52	0.00
5/18			58	0.01
5/30			67	0.83
5/31			48	0.5
6/1			49	0.63
6/2			45	0.02
6/3			41	0.00
6/4			44	0.00
6/5			63	0.56
6/6			46	0.01
6/7			42	0.00
6/8	5:08 am	8:36pm	58	0.57

Table 3				
Detector Details				
Detector Number	Manufacturer	Detector Type	Microphone	Horn Attachement[1]
1	Wildlife Acoustics	SM2	SMX-Ux with filter	No
2	Wildlife Acoustics	SM2	SMX-Uxwith filter	No
3	Wildlife Acoustics	SM3	U1 with no filter	No
4	Wildlife Acoustics	SM3	U1 with no filter	No
5	Wildlife Acoustics	SM3	U1 with no filter	No
6	Wildlife Acoustics	SM3	U1 with no filter	no
[1] Horn attachment reduces call quality for omni-directional microphones and was not used for these surveys.				


EAFR Light Demo Range
Bat Acoustic Survey Site
200 Meter Buffer
Encompassing 120 acres
Map: Light Demo Range Habitat Buffer
Purpose: To show location of Light Demo Range and extent of habtiat.
Map created by Allan Thompson of Northern Stewards LC, Watebury, VT
802-244-8131 for VTNG
Map prepared: 6/2/2015
Not a survey map.
Legend
SitePlan_polygon_Buffer (transparent)
Site Plan_polygon
200
100
0
200 Meters


EAFR Light Demo Range
Bat Acoustic Survey Site
200 Meter Buffer
Encompassing 120 acres
AREA OF INTEREST
± 60 ACRES
CONCRETE OBSTACLE SITE
LIGHT DEMO RANGE ACCESS ROAD
WIRE OBSTACLE SITE
M35
LIGHT DEMO RANGE ROAD #4
LIGHT DEMO RANGE ROAD #1
LIGHT DEMO RANGE ROAD #3
LIGHT DEMO RANGE ROAD #2
TIMBER CUTTING SITE
ROAD CRATER SITE
MINE FIELD SITE
STEEL CUTTING TIMBER
GENERAL DYNAMICS FIRING TOWER
200
100
0
200 Meters
Map: Light Demo Range Habitat Buffer
Purpose: To show location of Light Demo Range and extent of habtiat.
Map created by Allan Thompson of Northern Stewards LC, Watebury, VT
802-244-8131 for VTNG
Map prepared: 6/2/2015
Not a survey map.
Legend
SitePlan_polygon_Buffer (transparent)
Site Plan_polygon



MAP ID	Project Location within Property/ Project	Site Code	Type (PAS, ACT, TRX)	Detector	DET#	NAME CODE	SITE CODE	ELEV-FT	Longitude	Longitude	Latitude	Latitude
1	Demo Range	53road	PAS	SM3-	4	EAFR	DEMO	941.36	-72	9181054869894	44	483639347
2	Demo Range	woodrd	PAS	SM3-	4	EAFR	DEMO	969.2	-72	9202938197225	44	4816110142509
3	Demo Range	forest	PAS	SM2-	2	EAFR	DEMO	879.04	-72	9183338203363	44	482306014081
4	Demo Range	53road	PAS	SM3-	3	EAFR	DEMO	941.36	-72	9181054869894	44	483639347
5	Demo Range	woodrd	PAS	SM2-	1	EAFR	DEMO	969.2	-72	9202938197225	44	4816110142509

Results

Detector Placement

Detectors were placed on site between 5/15/2015 and 6/9/2015 (Table 2). Within the site (120 acre HAOI), three locations were chosen. 1) A forest location (forest) was chosen for its linear pathway and likely hood for foraging bats. A recent timber harvest had created forest openings throughout the HAOI. This location was chosen for its association with a small valley to a small stream. 2) A woods road (woodrd) was chosen for its proximity to forest openings and larger openings. This small wood road would serve as a flyway between larger openings and forest interior. The wood road has high clutter, closed canopy. The detector was placed in a small forest opening about 30′ wide with a closed, high canopy, along the woods road. 3) The road leading to the HAOI (53road) and leads to Range 5-3 is a gravel road with a closed canopy about 30′ across. The road is well established and has been present for many years. Bats using the area would likely use this flyway frequently.

All detectors had microphones at 10′ in the air and tucked against but at least 5′ of a tree limbs to stay outside of but within recording distance or flyways. The microphone was facing forest/road openings, though with the omnidirectional microphones, detection cones include areas within the detection sphere.

Recording events between 5/15 and 5/19 produced a limited number of recorded bat pass sequences. As a result the detectors were pulled on 5/19/2015 and reset 5/30/2015. In addition, Detector 3, placed along the 5-3 Road was found to have fallen over. Roughly 4 hours of quality recording occurred before not recording anything after the event.

During nights of 5/30/2015 and 6/5/2015 the woodsrd was surveyed and during nights of 6/6/2015 and 6/8/2015 the 5-3 road was surveyed. A total of 9 successful survey nights were recorded.

File Management (table 17)

Files were transferred to computer. SM2 .wac files were converted to .wav using wac2wav programs. Files were renamed using the following formula: Acoustic method_detectortype_detectornumber_Landowner_Site_locationwithin site_0_yyyymmdd_hhmmss_000_speciesID. Example: PAS_SM2-_Det2_EAFR_DEMO_forest-0_20150618_083922_000-Epfu. Where epfu is the 4 character species generated auto classification and auto renamed. Where manually named, the file might read: PAS_SM2-_Det2_EAFR_DEMO_forest-0_20150618_083949_000_EPTFUS. The manual species name would receive 6 characters.

Coarse Analysis

A total of 614 files were collected. A coarse analysis was conducted (table 4) to determine that 72 of these files are considered to be high frequency bats (HiF).

Table 4	
Sonobat Coarse Analysis	
Frequency Clad	**Number of files**
HiF	72
LoF	393
bat passes	465
Non-bat	149

Once it was determined that high frequency bats are present, all files were analyzed using Kaleidoscope's 2.2.2 auto classifier. Table 5 shows results of this acoustic analysis.

Table 5											
Kaleidoscope Acoustic Nightly output by number of files (files											
KaPro 3.1.1 Classifiers 2.2.2.											
		EPFU	**LABO**	**LACI**	**LANO**	**MYLE**	**MYLU**	**MYSE**	**PESU**	**NOID**	**NOISE**
*	ALL	142	1	192	93	6	18	22		147	249
20150517	*	2			2					2	4
20150530	*	3		9	17					14	20
20150603	*				1					0	0
20150604	*	26			7		3			12	24
20150605	*	2			10		1			9	14
20150606	*	1		3	3					5	4
20150607	*	104	1	65	34	4	12	17		68	84
20150608	*	4		2	3	2	2	5		8	7

	Table 6							
	Kaleidoscope Acoustic Nightly MLE nightly output (red cells are those with MLE values <0.05 and correspond to species considered by Kaleidoscope to be present.							
	EPFU	**LABO**	**LACI**	**LANO**	**MYLE**	**MYLU**	**MYSE**	**PESU**
20150517	0	0.5888772	0	0.0000001	0.0000334	0	0	1
20150530	0.1754347	1	1	0.249969	1	1	1	1
20150603	0.9574044	1	0.0001513	0	1	1	1	1
20150604	1	1	1	0.154092	1	1	1	1
20150605	0	1	1	0.5992095	1	0.00159	1	1
20150606	0.8885309	1	1	0.0000007	1	0.118899	1	1
20150607	0.8237277	1	0.0184034	0.1223329	1	1	1	1
20150608	0	0.5204723	0	0.154616	0.0007497	0	0	1
20150517	0.010026	0.9719552	0.3064747	0.2592813	0.0067292	0.050471	0.0000031	0.9719552
20150530	EPFU= *Eptesicus fuscus, LABO= Lasiurus borealis, Laci = Lasiurus cinereus MYLE= Myotis leibii, , MYLU= Myotis lucificugus, MYSE =Myotis septentrionalis PESU= Perimyotis subflavus.*							

Kaleidoscope Pro night/site level MLE results (table 6) indicate the following species are present: big brown, hoary, eastern small-footed, little brown, and northern long-eared. As a result, a qualitative analysis of is required for each site/night where MLE results suggests presence to determine if files classified as MYSE are indeed probable MYSE.

Qualitative Analysis

Table 7 Files classified as MYSE using different tools						
Program	Classified as MYSE (one or both programs classified as MYSE)	Sonobat	Kaleidoscope Pro	Agreement (where both programs agreed)	Manual Vetted (number of files where acoustic surveyor classified file as MYSE)	Total agreement (where both programs and manual vetter classified as MYSE/MYLE.
Number of Files Classified as MYSE	27	18	22	19	4	4

72 files (table 11) are considered to be high frequency. All 72 files were manually vetted and where possible identified to species. Of these, 27 were classified by either Kaleidoscope Pro or Sonobat 3.2.2, or both as MYSE (table 12) . Of these 27 files, 4 were considered to be of high quality, offering call characteristics indicative of MYSE/MYLE (table 13). Other files, classified as MYSPP_myse exhibit calls similar in structure to MYSE but do not have enough characteristics for a manual vetter to suggest probability.

Characteristics between Myotis *spp*
MYLU can be distinguished from other *Myotis* spp by having a lowest slope of <3kHz/ms or having a call duration of >7ms. MYSE can be distinguished from other *Myotis* spp in part by having a high Fc (>50Khz), high frequencies (>104kHz), high FreqMaxPwr (>75kHz), Steep SlopeAtFC (>12kHz/ms), or steep total slopes (>22kHz/ms). These do not indicate limits, or ranges of frequencies or slopes. These features still overlap greatly. Because of this overlap, characteristics should appear on a majority of pulses within a call and occur without overlap with other species.
MYLE can be distinguished from other *Myotis* spp by sharing high frequencies, steep slopes and overall its smooth curve with no inflection. This curved variation is distinctive of MYLE, but lacking this curve is not distinctive of MYSE.

Distinguishing features may not be emitted or recorded. The presence or absence of these features can be a function of the recording environment, a subject's behavior, or recording parameters. When they are absent, classifying species with high probability can be difficult. Given these overlapping characteristics, conclusions regarding presence/absence must be willing to accept a certain amount associated with these overlapping characteristics, especially when characteristics that are present still overlap with other species.

Table 8 Features helpful to distinguish from and between species

Variable	MYLU	MYSE	MYSE from MYLU	MYSE from MYLE	MYLE	MYLE from MYLU	MYLE from MYSE
Call Duration	**>7ms**						
Fc		>50kHz	>46kHz	>50kHz		>46kHz	
HiFreq		**>104kHz**	**>**100kHz	>120kHz		>100kHz	
FreqMaxPwr		**>71kHz**	>73kHz	>71kHz			
Total Slope		**>22kHz/ms**	>6.7kHz/ms	>22kHz/ms		>20kHz	
Other characteristics		Slope appearing straight, sometimes down to 32 kHz			**Smooth, no inflection**	**Smooth, no inflection**	**Smooth, no inflection**

Bold text = features, that are characteristic of species and by themselves can be helpful for ID

Variable	Definition
CallDuration	Duration of the call (milliseconds).
Fc	Characteristic frequency of the call. Determined by finding the point in the final 40% of the call having the lowest slope or exhibiting the end of the main trend of the body of the call (kHz).
HiFreq	Highest apparent frequency of the call.
Total Slope	Total slope of the call, calculated from the difference in frequency and time from the point of highest frequency to the point of the characteristic frequency.
Inflection	Inflection or knee is an abrupt point at which slope changes from steep to flatter.

Table 9 Features present in files (YES) that are helpful to distinguish from and between species

Feature	MYLU	MYSE	MYSE from MYLU	MYSE from MYLE	MYLE	MYLE from MYLU	MYLE from MYSE
Call Duration	YES						
Fc		NO		NO	NO	YES	
HiFreq		NO	YES	NO	NO	NO	
Total Slope		NO	NO	NO	NO	NO	
Other characteristics					NO	NO	NO

Table 10

File Name	Classification	Reason
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232819_000-Myse.wav	*MYSE/MYLE*	High F: 100kHz, straight, steep slope, Analook OPS: 210, with inflection, lacks smooth transition. Low frequency 32kHz. High frequency, slopes, overall slope transitions overlap with MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011258_000-Myse.wav	*MYSE/MYLE*	High F: 112kHz, more clear when viewed in analook. Straight steep slope, Analook OPS: 210. With inflection, lacks smooth transition. Low frequency 33kHz. High frequency, slopes, overall slope transitions overlap with MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015818_000-Myse.wav	*MYSE/MYLE*	High F: 115kHz, much more clear when viewed as .zc file in Analook, OPS: 201. Low frequency 33kHz. High frequency, slopes, overall slope transitions overlap with MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235608_000-Myse.wav	*MYSE/MYLE*	High F: 112kHz, more clear when viewed in analook. Analook OPS: 210. With inflection, lacks smooth transition. Low frequency 35kHz. High frequency, slopes, overall slope transitions overlap with MYLE

Conclusion

Given the facts that 1) Bat passes include high frequencies 110-115 kHz 2) steep slopes >17kHz/ms 3) pulses exhibit transition characteristic of, but not limited to MYSE 3) each of the four files exhibiting pulses with low frequencies below average for MYLE slopes, it is possible that the acoustic files recorded at the LDR within the EAFR in Jericho, VT between 5/30/2015 and 6/9/2015 were emitted by the federally endangered northern long-eared bat (*Myotis septentrionalis)* or the eastern small footed bat *(Myotis leibii).* Most of the MYSE files did not exhibited enough distinct call characteristics to make accurate species classification.

Due to this ambiguous result, it is wise to assume presence of MYSE.

Impacts on bats and bat habitat.

Impacts from construction of and the use of the LDR may impact bat, if they are roosting in the HAOI, by creating noise and vibrations that will impact bats while roosting, that deviate from historic norms. It is recommended that netting surveys occur to attempt to trap bats and track bats to roosting trees to identify if bats are within a distance to be impacted by these noises.

Noise relating to the creation of and use of the LDR, if conducted during nightly active times will may also impact foraging bats. It is recommended that these activities are conducted during daylight hours, non-active daily periods. Dawn-Dusk.

- Consult with USFWS
- Conduct trapping surveys
- If bats are found during trapping surveys
    - Consult with USFWS
- If bats are not found during trapping surveys
    - Commit to daylight (dawn-dusk) construction hours
    - Commit to daylight use (explosion hours)

Table 11

All files classified as High Frequency by Sonobat with classifications by programs and Manual vetting

SONOBAT*						Kaleidoscope Pro**			Manual***
Filename****	**HiFspp**	**Consensus**	**ByVote**	**#Maj**	**#Accpt**	**AUTO ID**	**PULSES**	**MATCH**	**Vetted**
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_220452_000.wav	1			1	1	MYLU	16	12	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_220454_000.wav	1					NoID	4	0	MYLU
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_220530_000.wav	1	LuSo	MyluMyso	5	5	MYLU	28	17	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_220634_000.wav	1			1	2	MYLU	15	13	MYLU
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_220654_000.wav	1	LuSo	MysoMyle	2	4	MYLU	40	30	MYLU
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_220854_000.wav	1					MYLU	13	8	MYLU
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_221310_000.wav	1					MYLU	12	8	MYSPP_EPFU
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_221334_000.wav	1		LaciMyluMyso	1	2	LACI	9	2	Mylu/LACI
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232130_000-Myse.wav	1	Myse	Myse	5	6	MYSE	24	10	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232736_000.wav	1					LABO	3	2	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232814_000.wav	1					Noise	0	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232819_000-Myse.wav	1	Myse	Myse	3	3	MYSE	15	7	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232824_000.wav	1					Noise	0	0	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_233824_000.wav	1	LuSo	MyluMyso	7	8	MYLU	52	28	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_233829_000.wav	1	LuSo		1	1	MYLU	12	9	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_233902_000.wav	1	LuSo	MyluMyso	5	8	MYLU	42	34	MYSPP_myle
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_233907_000.wav	1	LuSo	MyluMyso	5	5	MYLU	21	15	MYSPP_myle
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_233914_000.wav	1			1	2	MYLU	16	10	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_233919_000.wav	1					Noise	0	0	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_234456_000.wav	1			1	1	MYSE	10	6	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_234501_000.wav	1					Noise	0	0	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_234516_000.wav	1					NoID	3	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_001114_000-Myse.wav	1	Myse	Myse	2	2	MYSE	33	15	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_001119_000.wav	1					Noise	0	0	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011258_000-Myse.wav	1	Myse	Myse	5	5	MYSE	12	4	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011303_000.wav	1					NoID	6	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011314_000-Myse.wav	1	Myse	Myse	3	4	MYSE	19	9	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011319_000-Myse.wav	1	Myse	Myse	2	2	NoID	1	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011438_000-Myse.wav	1	Myse	Myse	8	8	MYSE	14	6	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011443_000.wav	1					Noise	0	0	MYSPP

PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011536_000-Myse.wav	1	Myse	Myse	3	3	MYSE	14	8	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011541_000-Myse.wav	1	Myse	Myse	5	6	NoID	14	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011544_000-Myse.wav	1	Myse	Myse	5	5	NoID	19	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011618_000-Myse.wav	1	Myse	Myse	6	6	MYLE	22	7	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011644_000-Myse.wav	1	Myse	Myse	8	8	MYSE	12	5	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011726_000.wav	1					NoID	4	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_012042_000.wav	1	LuSo		1	1	MYLU	30	15	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_014626_000.wav	1					MYLE	32	8	MYSPP_myse_epfu
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015758_000.wav	1			1	1	NoID	4	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015818_000-Myse.wav	1	Myse	Myse	4	4	MYSE	35	19	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015823_000.wav	1		Myse	6	7	NoID	18	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015842_000-Myse.wav	1	Myse	Myse	4	4	MYSE	29	15	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015847_000.wav	1					Noise	0	0	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015924_000.wav	1			1	1	MYSE	38	11	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015929_000-Myse.wav	1	Myse	Myse	4	4	MYSE	37	17	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015934_000.wav	1			1	1	NoID	3	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015946_000.wav	1					MYSE	8	6	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021040_000.wav	1					NoID	8	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021045_000.wav	1					MYSE	23	12	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021900_000.wav	1			1	2	MYSE	36	15	MYSPP_myse_EPTFUS
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021905_000-Myse.wav	1	Myse	Myse	3	3	NoID	10	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_022206_000.wav	1			1	1	MYLE	25	6	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_032708_000.wav	1					MYLE	16	7	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_032713_000.wav	1					Noise	0	0	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_033948_000.wav	1			1	2	NoID	20	0	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_033953_000.wav	1			1	1	MYSE	28	9	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_222200_000-Myle.wav	1	Myle	Myle	3	3	MYLE	15	10	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_222205_000.wav	1		MyluMysoMyle	4	8	MYLE	39	13	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_222210_000.wav	1		Myle	2	3	MYSE	12	3	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_232434_000-Myse.wav	1	Myse	Myse	2	2	MYSE	15	10	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_232439_000.wav	1			1	1	MYSE	3	2	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_233808_000-Mylu.wav	1	Mylu	Mylu	6	8	MYLU	38	26	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_233813_000.wav	1					MYLU	17	10	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235608_000-Myse.wav	1	Myse	Myse	4	5	MYSE	17	10	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235613_000.wav	1					NoID	15	0	MYSPP

PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235616_000.wav	1			1	1	MYSE	3	2	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_woodrd-0_20150530_235620_000.wav	1	LuSo		1	1	NoID	4	0	MYSPP_luso_laci
PAS_SM3-_Det4_EAFR_DEMO_woodrd-0_20150605_000830_000.wav	1					MYLU	15	9	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_woodrd-0_20150605_000904_000.wav	1					MYLU	4	4	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_woodrd-0_20150605_011200_000.wav	1	LuSo	MyluMyso	8	8	MYLU	34	21	MYLU
PAS_SM3-_Det4_EAFR_DEMO_woodrd-0_20150605_224042_000.wav	1					MYLU	19	11	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_woodrd-0_20150606_033202_000.wav	1			1	1	NoID	9	0	FRAG_HI

*Myse = *Myotis septentrionalis*, Cora = *Corynorhinus rafinesquii*, species not present, LUSO, MyluMyso= file resembles the undistinguishable *Myotis lucifugus* and *Myotis sodalis*, MYLE = *Myotis leibii*,
**MYSE= *Myotis septentrionalis*, NoID = file not classified to species, MYLE = *Myotis leibii*,
***MYSPP= *Myotis* species, call does not exhibit enough species specific characteristics to make a manual classification. MYSPP_myse = *Myotis* species, call does not exhibit enough characteristics to make a manual classification, though does closely resemble MYSE. MYSPP_MYSE_EPTFUS = File includes *Myotis* and Eptesicus, FRAG_HI = undistinguishable high frequency bat. MYSE/MYLE: files exhibiting characteristics that overlap with MYSE and MYLE but do not have enough distinct characteristics
**** Filenames with species appended to filename by Sonobat.

Table 12

All files classified as MYSE by tools used: Sonobat and Kaleidoscope Pro. Blue Shade = agreement between programs. Green shading indicates files closely resembling MYSE

SONOBAT*							KaPro**				Manual***
Filename****	Consensus	By Vote	#Maj	# Accpt	Mean Clssn	Discr Prob	AUTO ID	PULSES	MATCHING	Percent Matching	Vetted
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232130_000-Myse.wav	Myse	Myse	5	6	Myse	0.9915	MYSE	24	10	42%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232819_000-Myse.wav	Myse	Myse	3	3	Myse	0.9957	MYSE	15	7	47%	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_234456_000.wav			1	1	Mylu	0.9762	MYSE	10	6	60%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_001114_000-Myse.wav	Myse	Myse	2	2	Myse	0.9777	MYSE	33	15	45%	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011258_000-Myse.wav	Myse	Myse	5	5	Myse	0.9989	MYSE	12	4	33%	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011314_000-Myse.wav	Myse	Myse	3	4	Myse	0.9928	MYSE	19	9	47%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011319_000-Myse.wav	Myse	Myse	2	2	Myse	0.9994	NoID	1	0	0%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011438_000-Myse.wav	Myse	Myse	8	8	Myse	0.9343	MYSE	14	6	43%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011536_000-Myse.wav	Myse	Myse	3	3	Myse	0.9991	MYSE	14	8	57%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011541_000-Myse.wav	Myse	Myse	5	6	Myse	0.9997	NoID	14	0	0%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011544_000-Myse.wav	Myse	Myse	5	5	Myse	0.9993	NoID	19	0	0%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011618_000-Myse.wav	Myse	Myse	6	6	Myse	0.9674	MYLE	22	7	32%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011644_000-Myse.wav	Myse	Myse	8	8	Myse	0.9957	MYSE	12	5	42%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015818_000-Myse.wav	Myse	Myse	4	4	Myse	0.987	MYSE	35	19	54%	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015842_000-Myse.wav	Myse	Myse	4	4	Myse	0.9855	MYSE	29	15	52%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015924_000.wav			1	1	Myse	0.9717	MYSE	38	11	29%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015929_000-Myse.wav	Myse	Myse	4	4	Myse	0.9763	MYSE	37	17	46%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015946_000.wav							MYSE	8	6	75%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021045_000.wav							MYSE	23	12	52%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021900_000.wav			1	2	Myse	0.9761	MYSE	36	15	42%	MYSPP_myse_EPTFUS
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_021905_000-Myse.wav	Myse	Myse	3	3	Myse	0.9774	NoID	10	0	0%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_033953_000.wav			1	1	Myse	0.9891	MYSE	28	9	32%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_222210_000.wav		Myle	2	3			MYSE	12	3	25%	MYSPP
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_232434_000-Myse.wav	Myse	Myse	2	2	Myse	0.9567	MYSE	15	10	67%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_232439_000.wav			1	1	Cora	1	MYSE	3	2	67%	MYSPP_myse
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235608_000-Myse.wav	Myse	Myse	4	5	Myse	0.9046	MYSE	17	10	59%	MYSE/MYLE
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235616_000.wav			1	1	Cora	1	MYSE	3	2	67%	MYSPP_myse

*Myse = *Myotis septentrionalis*, Cora = *Corynorhinus rafinesquii*, species not present. , Blank spaces are files that did not contain enough calls that matched a species.

**MYSE= *Myotis septentrionalis*, NoID = file not classified to species, MYLE = *Myotis leibii*,

***MYSPP= *Myotis* species, call does not exhibit enough species specific characteristics to make a manual classification. MYSPP_myse = *Myotis* species, call does not exhibit enough characteristics to make a manual classification, though does closely resemble MYSE. MYSPP_MYSE_EPTFUS = File includes *Myotis* and Eptesicus. MYSE/MYLE: files exhibiting characteristics that overlap with MYSE and MYLE but do not have enough distinct characteristics

**** Filenames with species appended to filename by Sonobat.

Table 13					
All files classified as MYSE by tools used: Sonobat and Kaleidoscope Pro					
	SONOBAT*	KaPro**	Manual***		
Filename****	Consensus	AUTO ID	Vetted	High frequency	
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150607_232819_000-Myse.wav	Myse	MYSE	MYSE/MYLE		
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_011258_000-Myse.wav	Myse	MYSE	MYSE/MYLE		
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_015818_000-Myse.wav	Myse	MYSE	MYSE/MYLE		
PAS_SM3-_Det4_EAFR_DEMO_53road-0_20150608_235608_000-Myse.wav	Myse	MYSE	MYSE/MYLE		
*Myse = *Myotis septentrionalis*, Cora = *Corynorhinus rafinesquii*, species not present. , Blank spaces are files that did not contain enough calls that matched a species. **MYSE= *Myotis septentrionalis*, NoID = file not classified to species, MYLE = *Myotis leibii*, ***MYSPP= *Myotis* species, call does not exhibit enough species specific characteristics to make a manual classification. MYSPP_myse = *Myotis* species, call does not exhibit enough characteristics to make a manual classification, though does closely resemble MYSE. MYSPP_MYSE_EPTFUS = File includes *Myotis* and Eptesicus. MYSE/MYLE: files exhibiting characteristics that overlap with MYSE and MYLE but do not have enough distinct characteristics **** Filenames with species appended to filename by Sonobat.					

Table 14 Detector recording settings												
SM2 settings												
FS	Gain	HPF	LPF	FRQMIN	FRQMAX	DMIN	TRGLVL	TRGWIN	MAX LENGTH	DIV RATIO	NAP	FILE TYPE
384000	Off	FS/48	OFF	n/a			8SNR	2.0S	OFF	12	OFF	.WAC
SM3 settings												
Auto (usually 300000)	off	Off	Off	16kHz	192kHz	1.5MS	AUTO	3.0S	15.0S	Off	off	.WAV

Table 15 Acoustic Analysis Programs Used						
	Version	Qualitative Analysis	Generate Auto ID's	Generate Site/night MLE's	MLE's reported	MLE's considered
Sonobat	3.2.2 NY-PA-WV	Yes	Yes	Yes	No	Yes
Kaleidoscope Pro	2.2.2 (VT region, excluding MYSO)	No	Yes	Yes	Yes	Yes
Echo Class	V3	No	yes	Yes	Yes	Yes

Table 16 Other programs used		
Other Programs Used	**Purpose**	**Reason**
Kaleidoscope Pro	To split max duration to 5 second	SM3 .wav files are up to 15.0 seconds, too long for Sonobat to analysis. Reducing and parsing out calls within each 15 second file allows for analysis
Kaleidoscope Pro	To convert to and rename zero cross files	For analysis with EchoClass
Sonobatch scrubber 5.4	To remove noise and low quality calls	To remove noise and low quality calls.
WAC2WAV	To convert .wac files to .wav files	SM2 detectors are set to record in .wac format to reduce battery use and increase space.
Analook	To view .zc files	Time view calls in a different program, may offer different details, especially high frequencies

Table 17 Data flow						
SM2						
.wac files	.wav files	attribute .wav files	Scrub files	Split duration to 5 seconds	Merge with SM3 files	Analysis using Sonobat
SM3						
	.wav files	Attribute .wav files	Scrub files	Split duration to 5 seconds	Merge with SM2 files	Analysis using Sonobat
				Covert to zero cross	Analysis using EchoClass	
				Analysis using KaPro		

Camp Ethan Allen Training Site 2015 Bat Netting Survey

113 ETHAN ALLEN RD

JERICHO, CHITTENDEN COUNTY

VERMONT

JULY 2015

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ABSTRACT

On the nights of July 10 to July 14 2015, staff from Vesper Environmental, LLC (West Sand Lake NY) conducted netting surveys for bats at the Vermont National Guard Camp Ethan Allen Training Site, Jericho Vermont, in an attempt to capture northern long-eared bats (*Myotis septentrionalis*) MYSE within specific portions of the training center where acoustic surveys the previous year had suggested their presence. Three distinct sites were sampled for a total of 36 net nights of effort at 21 different net set locations. Fifteen bats were captured, 13 big brown bats (*Eptesicus fuscus*) and two little brown bats (*Myotis lucifugus*). Both little browns, an adult male and adult non-reproductive female, were radio- tagged and were subsequently tracked and monitored by staff from Northern Stewards. The male was never detected after release, the female was found in a building in Underhill Center Vermont approximately 2.4 km to the north of the capture site. Acoustic detectors were set at three locations for a total of 4 detector-nights to determine background levels of bat activity during netting. Fifty-eight call files (14.5 call files per detector-night) were identified as bats by Kaleidoscope Pro v.3.1.1 (Wildlife Acoustics Inc.). None of the call files were attributed to northern bats. The Maximum Likelihood Estimator (MLE) for Kaleidoscope Pro predicted that three species, the big brown, silver-haired, (*Lasionycteris noctivagans)* and the little brown bat, were likely to be present at Site 2 during netting. Big browns and little browns were captured in nets at that site. Northern bats were not present at the sampling sites in densities that were detectable at this level of effort.

INTRODUCTION

Northern long-eared bats (*Myotis septentrionalis*) (northern bats) were common across most of the state of Vermont prior to 2005. With the arrival of the disease White Nose Syndrome (WNS) in 2006 (Blehert et. al. 2009) the species suffered severely and by 2010 had declined by over 99% in known hibernacula within the State (Turner et al. 2011) by 2010. They are still likely declining and are now rarely netted in Vermont during the summer months (Scott Darling personal communication 2015). The species is now protected under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as threatened (northern bat) under the Endangered Species Act (ESA) of 1973, as amended.

This report summarizes the results of a netting survey intended to capture northern bats conducted at the Vermont National Guard Camp Ethan Allen Training Site, 113 Ethan Allen Rd, Jericho, Chittenden County Vermont (Ethan Allen) (Figure 1). the survey was conducted as a follow-up to 2014 acoustic surveys that recorded calls attributed to northern bats (Thompson 2014). Ethan Allen is 4540 hectares (ha) in size and is a combination of mixed northern hardwoods and disturbed small shrub/grasslands. In the vicinity of the sampling sites elevations vary from about 270 meters to 350 meters. This survey was an effort to capture northern bats in the vicinity of those presumed 2014 acoustic detections and was not linked to United States Fish and Wildlife Service (USFWS) presence/absence survey standards (USFS 2014, USFWS 2015).

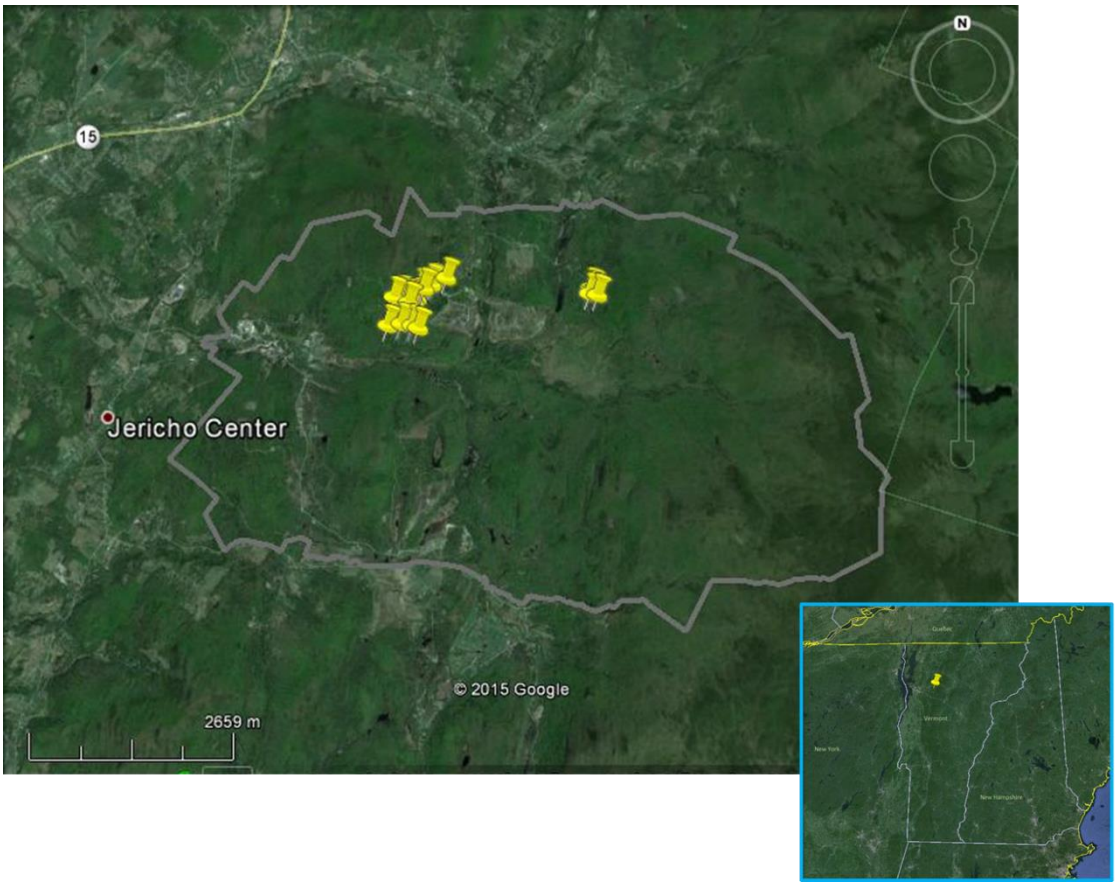

Figure 1. Ethan Allen property boundary (grey) and the distribution of sampling locations (yellow).

SURVEY METHODS

Because this was not a presence/absence survey, the distribution or intensity of effort was not necessarily consistent with the United States Fish and Wildlife (USFWS) survey standards (USFS 2014, USFWS 2015). Nets were set in the vicinity of presumed acoustic detections of northern bats determined during 2014 acoustic surveys (Thompson 2014) in three different areas (sites 1 to 3) (Figure 2) Specific net locations were selected along isolated water sources or likely travel corridors where flight corridors were constricted by vegetation. Net sets sites with net sets identified using letters and the site number as a prefix (e.g. 1-D). Because of constrictions, net sets generally consisted of two nets stacked vertically between poles 6 meters (m) tall. Nets were 75 denier 2-ply 38 mm mesh polyester intended for bat mist netting (Avinet, Cortland NY). Net lengths varied from 6 m in narrow flight corridors to 12 m in more open areas. Weather conditions were appropriate for netting throughout the survey period as there was no rain, high winds, or temperatures below 10 degrees C. Coordinates of the sampling sites were recorded using the GPS Kit on an iPhone 5s (Apple Inc, Cupertino, CA). Assembled acoustic units were photographed using an SLR camera (70-D Canon USA) or I-phone.

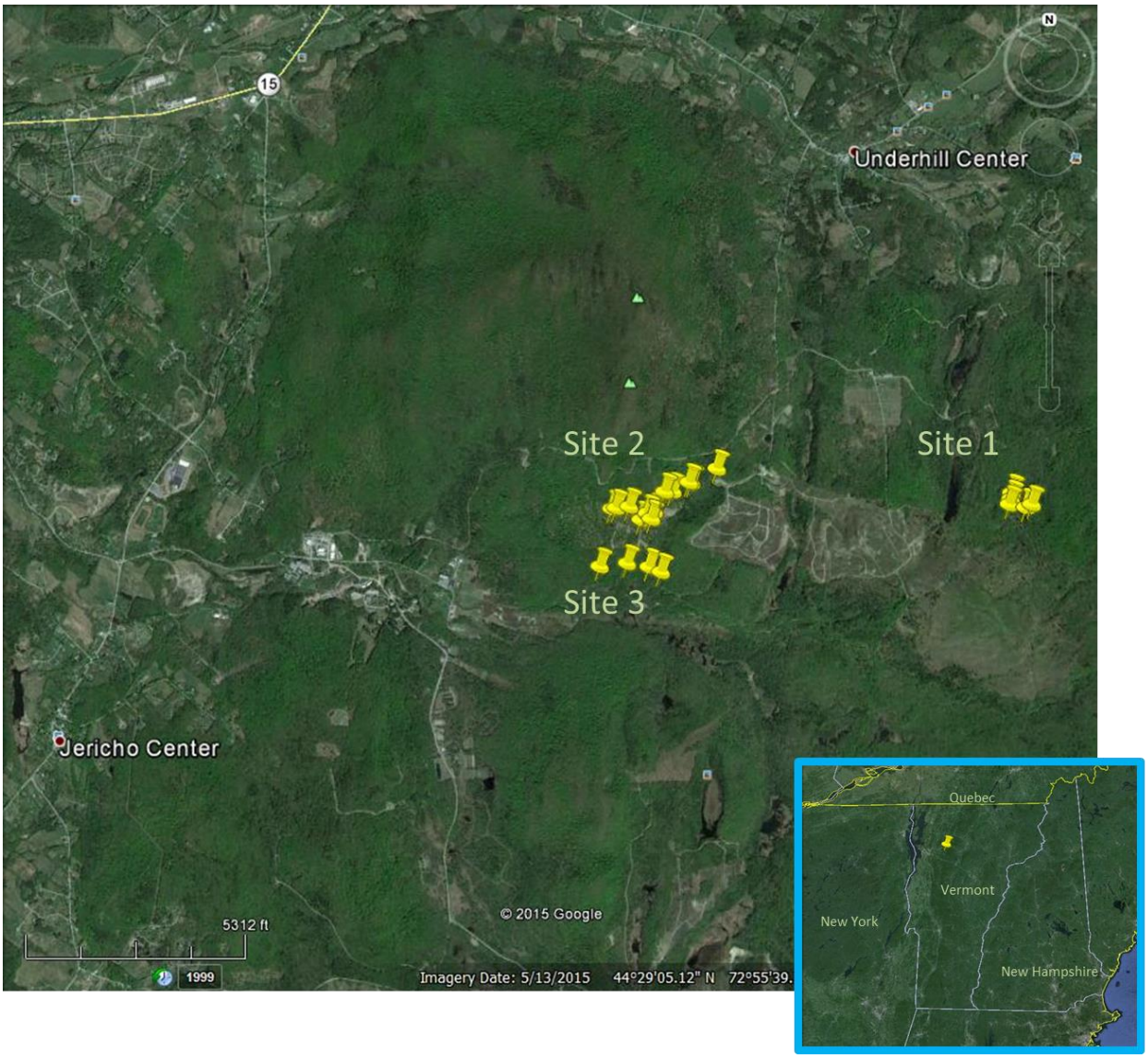

Figure 2, Distribution of Ethan Allen Training site 2015 netting locations, Jericho, Chittenden County, Vermont.

All captured individuals were removed from the net and placed in 13 cm x 7.9 cm x 27cm paper lunch bags (Western Family Foods Inc Portland OR) until processing. A qualified biologist processed each capture and collected the data including species, sex, age, reproductive condition, weight, right forearm length, Each bat was photographed to document species,. All bats were handled to the minimum extent possible and were processed and released as quickly as possible. Radio –tags were fitted to Myotis species. Transmitters weighing 0.35 g. (Model LB-2n Holohil Systems Ltd, Carp Ontario) were applied between the scapula after trimming the fur using surgical adhesive (Perma-Type, Plainville CT). Tracking was conducted using R-1000 receivers (Communications Specialist Inc, Orange, CA) and three-element yaggi antennas.

Acoustic detectors were deployed during the netting period near net sets at Site 2 as a second indicator of bat activity. Units were deployed in compliance with all USFWS survey guidelines (USFWS 2015). Recording began each evening at 20:00hrs and ended at 06:00hrs. Microphones were set at least 1.5 meters above the surrounding vegetation and angled upwards at about 45 degrees. Microphones were positioned to minimize reflections off nearby clutter within the 45°cone of detection, yet close enough to the most likely areas of bat activity (e. g., forest/ open area interfaces) to record animals that are in the area.
Vocalizations were recorded using the iFR-IV integrated field recorder (Binary Acoustics Technologies, Tucson, AZ), which is a full spectrum recorder. Detectors were confirmed to be functioning within manufacturer's specifications prior to the onset of the project by the manufacturer and were confirmed fully operational when deployed. Activated units began recording at 20:00 hours each evening and stopped recording at the end of netting (around 03:00 hours) each morning. At the end of each recording session, the unit performed an automated test that documented that the detector was still functioning properly. The recorded files were reviewed for further evidence that the system was working properly as evidenced by the distribution of recorded files throughout the sampling period.

Recordings were made using SPECTOR III software (Binary Acoustics Technologies Tucson AZ). The acoustic data was downloaded daily from each detector to external drives (Cruzer Guide 64 GB, SanDisk Corporation, Milpitas, CA). Collected data was then copied to external hard drives as both backup copies and copies for processing (Seagate model STBU1000100, Seagate Technologies LLC, Cupertino, CA; Toshiba model E145163, Toshiba American Information Systems Inc. Irvine, CA; WD passport model 3613B, WD My Cloud Mirror, WD My Book, Western Digital Corporation, Irvine, CA,).

All recorded files were first processed using SCAN'R (Binary Acoustic Technology, Tucson, AZ). To ensure that reasonable quality calls were run through the later automated programs, we required at least three pulses per file. All other defaults remained the same as the default settings of the manufacturer. SCAN'R separated the files that included bat calls of sufficient quality for further analysis (passed files) from those files that did not (failed files). Passed files were further analyzed using Kaleidoscope Pro v.3.1.1 (Wildlife Acoustics, Concord, MA). Kaleidoscope Pro analysis was restricted to the 9 species of bats most commonly found in Vermont, including MYSE.

Analysis programs (in this case Kaleidoscope) work by describing each pulse in the call based on a number of quantifiable characteristics, (e.g. slope at characteristic frequency, maximum frequency) then the results for this assessment are combined with results from all other pulses in the call file. These are then compared to the same analysis of files of known origin to predict the species identification.

Kaleidoscope applies a Maximum Likelihood Estimators (MLEs), which incorporates the overall number of calls recorded and the classification rates for each species to determine the likelihood that given species are present (Britzke et al. 2002). The programs produce P-values indicating the probability of a species being present at a site. USFWS guidelines set a P value of less than 0.05 as the threshold for likely presence (USFWS 2015)

RESULTS

Over the nights of July 10 to July 14 2015, 21 net sets were deployed totaling 36 net nights of effort (Table 1, Figure 3, and Appendix 1). Fifteen bats were captured including 13 big browns and 2 little brown bats (Table 2). Little brown captures included one male (bat#1-4) and one non reproductive female (bat #2-4) (Table 2, Figure 4). Both little browns were radio-tagged before release and later tracked by staff from Northern Stewards. The male was never detected after release. The female was detected in the attic of the town clerk's office in Underhill Vermont, about 2.4 km north of the capture site. Subsequent exit counts ranged from 6-12 bats and included both little browns and big browns (Allan Thompson personal communication 2015)

Table 1. Net set information Ethan Allen Training Site 2015

Site	Set	Dates Surveyed	Degrees N	Degrees W	net length (m)	# of nets	habitat
1	A	7/10/15 to 7/11/15	44°29'02.53"	72°53'11.59"	9	2	closed corridor
1	B	7/10/15 to 7/11/15	44°29'01.07"	72°53'11.89"	6	1	closed corridor
1	C	7/10/15 to 7/11/15	44°28'59.84"	72°53'12.46"	9	2	closed corridor
1	D	7/10/15 to 7/11/15	44°28'59.14"	72°53'07.33"	6	1	closed corridor
1	E	7/10/15 to 7/11/15	44°28'59.86"	72°53'05.39"	9	2	closed corridor
2	A	7/11/2015	44°29'05.05"	72°54'56.97"*	9	2	closed corridor
2	B	7/11/2015	44°29'02.91"	72°55'04.00"	6	2	open corridor
2	C	7/11/2015 to 7/12/15	44°29'03.10"	72°55'01.58"	12	2	closed corridor
2	D	7/11/2015 to 7/12/15	44°28'58.24"	72°55'07.35"	9	1	pool
2	E	7/11/2015 to 7/12/15	44°28'56.32"	72°55'11.66"	12	2	pool
2	F	7/11/2015 to 7/12/15	44°28'59.38"	72°55'15.50"	9	2	open corridor
2	G	7/11/2015 to 7/12/15	44°28'59.08"	72°55'19.77"	9	2	pool
2	H	7/11/2015 to 7/12/15	44°28'58.85"	72°55'21.26" *	6	2	pool
2	I	7/12/2015	44°29'08.25"	72°54'46.85" *	6	1	closed corridor
2	J	7/12/2015	44°29'05.30"	72°54'55.25" *	9	1	closed corridor
2	K	7/12/2015	44°28'57.54"	72°55'09.33"	12	2	wood /open edge

Site	Set	Dates Surveyed	Degrees N	Degrees W	net length (m)	# of nets	habitat
2	L	7/12/2015	44°28'56.55"	72°55'08.23"	9	1	open corridor
3	A	7/12/15 TO 7/13/15	44°28'44.09"	72°55'04.97"	6	2	closed corridor
3	B	7/12/15 TO 7/13/15	44°28'45.26"	72°55'08.89"	6	2	closed corridor
3	C	7/12/15 TO 7/13/15	44°28'46.13"	72°55'16.05"	9	2	closed corridor
3	D	7/12/15 TO 7/13/15	44°28'45.39"	72°55'25.05"	9	2	closed corridor

Figure 3. Location of net sets at Site 1 (left) and Sites 2 and 3 (right) Ethan Allen Training Center 2015.

Table 2. Bat Captures, Ethan Allen Training Center 2015.

Bat	Species	Net Set	Date	Time of Capture	Capture Height (m)	Age	Sex	Repro Condition	RT Forearm Length	Mass
1-1	EPFU	1-A	7/10/2015	21:35	0.5	A	F	PL	46.0	18.3
1-2	EPFU	1-A	7/10/2015	21:35	2	A	F	PL	46.0	16.6
1-3	EPFU	1-A	7/10/2015	21:35	2.5	A	F	PL	47.0	18.5
1-4	MYLU	1-A	7/10/2015	23:00	2.5	A	M	NR	38.9	8.5
1-5	EPFU	1-A	7/10/2015	23:00	3.0	A	F	NR	48.8	16.6
1-6	EPFU	1-A	7/10/2015	23:00	3.0	A	M	NR	48.0	13
1-7	EPFU	1-A	7/10/2015	23:00	3.5	A	F	PL	47.7	22.3
1-8	EPFU	1-A	7/11/2015	1:20	1.0	A	M	TD	46.7	15.3
1-9	EPFU	1-B	7/11/2015	2:30	3.0	A	F	NR	49.0	1.3
1-10	EPFU	1-B	7/12/2015	0:30	1.0	A	F	NR	45.6	21.7
2-1	EPFU	2-C	7/11/2015	21:06	3.0	A	M	R	46.8	17
2-2	EPFU	2-C	7/11/2015	22:05	3.5	A	M	R	45.9	19.8
2-3	EPFU	2-C	7/11/2015	22:05	3.5	A	M	R	46.8	17.9
2-4	MYLU	2-C	7/13/2015	1:20	2.5	A	F	NR	38.5	7.2
3-1	EPFU	3-C	7/13/2015	21:45	2.5	A	F	PL	45.7	17.2

Figure 4. Images of MYLU captures at the Ethan Allen Training Site 2015. Bats #1-4 (left) and #2-4 (right)

Three detectors were deployed at Site 2 (Table 3, Figure 5) for a total of four detector- nights of acoustic survey effort. Fifty-eight call files were recorded that were attributed to bats (Table 4) for a mean detection rate of 14.5 calls per detector -night. The Maximum Likelihood Estimator (MLE) for Kaleidoscope Pro predicted that three species, the big brown, silver-haired, and little brown bats, were likely to be present at Site 2 during netting (Table 5). Both the big brown and Little brown bat were captured at that site in nets.

Table 3. Bat acoustic sampling set information, Ethan Allen Training Site 2015.

Acoustic Set	Dates Surveyed	Detector	Degrees N	Degrees W
1	7/11/15	28	44°28'58.00"	72°55'09.17"
1	7/12/15	49	44°28'58.00"	72°55'09.17"
2	7/12/15	52	44°28'59.35"	72°55'20.15"
3	7/12/15	28	44°29'08.19"	72°54'46.53"

Figure 5. Location of acoustic sampling sets (blue) relative to net sets (yellow) Site 2, Ethan Allen Training Site 2015.

Table 4: Number of Acoustic files attributed to each species per site night by Kaleidoscope. Species abbreviations include big brown (EPFU); silver-haired (LANO); red, Lasiurus *borealis* (LABO); hoary *Lasiurus cinereus)* (LACI); small-footed *Myotis leibii* (MYLE); little brown (MYLU); Indiana *Myotis sodalis* (MYSO); and tri-colored bats *Perimyotis subflavus* (PESU). There were also bat calls not identified to species (NOID). MLE predictions of likely presence are highlighted in blue.

Detector Site	Date	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	MYSO	PESU	NOID	Total
1	7-11-2015	13	1	1	2	0	16	0	3	0	0	36
1	7-12-2015	10	0	2	2	0	0	0	0	0	0	14
2	7-12-2015	2	0	0	0	0	1	0	0	0	0	3
3	7-12-2015	2	0	0	1	0	1	0	1	0	0	5
	Total Files	27	1	3	5	0	18	0	4	0	0	58

Table 5: Kaleidoscope Maximum Likelihood Estimator (MLE) Results. A value of 0 indicates likely presence, 1 indicates likely absence. USFWS guidelines (USFWS 2015) require a P value of 0.05 or lower to meet the regulatory threshold for likely presence (highlighted in blue). Species abbreviations are the same as in Table 2.

Detector Site	Date	EPFU	LABO	LACI	LANO	MYLE	MYLU	MYSE	MYSO	PESU
1	7/11/15	0	0.982833	0.430059	0.982833	0.982833	0	0.982833	0.180716	0.982833
1	7/12/15	1E-07	1	0.032232	1	1	1	1	1	1
2	7/12/15	0.026268	1	1	1	1	0.065595	1	1	1
3	7/12/15	0.057145	0.999802	0.999802	0.759998	0.999802	0.134452	0.999802	0.165653	0.999802

DISCUSSION AND CONCLUSIONS

Bat densities as measured by captures (0.42 bat captures per net night) and acoustic detections (14.5 per detector- night) were very low by historical standards but within reasonable values for higher elevation areas since the onset of WNS. The netting and acoustic results were similar in that big brown bats were the most common species detected by both methods and two of the three species predicted by MLE's were captured in nets. Northern bats were not present at the sampling sites in densities that were detectable at this level of effort.

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Appendix 1

Camp Ethan Allen Training Site
2015 Bat Net
Set Images

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Figure 1. Net sets 1-A to 1-C

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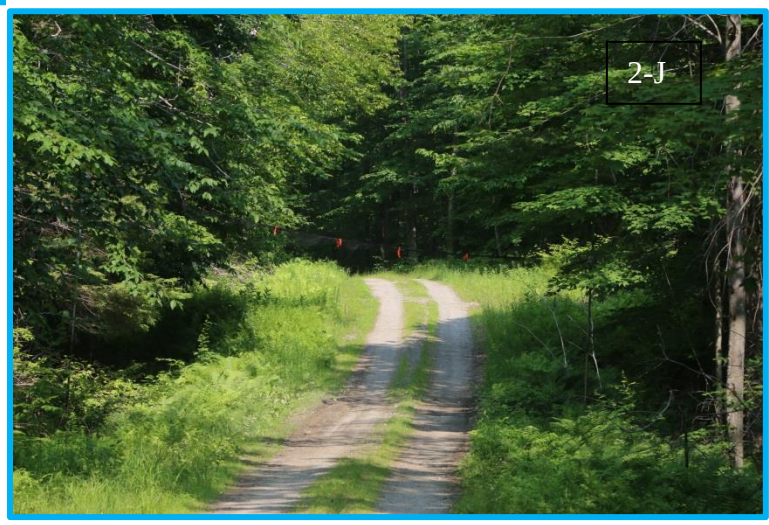

Figure 3. Net sets 2-A and 2-J

Figure 4. Net sets 2-B and 2-C

Figure 5. Net sets 2-D, 2-E, 2-K and 2-L

Figure 6. Net sets 2-F, 2-G, 2-H, and 2-I

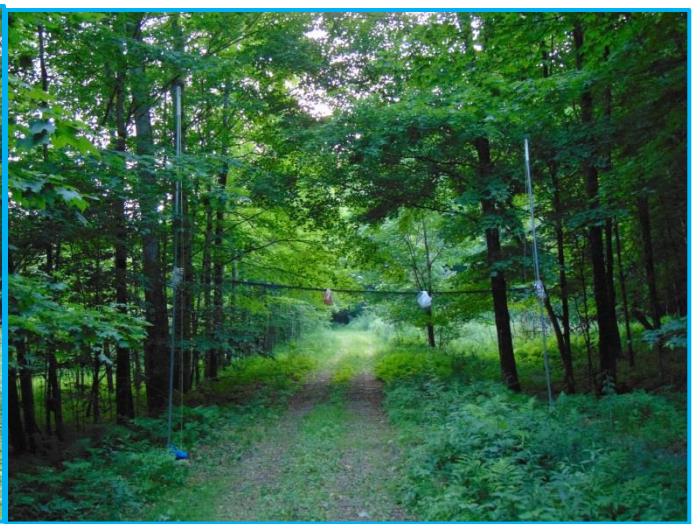

Figure 7. Net sets 3-A and 3-B

Figure 8. Net sets 3-C and 3-D

Appendix F

ARCHAEOLOGICAL RESOURCES ASSESSMENT FOR THE 5-3 DEMO RANGE PROJECT AREA,VERMONT ARMY NATIONAL GUARD ETHAN ALLEN TRAINING CENTER, JERICHO, UNDERHILL, BOLTON, CHITTENDEN COUNTY, VERMONT

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December, 2014

ARCHAEOLOGICAL RESOURCES ASSESSMENT FOR THE 5-3 DEMO RANGE PROJECT AREA,VERMONT ARMY NATIONAL GUARD ETHAN ALLEN TRAINING CENTER, JERICHO, UNDERHILL, BOLTON, CHITTENDEN COUNTY, VERMONT

Project Description

This report details the results of the University of Vermont Consulting Archaeology Program's (UVM CAP) archaeological resources assessment of a 1000 m (3280 ft / 0.61 mi) diameter area centered upon the existing 5-3 Demo Range on Engineer Lane within the Vermont National Guard's (VTANG) Ethan Allen Training Center, which is located in the towns of Underhill, Jericho, and Bolton, Chittenden County, Vermont. The proposed 5-3 Demo Range project encompasses a broad area in the Town of Jericho of approximately 78 hectares (194 acres) and is roughly bounded north by Castle Trail, east by a combination of the tank range, Poor Farm Road and the classroom/mess hall complex on Entrance Road, and on the south by Lee River Road (Figure 1).

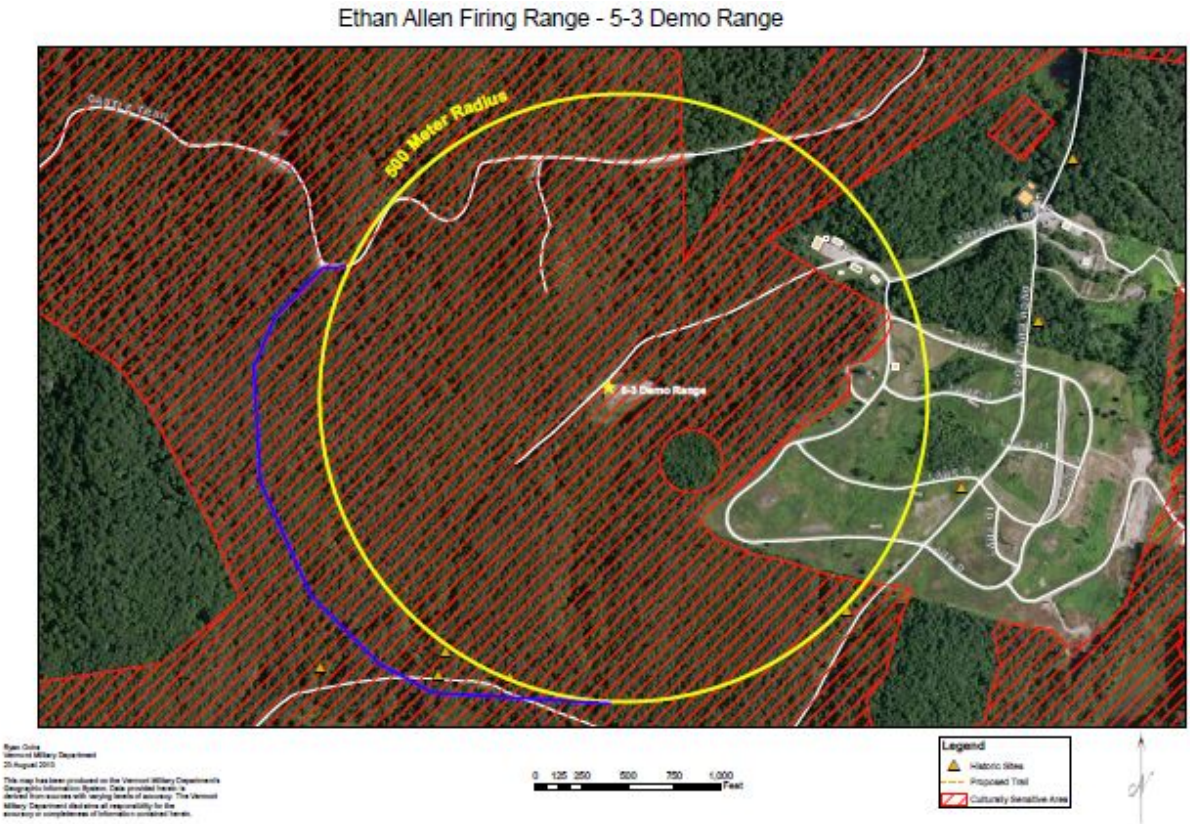

Figure 1. Map showing the 5-3 Demo Range project area within the Ethan Allen Training Facility, Jericho, Chittenden County, Vermont (map provided by VTANG). Hatched area represents potential for archaeological sensitivity based on earlier application of a computer-generated model for predicting the location of preContact era Native American sites.

Study Goal

The goal of this ARA was to identify those portions of the 5-3 Demo Range project area that may contain precontact Native American and/or historic archaeological sites. Many of the VTANG's Ethan Allen Training Center property's historic sites have been previously identified and inventoried (Thomas, Doherty, Florentin, Kenny, and Mandel 2005; Robins and Crock 2009). Two are located within or adjacent to the proposed 5-3 Demo Range project area and are discussed in more detail below. The parameters for establishing Precontact Native American site potential were based on the Vermont's Division for Historic Preservation's *Environmental Predictive Model for Locating Archaeological Sites.* This computer generated model combined with direct examination of the ground was used to define specific areas within the project area that could be sensitive for precontact Native American sites. Where identified, archaeologically sensitive areas requiring avoidance or subsurface Archaeological Phase I site identification surveys were plotted using a handheld Global Positioning System (GPS) unit.

Archaeological Site Potential

Precontact Native American

According to Thomas et. al. (2005:36), the "general background information drawn from the Browns River valley and other upland settings suggests that a relevantly low density of prehistoric sites is likely to be characteristic of the range. Sites are most likely to be located along major streams, particularly stream confluences. Some sites in similar upland settings have been found on higher valley edge features, such as lacustrine and kame terraces. These features may have provided overlooks of the valley bottom. Such features, particularly those located on the north and east sides of narrow valleys, may have also been attractive because they were exposed to greater amounts of solar radiation in the fall and winter than the valley floor. All sites are likely to be small and contain low densities of artifacts."

Although the overall potential for precontact Native American sites within the limits of the Ethan Allen Training Center's property is considered to be relatively low as compared to other areas in the region, they do exist. To date, one precontact Native American site has been identified on the Ethan Allen Training Center property. This site, designated VT-CH-1127 in the Vermont Archaeological Inventory (VAI), is located on Beartown Road on a prominent ridge overlooking an expansive pond/wetland/stream complex that forms a tributary to the Browns River (Mandel 2014). Furthermore, a digital Geographic Information System (GIS) rendering of the VDHP's *Environmental Predictive Model for Locating Precontact Archaeological Sites* indicated that at least a few key archaeological sensitivity factors that may have attracted Native American habitation in the past are present within the 5-3 Demo Range project area (Figure 2).

However, it is also important to note that there have been other archaeological Phase I site identification surveys conducted within the VTANG's Ethan Allen Training Center property that have proved negative for precontact Native American sites. Two of these areas tested were within in the 5-3 Demo Range project area and two other areas tested were close to the 5-3 Demo Range project area and in similar elevational and topographic environments as present within portions of the 5-3 Demo Range project area.

Of the two areas already tested within the 5-3 Demo Range project area, one was located on the top southern edge of a knoll-like spur that overlooked the Lee River valley to the south. The Lee River flows east to west approximately 300 m (984 ft) south of the area tested. The top of the landform was wooded and fairly level at about 274.3 m (900 ft) above mean sea level, but it had steep slopes forming its southern, eastern, and western boundaries. The sample area encompassed roughly 0.05 hectare (0.12 acre), while the overall landform was 2.5 hectares (6.2 acres). The tested area was located about 91 m (300 ft) west of Poor Farm Road and about 120-140 m (393.7 and 459.3 ft) north of Lee River Road. The stratigraphy in this area consisted of a plow zone (Ap), generally about 22 cm (9 in) deep, underlain by undisturbed subsoils (Bs-B soil) (Thomas et al 2005 3.23, 3.24). In addition to this area, some archaeological Phase I testing also was conducted in the woods to the west of the tank range along the top of a steep slope that angled down to a northeast to southwest trending drainage. Like the above area, this area also proved negative for precontact Native American sites.

The two other negative areas previously studied and located in environments similar to those found in the southern portions the 5-3 Demo Range project area include one that was located on top of a small 0.006 hectare (0.01 acre) wooded knoll like spur inside the General Dynamics complex north of Lee River Road just east of General Dynamic's ammo bunker. The top of this landform was at about 219.5 m (720 ft) above mean sea level. The Lee River flows east to west past the site about 230 m (755 ft) to the south and a small tributary is located roughly 70 m (230 ft) to the south and east of the spur. The stratigraphy in this area consisted of an old plowzone (Ap) underlain by undisturbed weathered subsoils (Bs-B) (Thomas et. al. 2005:3.20, 3.22). The other potentially relevant previously tested area was a roughly 0.05 hectare (0.12 acre) long narrow bench / proglacial valley edge feature (Thomas et. al. 2005). It was located inside the General Dynamics complex north of the Lee River Road and east of the eastern end of their firing range. The top of the landform tested was between 219.5 and 225.5 m (720 and 740 ft) above mean sea level. The current channel of the Lee River is located approximately 125 m (410 ft) to the south, and a small intermittent stream has cut a small gully on the west side of the sample area (Thomas et. al. 2005:3.3, 3.24). The stratigraphy in this area consisted of one or two plow zones (Ap) underlain by undisturbed subsoil (B, sometimes with a trace of Bs).

Historic

Previous archaeological field inspections and surveys conducted by the UVM CAP, have identified numerous historic sites on the VTANG's Ethan Allen Training Center property (Thomas et. al. 2005; Robins and Crock 2009). Of these, J18 (VT-CH-747) and J53 (VT-CH-780), are located within or immediately adjacent to the 5-3 Demo Range project area (Figure 3). The historic site J18 (VT-CH-747), the 'I.C. Stone Site,' consists of a house cellar foundation on the north side of Lee River Road and a large barn foundation on the south side of the road opposite the residence (Figure 4). In addition, there is a surface scatter of historic artifacts, possibly related to this farmstead, located 35 m (114.83 ft) northeast of the house site (Thomas et. al. 2005:6.122-6.124). The historic site J53 (VT-CH-780), the 'S. Pease site,' is a 19th -20th century farmstead located on the west side of Poor Farm Road and consists of the remains of a house cellar, well, barn (with silo pad) and an outbuilding (probably a sugarhouse) as well as a possible garbage dump (Figures 5 and 6).

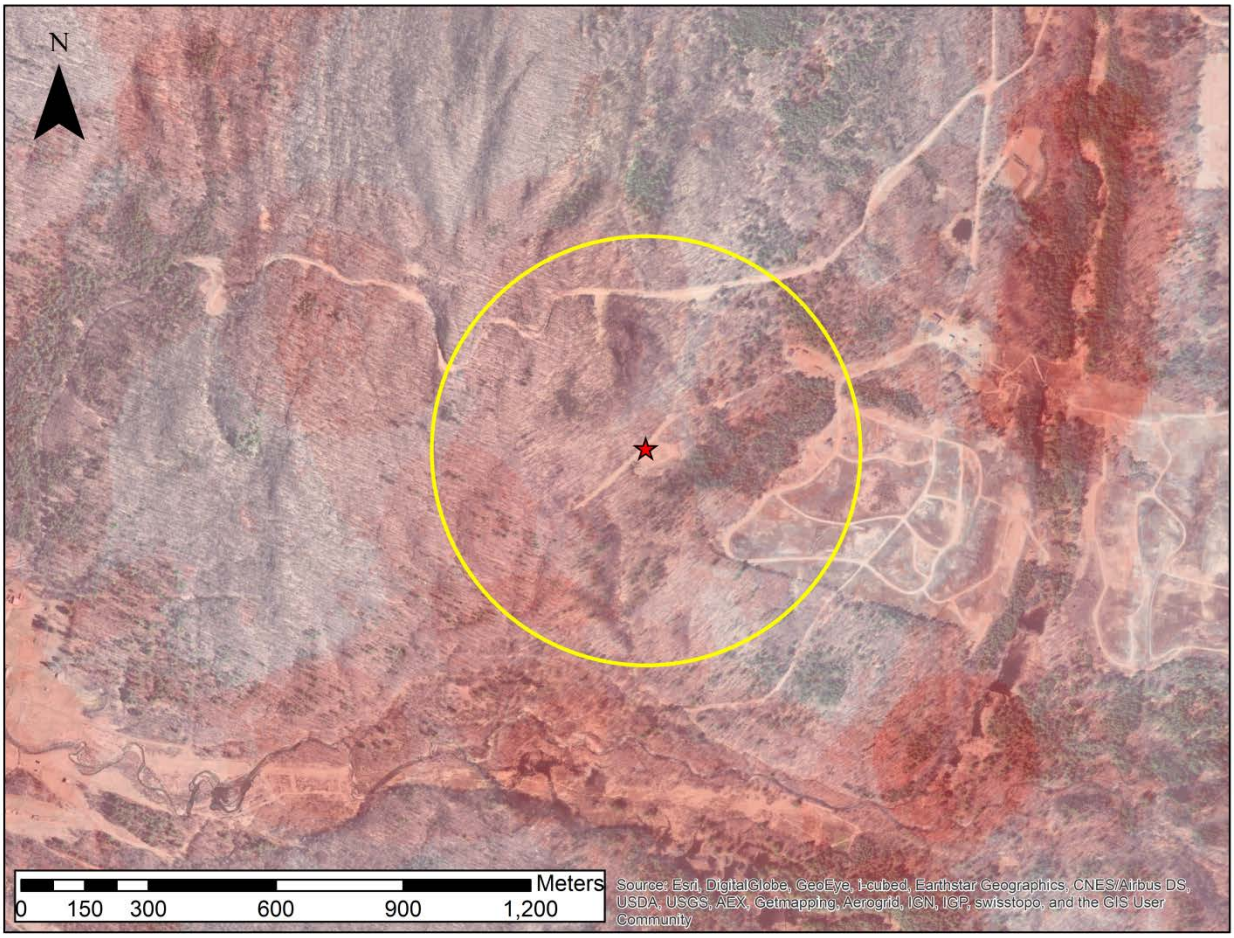

Figure 2. Detail of the GIS Archeological Sensitivity Map for the 5-3 Demo Range project area (yellow circle) within the Ethan Allen Training Center, Jericho, Chittenden County, Vermont. The areas with greater numbers ofl key archaeological sensitivity factors in common appear as more intense in color in this view.

From the available historic aerial photographs, it could be determined that a portion of the southern part of the 5-3 Demo Range project area had experienced significant land modification for previous military related activities. This included the sites of two old firing ranges that were built immediately north of Lee River Road, just west of its intersection with Poor Farm Road (Figure 7 and 8). These ranges appear to have been developed in the 1920s or 1930s and abandoned between 1942 and 1962 (Air Mapping Corp. 1942; Arial Explorations Inc., 1937; Geotechnics & Resources Inc. 1962). The sites of these ranges are now occupied by open mature forests. The evidence for their location consists of fairly level ground with remnants of earthen berms. The aerial imagery also indicated there were other areas of potential military disturbance located to the north and east of the old ranges, but that these disturbances appeared to be more limited to vehicles driving on the ground surface (see Figure 7). Areas such as this, where no previous archaeological work had been conducted and where substantial ground disturbance could not be demonstrated by aerial image analysis, were subjected to field inspection.

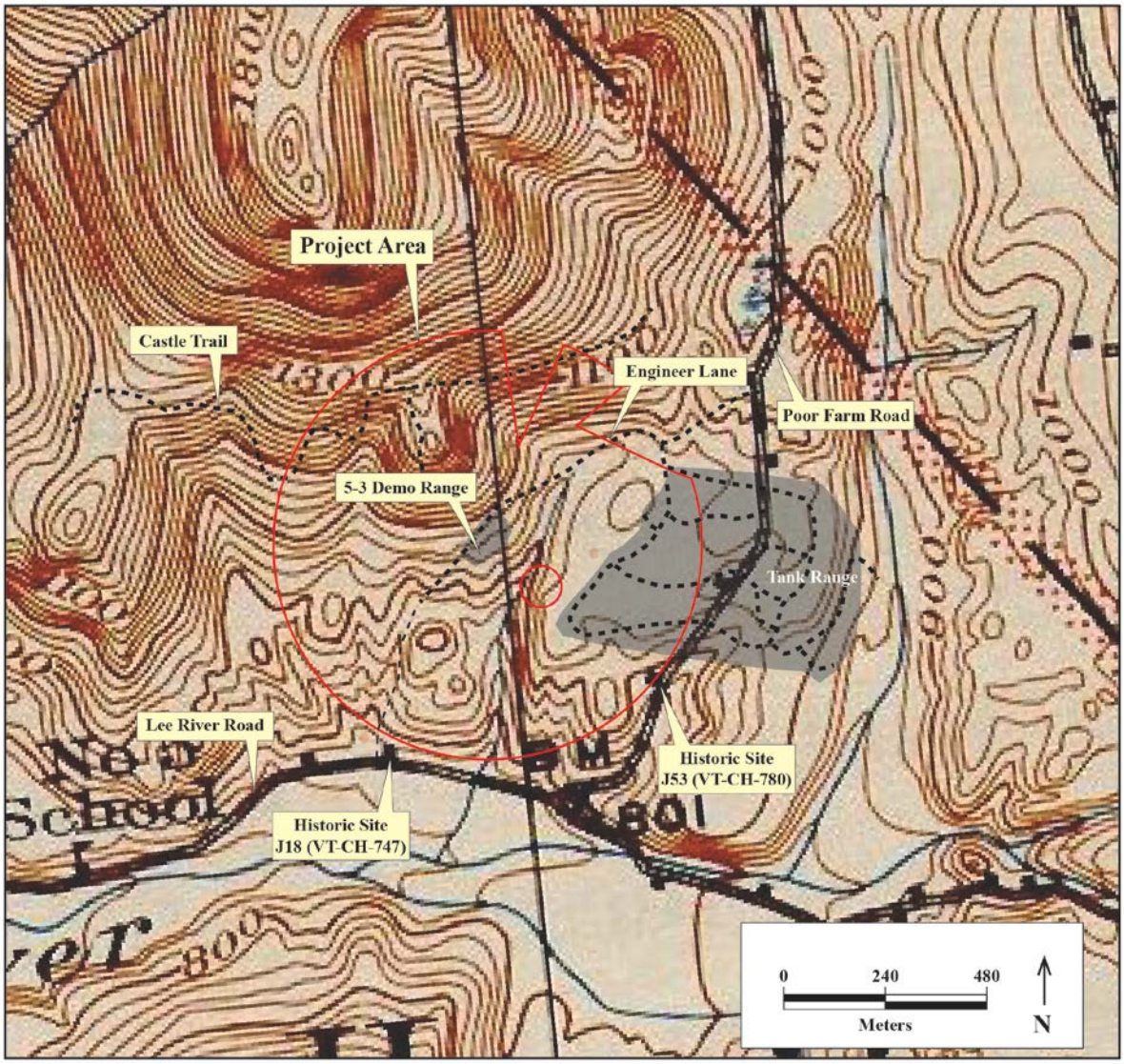

Figure 3. Detail of the 1924 *Camels Hump, VT*, USGS 15-Minute Quadrangle showing the location of the 5-3 Demo Range project area within the Ethan Allen Training Center, Jericho, Chittenden County, Vermont.

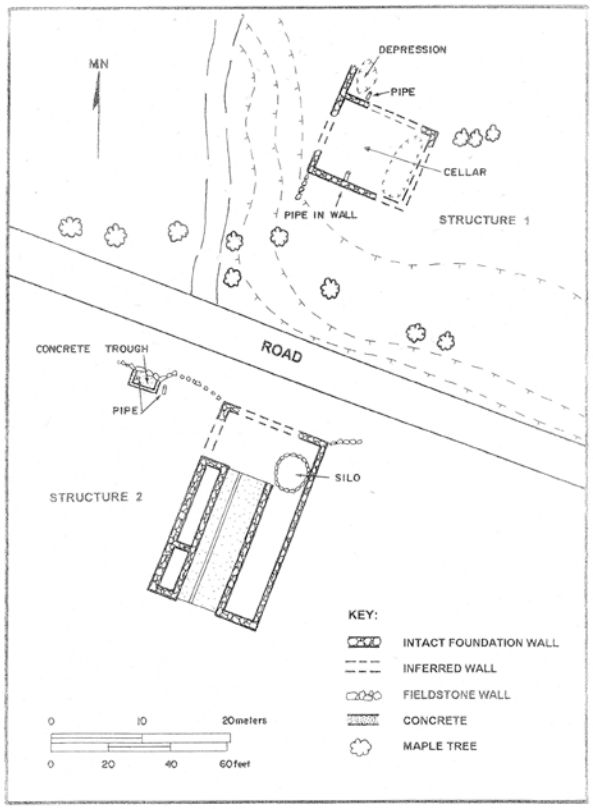

Figure 4. Plan of the historic site J18 (VT-CH-747), the 'I.C. Stone Site' (Thomas et.al. 2005:6.124).

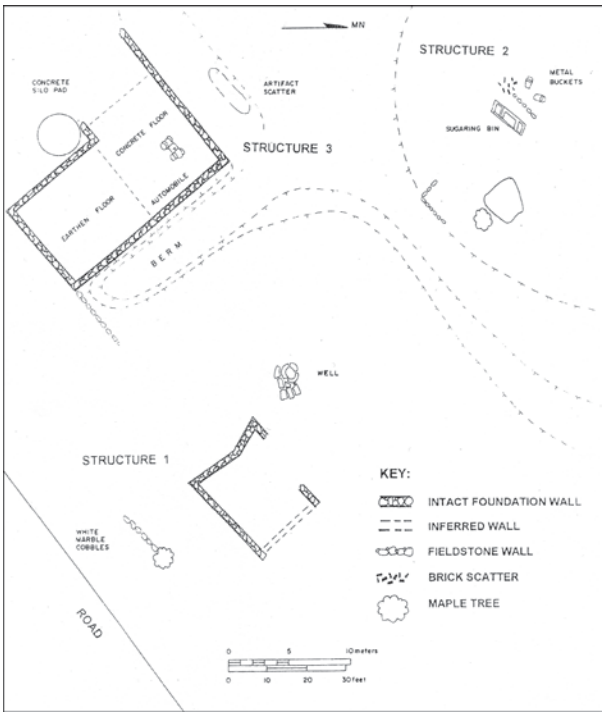

Figure 5. Plan of the historic site J53 (VT-CH-780), the 'S. Pease Site' (Thomas et.al. 2005:6.190).

Figure 6. View of the barn area of the historic site J53 (VT-CH-780) within the Ethan Allen Training Center, Jericho, Chittenden County, Vermont (2014).

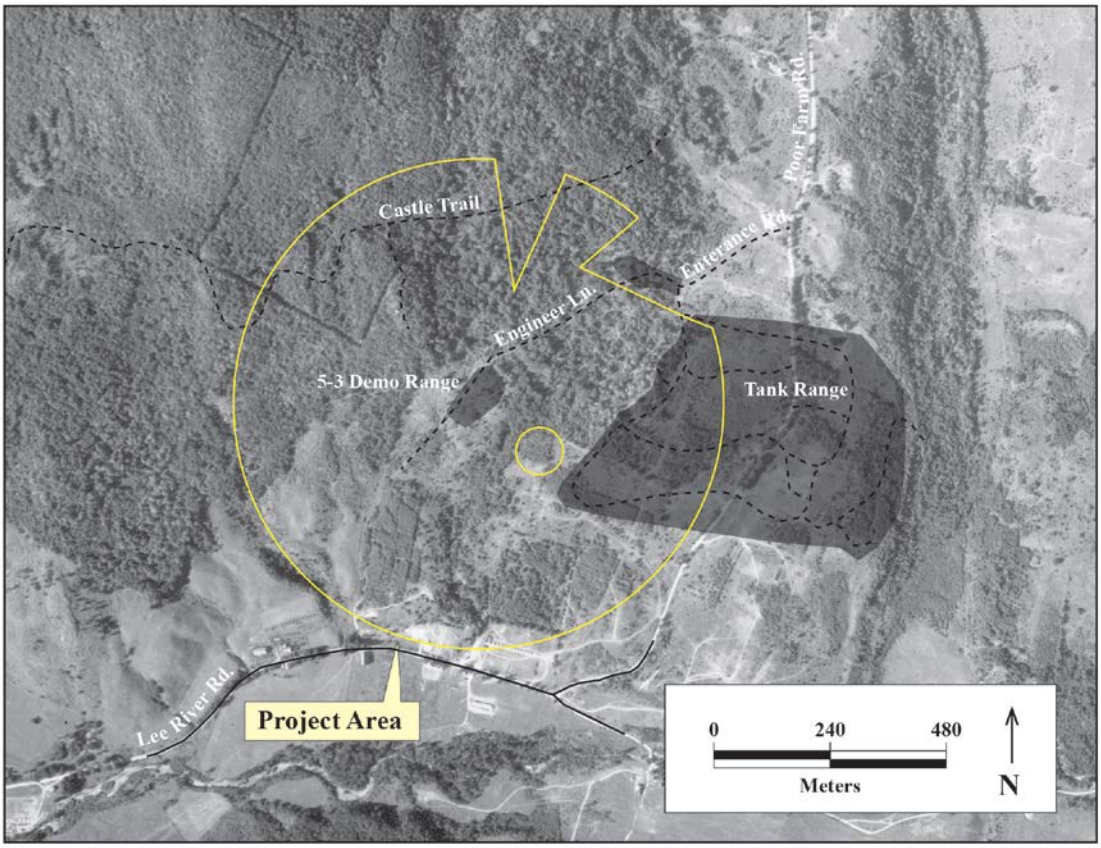

Figure 7. Detail of a 1937 historic aerial photograph showing the 5-3 Demo Range project area within the Ethan Allen Training Center, Jericho, Chittenden County, Vermont (Arial Explorations Inc., 1937). Note areas previously cleared for cultural resources have been cut out of the circular project area boundary.

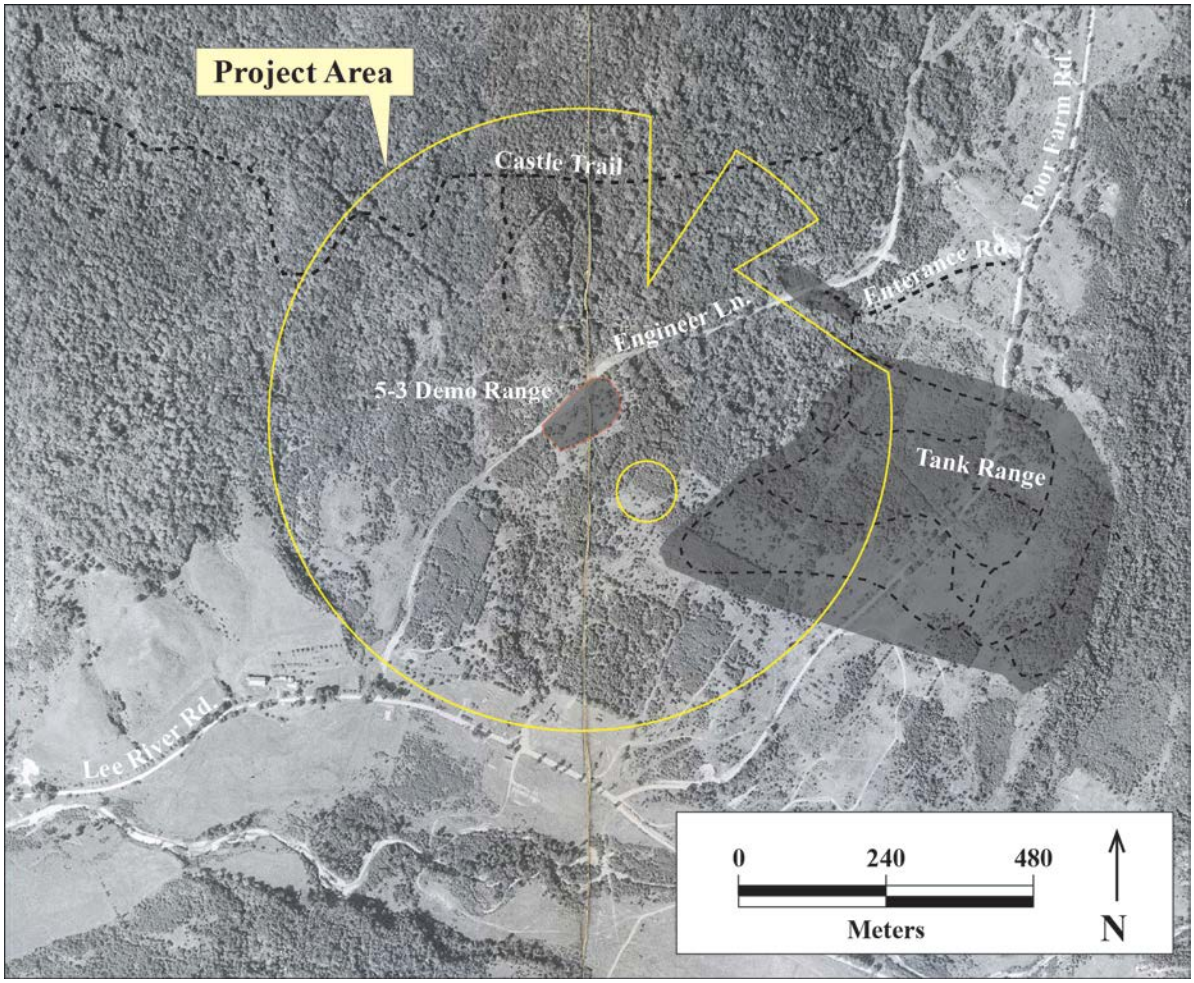

Figure 8. Detail of a 1943 aerial photograph showing the 5-3 Demo Range project area within the Ethan Allen Training Center, Jericho, Chittenden County, Vermont. Note the extensive ground disturbance associated with Engineer Lane. Areas previously cleared for cultural resources have been cut out of the circular project area boundary.

Field Inspection

Introduction

On November 25, 2014, Kate Kenny, a research supervisor with UVM CAP conducted a field inspection of the 5-3 Demo Range project area. The field inspection revealed that much of the proposed project area consisted of a series of undifferentiated convex slopes situated at the southern foot of Bald Hill (the 573 m / 1880 ft summit of which is about 2 km / 1.2 mi north of Lee River Road). The 1927 USGS map indicated that elevations within the overall project area ranged from 237.7 to 408.4 m (780 to 1340 ft) above mean sea level (see Figure 3). Much of the northernmost portion of the 5-3 Demo Range project area, the area north of Engineer Lane, did not require field inspection, due to the steep topography found in that area and, therefore, the unlikely presence of preContact or historic era archaeological sites.

The area that was inspected is generally below 304.8 m (1000 ft) in elevation above mean sea level. The remaining area includes various dry draws, spurs, and drainages near the base of the slopes that lead down south towards the Lee River Valley (see Figure 3). Among them are two relatively significant unnamed north-south trending drainages. Except for the area along Lee River Road, which is identified as being derived from glaciolacustrine littoral sediments, soils in the project are derived from glacial till (Doll, Stewart and MacClintock 1970). Finally, most of the area examined is currently occupied by open deciduous woodland, ranging from young to mature stands. Much, but not all, of the area within the 5-3 Demo Range project area had been used for agricultural purposes in the past (for woodlots, pasture and/or fields). Only the ground in the immediate vicinity of the existing 5-3 Demo Range itself had been more recently modified by leveling through a combination stripping and filling. In some places on this particular range, there are large amounts of sandy fill (up to a few feet in places).

Results

The field survey identified a few areas of archaeological sensitivity. Areas with potential historical archaeological sensitivity included the two known farmstead sites described above and a 20th century military concrete bunker structure located north of Lee River Road in the area of the old ranges (Figures 9 and 10). In terms of sensitivity for preContact Native American sites, a number of areas were highlighted by the predictive model given that they exhibit “habitability” factors such as level terrain and proximity to water. While the project area does contain level landforms in proximity to seasonal draws and drainages, upon inspection in the field these areas are considered only marginally sensitive, especially considering the upland setting and negative results of previous archaeological studies of more sensitive locations in the near vicinity.

Figure 9. View of a historic military bunker located north of Lee River Road within the Ethan Allen Training Center, Jericho, Chittenden County, Vermont (2014).

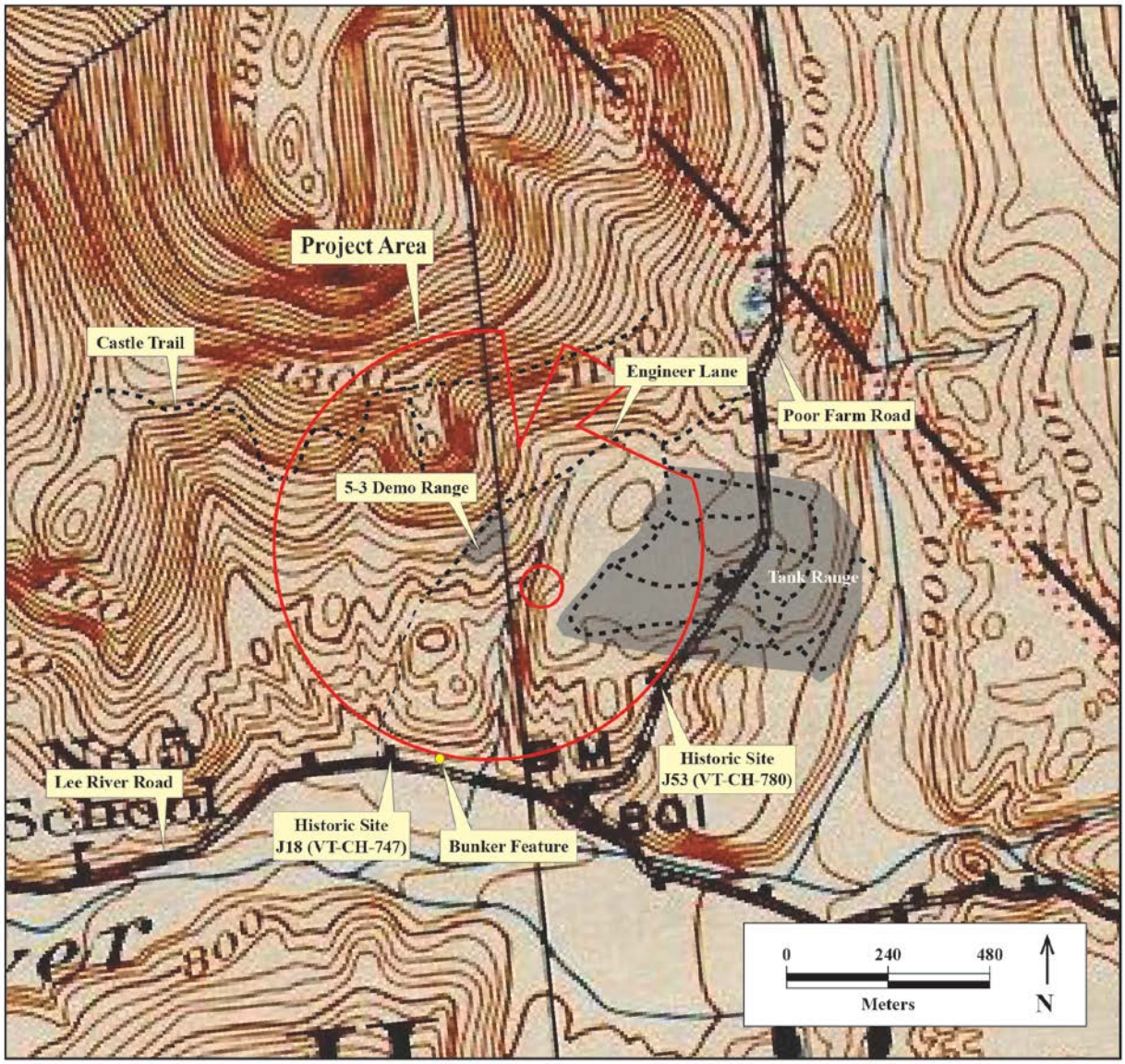

Figure 10. Map showing the area investigated for the 5-3 Demo Range project, VTANG Ethan Allen Training Center, Jericho, Chittenden County, Vermont (Base Map: *Camels Hump, VT,* USGS 15-Minute Quadrangle 1924).

Conclusions and Recommendations

Based on the field inspection, UVM CAP determined that there are archaeologically sensitive areas within or immediately adjacent to the proposed 5-3 Demo Range project area. These include two previously identified historic sites, J18 and J53 as well as the small 20th century military bunker located north of Lee River Road that was recorded by GPS during this field inspection. If these sites can be avoided, it is recommended that a well-marked buffer zone be established around them during the duration of any undertaking in the area. However, if ground disturbance cannot be avoided in the area of these sites, the UVM CAP recommends that further archaeological studies be conducted as part of the Section 106 permitting process.

Although several areas highlighted by the computer-based predictive model were examined closely for potential precontact Native American site sensitivity, none were assessed as moderately or highly sensitive for significant archaeological sites. The generally low sensitivity of the project area (compared to other parts of the property) and the negative results from previous archaeological Phase I site identification surveys, either within the project area or in similar environments nearby, indicates that there is a very low potential for precontact Native American sites in the 5-3 Demo Range project area. Therefore, any proposed improvements and/or activities in the 5-3 Demo Range project area are unlikely to impact significant precontact Native American archaeological resources.

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Appendix G

VTARNG-FE-ENV **24 JULY 2019**

MEMORANDUM FOR RECORD

SUBJECT: Tribal Consultation Efforts with the Stockbridge-Munsee of the Mohican Nation.

The Stockbridge-Munsee Band of the Mohican Nation is a Federally recognized Native American Tribe with ancestral ties to Vermont.

1. In 2010, The Vermont Army National Guard (VTARNG) initiated consultation with the Stockbridge-Munsee Band as part of the 5-year Integrated Cultural Resources Management Plan (ICRMP) update.

2. No formal response letter was ever received from the Stockbridge-Munsee Band to the VTARNG.

3. However, Sherry White, the Stockbridge-Munsee Tribal Historic Preservation Officer, stated in an e-mail dated January 21, 2010 and confirmed on May 30, 2013 via e-mail, that the Stockbridge- Munsee Band was only interested in the southwest quarter of Vermont, including the Bennington, Vergennes and Rutland areas.

4. The Stockbridge-Munsee was again contacted in 2014 and indicated again that it was only interested in 2 southern counties of Vermont.

5. Although the Stockbridge-Munsee Band of the Mohican Nation is only interested in projects occurring in the southwest portion of Vermont, the VTARNG will send the Tribe a notification that the EA and FONSI are available for review.

Since the Hyde Park project is nowhere near any stated interests of the Stockbridge-Munsee tribe, no further consultation was deemed necessary.

Mike O'Hara
Military Lands Administrator
VT Army National Guard

Michael Ohara

Environmental Division
Vermont Army National Guard
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June 3, 2015

Mr. Scott Dillon, Survey Archaeologist
Vermont Division for Historic Preservation
National Life Building, Floor 6
Montpelier, VT 05620-1201

CONCUR
Vermont Division for Historic Preservation

e-Signed by Scott Dillon
on 2016-05-04 15:44:55 GMT

State Historic Preservation Office

SUBJECT: Construction of a Demolition Range

Dear Mr. Dillon:

The Vermont Army National Guard is planning to expand range 5-3 into a multi-stationed demolition instruction range at the Ethan Allen Training Site in Underhill, Jericho and Bolton Vermont. The project will include tree removal, grading and site preparation, as well as construction of a number of small bunker style reinforced demolition stations. The stations will be connected by a gravel road.

Most of the area was identified by a computer model as having potential for archaeological sensitivity for preContact era Native American sites. An Archaeological Resource Assessment titled, Archaeological *Resource Assessment for the 5-3 Demo Range Project Area, Vermont Army National Guard Ethan Allen Training Center, Jericho, Underhill, Bolton, Chittenden County, Vermont,* was conducted in response to this data and was completed by the University of Vermont Consulting Archaeology Program (UVMCAP) in December of 2014.

Based on the field inspection, UVM CAP determined that there are archaeological sensitive areas within or immediately adjacent to the proposed project area. These include two previously identified historic sites, J18 and J53, and a small 20th century military bunker just north of Lee River Road, which are beyond the actual construction zone by almost 500 meters, and would be avoided and not impacted by construction or training activities. No additional surveys were recommended.

Section 106 of the National Historic Preservation Act directs Federal Agencies to take into account the effects of their undertakings in historic properties. Under 36CFR§800, the Vermont Army National Guard has made a determination of no adverse effect. Please provide concurrence for the finding described above. If the State Historic Preservation Officer does not

object within 30 days of receipt of this finding, the Vermont Army National Guard will consider our responsibilities under Section 106 fulfilled and move forward with this project.

If you have any questions, please contact me by phone at 338-3316 of email at mike.ohara@state.vt.us. Thank you.

Mike O'Hara
Military Lands Administrator
State of Vermont Military Department

Enclosures

Appendix H

VERMONT ARMY NATIONAL GUARD STATEWIDE OPERATIONAL NOISE MANAGEMENT PLAN

May 2013

Prepared By:

Operational Noise Program
Environmental Health Engineering
Army Institute of Public Health
U.S. Army Public Health Command

VERMONT ARMY NATIONAL GUARD STATEWIDE OPERATIONAL NOISE MANAGEMENT PLAN

May 2013

Prepared by:
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EXECUTIVE SUMMARY

OVERVIEW

The Statewide Operational Noise Management Plan (SONMP) provides a strategy for noise management of Vermont Army National Guard (VTARNG) activity. Facilities used by the VTARNG include the Camp Ethan Allen Training Site (CEATS) and an Army Aviation Support Facility (AASF).

Elements of the SONMP include education about noise and Army noise metrics, complaint management, and when necessary, noise abatement procedures.

The SONMP provides a methodology for analyzing exposure to noise associated with military operations and provides land use guidelines for achieving compatibility between the noise generated by the Army and the surrounding communities. The Army has an obligation to U.S. citizens to recommend land use around its installations which will: (a) protect citizens from noise and other hazards; and (b) protect the public's investment in these training facilities.

Army Regulation (AR) 200-1 lists housing, schools, and medical facilities as examples of noise-sensitive land uses. Guidelines in the regulation state that for land use planning purposes, noise-sensitive land uses are acceptable within the Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III.

The noise exposure on communities is translated into Noise Zones. The program defines four Noise Zones:

- Noise-sensitive land uses are not recommended in *Zone III*.
- Although local conditions such as availability of developable land or cost may require noise-sensitive land uses in *Zone II*, this type of land use is strongly discouraged on the installation and in surrounding communities. All viable alternatives should be considered to limit development in *Zone II* to non-sensitive activities such as industry, manufacturing, transportation and agriculture.
- Noise-sensitive land uses are generally acceptable within the *Zone I*. However, though an area may only receive *Zone I* levels, military operations may be loud enough to be heard - or even judged loud on occasion. *Zone I* is not one of the contours shown on the map; rather it is the entire area outside of the *Zone II* contour.
- The *Land Use Planning Zone (LUPZ)* is a subdivision of *Zone I*. The *LUPZ* is 5 dB lower than the *Zone II*. Within this area, noise-sensitive land uses are generally acceptable. However, communities and individuals often have different views regarding what level of noise is acceptable or desirable. To address this, some local governments have implemented land use planning measures out beyond the *Zone II* limits. Additionally, implementing planning controls within the *LUPZ* can develop a buffer to avert the possibility of future noise conflicts.

Often, there are existing "noise-sensitive" land uses that could be defined as non-conforming. In most cases, this is not a risk to community quality of life or mission sustainment. The intent of AR 200-1 is to offer land use recommendations, which if adopted both on and off the installation, would facilitate future development that is unaffected by military noise.

Average noise levels over a protracted period of time may be the best tool for long-term land use planning, but they may not adequately assess the probability of community noise complaints. As recommended in AR 200-1, the SONMP will include supplemental metrics to identify where operational noise may at times reach levels high enough to generate complaints.

CONCLUSIONS

CAMP ETHAN ALLEN TRAINING SITE

The principle operational noise source for the VTARNG is weapon firing at CEATS. The majority of the land to the east and south of CEATS is forested, mountainous, and/or undeveloped. Noise-sensitive receptors include the towns off Underhill Center to the north, West Bolton to the South and Jericho Center to the West. There are two schools located within one mile of CEATS. The public is informed in advance of all VTARNG training activities via press release.

SMALL CALIBER WEAPONS

- Existing Activity. Zone II extends beyond the northern boundary up to 1.24 miles encompassing the Town of Underhill Center and beyond the southern boundary up to 0.6 miles encompassing the Town of West Bolton. Zone III extends beyond the southern boundary up to 250 meters (0.15 miles) into an area that has a residential property. On-post, Zone II encompasses the cantonment area including the transient barracks complex and Zone III enters a wooded portion of the cantonment area.

- Projected Activity. The CEATS has two proposed activities; increasing the allowed ammunition size on the High Angle Range (HAR) and the construction of an Urban Assault Course (UAC) over existing range footprints. Neither activity would significantly change the noise environment. If both actions are implemented, Zone III would increase slightly in the immediate range vicinity; Zone II would extend an additional 900 meters off-post to the north. No noise-sensitive land uses would be impacted.

LARGE CALIBER WEAPONS AND EXPLOSIONS

Land Use Compatibility

All CEATS Activity Land Use Compatibility: Based on annual average noise levels, the noise environment attributable to large caliber weapons firing and demolition activity at CEATS is compatible with the surrounding land use. Only very small portion of the LUPZ extend beyond the western boundary. Although the land use contours indicate compatibility between CEATS activity and the surrounding land uses, individual events have the potential to generate noise complaints.

VTARNG Activity Land Use Compatibility: The annual average noise levels environment attributable to VTARNG large caliber weapons firing and demolition activity are contained within the CEATS property.

Complaint Risk

General Dynamics Activity Complaint Risk Area: Under unfavorable weather conditions, the complaint risk guidelines indicate a low probability of receiving noise complaints. Along the western boundary, the guidelines indicate a moderate complaint risk in a small area. However, this area is primarily undeveloped.

VT ARNG Activity Complaint Risk Area: According to the complaint risk guidelines, depending upon the weather conditions, there is a low to moderate risk of complaints from the baseline large caliber weapons and explosives training. Noise from individual large caliber and demolition activity may at times be noticeable, or even deemed loud by those in the community.

Artillery and Mortar Firing

Under unfavorable weather conditions, the complaint risk guidelines indicate a moderate probability of receiving noise complaints from the Towns of Underhill Center and West Bolton.

Under neutral weather conditions, the complaint risk guidelines indicate a low probability of receiving noise complaints. Along the northern boundary there is a small area in which the guidelines indicate a moderate complaint risk.

Demolition Activity

Under unfavorable weather conditions, the complaint risk guidelines indicate a moderate probability of receiving noise complaints. Along the northern boundary near Beantown Road, there is a small area in which the guidelines indicate a high complaint risk.

Under neutral weather conditions, the complaint risk guidelines indicate a low probability of receiving noise complaints. Along the northern boundary there is a small area south of Stevensville Road in which the guidelines indicate a moderate complaint risk.

Helicopter Overflights:

Although the CEATS aviation activity would not generate a Zone II (65 dB ADNL), there is still the potential that individual aircraft overflights could annoy people and possibly generate complaints. However, to date, the VTARNG has no history of noise complaints related to aviation at CEATS.

ARMY AVIATION SUPPORT FACILITY

Land use at and around both AASFs is compatible with aircraft activity noise based on Army guidelines. Sufficient measures to mitigate the effects of aircraft noise are currently in place at each AASF, including departure and arrival procedures and the establishment of no-fly areas. However, there is always the possibility that an individual overflight could lead to a complaint. Pilots should remain vigilant in adhering to noise abatement procedures and fly-neighborly programs. To date, there have been no complaints from AASF activity.

RECOMMENDATIONS

The VTARNG should analyze all proposed changes within their area of responsibility consistent with the methodologies presented and/or referenced in this plan as early in the planning process as possible.

The Army and VTARNG can only make recommendations for compatible land use. This report's findings indicate what actions are appropriate to help guide future development of the adjacent properties.

The VTARNG should continue with its Operational Noise Management Program to reduce the potential of incompatible land uses around its facilities that could severely impact its mission as well as continue to be a good neighbor to the surrounding communities. At a minimum, municipal governments are encouraged to support public disclosure of all Noise Zones in addition to any other information which may convey how military training operations may affect the noise environment.

The VTARNG will continue to use the program to reduce the potential for noise complaints, caused by day-to-day operations, through a responsive noise complaint procedure, and by taking appropriate actions to guide future development of properties adjacent to its boundaries.

The VTARNG should continue to build its noise management program to:

(1) Reduce potential incompatible land uses around training facilities,
(2) Prevent detrimental effects on the mission, and
(3) Carry on the good-neighbor relationship with surrounding communities.

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1 INTRODUCTION

1.1 GENERAL

A Department of the Army (DA) goal is to establish effectual programs designed to minimize the Army's adverse impacts upon the quality of the human environment without impairing continued success in the Army's mission. In keeping with this goal, the Army established an Operational Noise Management Program (ONMP) as the framework for the management of noise produced by Army activities since noise has been determined by the United States Congress, as recorded in the Noise Control Act of 1972, to "present a danger to the health of this Nation's population" (PL 92-574, 1972). The primary tools for noise management are the Installation and Statewide Operational Noise Management Plans.

1.1.1 THE HISTORY OF NOISE MANAGEMENT IN THE ARMY

The advent of jet aircraft in the 1950s resulted in significantly greater noise levels around commercial airports that led to an intense outcry from the public. This backlash caused Congress to revise the Federal Aid to Airports Act to make Federal aid contingent upon implementation of programs to resolve noise problems with surrounding neighborhoods. Subsequently, Congress passed the Noise Control Act of 1972 and the Quiet Communities Act of 1978. Under these laws, airports and local communities carried out noise control measures such as revising zoning laws, altering real estate transaction requirements, purchasing buffer lands, and changing approach, departure, and run-up protocols. As a consequence, the Federal Aviation Administration (FAA) currently has specific requirements for community involvement in all airport planning.

The Noise Control Act and the Quite Communities Act contain language outlining the responsibilities of Federal Agencies in protecting the public from unreasonable noise impacts. Specifically, these laws state that:

> *"Federal agencies shall, to the fullest extent consistent with their authority under federal laws administered by them, carry out the programs within their control in such a manner as to … promote an environment for all Americans free from noise that jeopardizes their health and welfare."*

To comply with the intent of Congress, the Department of Defense (DoD) provided guidance to the military departments regarding the compatible use of public and private lands in the vicinity of military airfields. The DoD guidance (DODI, 1977):

- Defined restrictions on the uses and heights of natural and man-made objects in the vicinity of air installations.
- Defined restrictions on land use in the vicinity of air installations to assure compatibility with the existing characteristics, including noise from military operations.

- Provided policy as to the extent of the U.S. Government's interest in retaining or acquiring real property to protect the operational capability of active military airfields.

As a matter of general policy, the military departments were instructed to work toward achieving compatibility between air installations and the neighboring civilian communities through a compatible land use planning and control process conducted by the local civilian community.

Based upon DoD guidance, the DA then developed its ONMP that addresses noise from all military activities, not just airfields. The Army's program is designed to (U.S. Army, 2007):

- Control environmental noise to protect the health and welfare of military personnel and their dependents, Army civilian employees, and members of the public on lands adjacent to Army, Army Reserve, and Army National Guard installations; and

- Reduce community annoyance from environmental noise, to the extent feasible, consistent with Army, Army Reserve, and Army National Guard training and materiel testing activities.

1.1.2 THE ENCROACHMENT RISK

Military installations almost always tend to attract activity from the civilian sector because with government activity comes economic benefits. When people arrive to work at these installations, they soon need housing, grocery stores, restaurants, and other support facilities, and businesses crop up to meet that demand. At this point, the relationship between the adjacent town and the installation is in harmony (because one could not exist without the other), and each tend to over-look the other's inconvenient characteristics.

Often, the town that springs up next to the installation matures and acquires an economic momentum that is independent of the installation. As the town becomes less reliant on the installation as its economic lifeblood, those inconvenient characteristics (such as noise) that were over-looked in the past become less tolerable. New people moving into the area that gain their economic livelihood from areas other than the installation have difficulty understanding that the current location of the town near the installation grew from past ties that have long since been weakened or severed. This, coupled with the fact that increasing populations may also increase the outward sprawl of the town that at its inception originally may have been a comfortable distance away from the installation, ultimately leads to what is known as *encroachment*.

Encroachment is the process by which civilian issues impinge upon once-remote military installations. The simplest example of this is the physical development (particularly residential) of land directly adjacent to the installation whereby new residents become irritated by installation activities (primarily noise, but things like dust may also turn into contentious issues).

And, while noise is the focus of this plan, encroachment can take many forms. Examples include government entities passing endangered species legislation limiting where training may be conducted; air pollution regulations limiting something like dust; or a form of political

encroachment that endangers the training mission when relations between countries shift and installations outside of the U.S. are altered or closed.

These processes can put severe limitations upon the ability of a military installation to support training and for assigned units to maintain an adequate level of readiness. And herein lies the threat as it relates specifically to this plan: as military noise impacts upon the civilian communities increase, so increase both litigation and/or political pressures which could result in degradation of the installation's mission. More specifically, not only does the number of complaints to installation commanders increase dramatically, but so do the number of complaints to elected officials.

One of the best examples of degradation of mission performance due to encroachment occurred at the Naval Air Station (NAS) in Los Alamitos, CA. As is typical of these types of situations, when originally established during WWII, this NAS was in a rural area. But, the post-war expansion of Southern California eventually surrounded it with homes to the point where the Navy could no longer routinely fly its jet aircraft into the property. Today, the Navy has left and the property now serves the California Army National Guard and the U. S. Army Reserve which, compared to the Navy, operate relatively few noisy flights. In another highly politicized example, citizen outrage in 1999 over the noise and pollution of gunfire on Vieques Island (Puerto Rico) ultimately lead to the Navy's complete withdrawal from the island.

These situations are not limited to the Navy. In the Army's case, encroachment so severely limited the size of the explosives used at Fort Belvoir's (Virginia) Combat Engineer field training that it became necessary to move a portion of the training to a less urbanized area at Fort A. P. Hill, VA; but that too was only temporary. In the end, encroachment forced the Army to permanently move the engineer training school to Fort Leonard Wood, MO. In another case, encroachment saddled Fort Dix, NJ with limitations on both the types of weapons that could be fired and the times of day.

1.1.3 CONTENDING WITH THE RISK

In all of the above cases, limitations upon operational activities degraded the installations' capability to support essential training, so the training missions on these installations were then moved to other installations. For obvious reasons, this pattern cannot continue indefinitely.

The consequences of ignoring conflicts between the noise generated on military installations and desires of the civilian community regarding the use of the land surrounding these installations can be grave. If the military fails to respond to concerns of the civilian community, the potential exists for estrangement and a general unwillingness within the civilian community to work with the military to formulate creative land use ideas that allow communities and installations to exist in harmony. Worse yet, a possible threat are increased political pressure or lawsuits that attempt to force unilateral military concessions without any reciprocal concessions from the community. The result is that commanders frequently are required to choose between being perceived as "good neighbors" or meeting training and testing requirements. Without question, this degrades military readiness.

To prevent conflicts between military operations and civilian land use from reaching significant proportions, the military (as a whole and individual installations) must take reasonable steps to protect the community from training noise, and it must work with the local governments and land owners to make sure that adjoining lands are developed in ways compatible with the noise environment.

1.2 THE ARMY'S OPERATIONAL NOISE MANAGEMENT PLANS

The primary strategy for working with communities to solve issues of noise incompatibility is the collaborative creation and maintenance of community-supported long-range plans for adjacent lands. This is coupled with installation efforts to simply be a good neighbor. This is where the Army's Operational Noise Management Plans are valuable.

The plans come in two formats—the Statewide Operational Noise Management Plan (SONMP) and the Installation Operational Noise Management Plan (IONMP) - and provide the installation(s) and land use planners with the following things:

- Accurate information needed at the planning table to solve encroachment problems including such things as computer-generated noise contour maps, planning strategies, examples of successes and failures at other installations, and basic economic information conveying the value of the installation to the community and the extended region. In addition, information about the military value to the nation is also beneficial so that leaders can understand the consequences to readiness from modifications to realistic training.

- Strategies for use on the installation(s) to limit, where feasible, the training noise that leaves the installation boundaries including altering training locations, maximizing the noise reduction at existing training locations, and implementing "good neighbor" programs that tailor training times to community needs.

Note: These noise plans, while not intended for wholesale dissemination to the public, should be distributed to all applicable regional land use planners and be made available to interested individuals.

1.3 CONTENT

This report is divided into sections detailing the nature of noise, noise metrics and noise management; the overall noise environment for the installation(s); descriptions of the noise generating activities at various locations within the installation(s); strategies for addressing current and potential incompatibilities at adjacent lands; and various appendices providing more detailed information on methodologies, definitions, and other similar information.

2 GENERAL NOISE MANAGEMENT CONCEPTS

2.1 GENERAL

Army installations are increasingly finding that land use around their boundaries is becoming incompatible with noise generated by their training. Three primary factors contributed to this trend.

First, the United States' population is expanding. When initially constructed, nearly all Army installations were built in rural areas (unless its purpose was to defend a specific city or place) because land was less expensive, there were few people to disturb, and secrecy could be maintained if needed. But, since 1940 the United States population has grown from 132,000,000 to its current (2012) estimated total of approximately 312,980,190 (U.S. Census Bureau). These additional people must live somewhere, so the populations have been spreading into formerly sparsely inhabited areas.

Secondly, technological advances resulted in more powerful weaponry with longer effective ranges. With increased power and range comes increased noise and the need for larger areas to test and train. In the past, when a new weapon was louder than its predecessor, few were around outside of the installation to notice a difference. Today, that is changing.

Lastly, both the military and local planners were late in recognizing the friction that the above two trends would cause. Thus, few plans to ensure compatible land use were made before encroachment problems arose.

Consequently, at an increasing number of installations, noise complaints are now a regular occurrence and must be managed so as to not jeopardize training.

2.2 ENCROACHMENT AND NOISE COMPLAINTS

Noise from U.S. military operations is rarely loud enough to cause physiological and/or physical damage to the hearing or homes of populations adjacent to installation boundaries. Nevertheless, while there is no physical danger from these sounds, many find them irritating to the point where they are moved to complain about them. Complaints can be directed any number of places (friends, local media, government representatives, etc.), but the ideal situation is that the complaint comes to the source (the installation) so it can be resolved in the best manner.

The most reliable way to ensure this happens is for installations to maintain the Noise Complaint Management Program required by Army Regulation 200-1 (AR 200-1), a copy of which is located at Appendix E.

2.2.1 THE NATURE OF ANNOYANCE AND COMPLAINTS

Annoyance (and thereby complaints) has its roots in both physical and psychological distress. Since military noise is rarely loud enough to cause physical distress, it follows that the vast majority of noise complaints installations receive are due to some sort of psychological objection. Put another way, some people just do not like the "cracks" and "booms" and are sometimes irritated enough to complain about them.

The usual complaint pattern is as follows: First, economic activity unrelated to the installation stimulates increased population and development in the vicinity. Next, segments of the new population who are not economically dependent on the installation (or take issue with other aspects of the government presence) find noise a specific object to complain about. Finally, the people reporting the complaints become more articulate and eventually address their grievances to higher levels of government, politicizing the issue and endangering the mission.

The amount of annoyance that a particular sound elicits in an individual depends on a combination of many factors. An issue may be the characteristics of the noise itself, such as the intensity and spectral qualities; duration; repetitions; abruptness of onset or cessation; and the *ambient noise* climate (or background noise).

2.2.2 KEYS TO SUCCESSFUL NOISE MANAGEMENT

A Noise Management Program is how installations deal with issues caused by noise. Issues range from addressing complaints, to advising local planning commissions, to developing action plans which limit future encroachment threats. These programs may be administered by a single person at smaller or more remote installations, or an actual noise committee at larger installations or those with significant encroachment concerns. The size and scope of the programs are generally up to the individual installations, but noise should always be given enough consideration so that, due to lack of attention, what are small problems today do not grow into large problems tomorrow.

As stated, Noise Management Programs can vary from installation to installation based on the characteristics of the noise itself, the installation size, and the surrounding population. But, all effective programs share certain elements.

Foremost, all successful Noise Management Programs are built on the cornerstones of **integrity** and **sensitivity**.

Still, to really understand issues of noise complaints and encroachment, one must first understand the basics of noise itself.

2.3 NOISE AND NOISE ASSESSMENT

Noise is simply unwanted sound.

The "unwanted" part of that definition is subjective to the receiver, and dependent upon many variables. But, properties of sound have been studied for hundreds of years in a branch of physics called "acoustics."

Note: This section is a highly simplified discussion. A more detailed discussion of sound is located in Appendix A.

2.3.1 THE SCIENCE OF SOUND

For the purposes of this plan, *sound* is the vibration of air pressure about a mean atmospheric pressure that is usually defined as 100,000 Pascals or 14.7 pounds per square inch (the standard atmospheric pressure at sea level). While all animals have different hearing ranges, these changes in atmospheric pressure as they relate to human hearing vary from approximately 0.0006 Pascals for a whisper at two meters, to 1,000 Pascals for an M16 rifle at the shooter's ear. It has two basic parts: the energy (i.e., is it loud or soft?) and the frequency (is the pitch high or low?).

Because of this large effective range of sound pressure and the fact that the human ear responds more closely to a logarithmic scale (rather than a linear), the *decibel* system (dB) was developed to quantify sound energy (loudness) into a meaningful and manageable scale. On this scale, the range of average human hearing runs from approximately zero (the *threshold* of hearing) to 140 for a healthy human hear, though zero is by no means the absence of sound (some people may hear sounds as low as -10 dB). Interestingly, the non-linear characteristics of human hearing means that in the decibel scale, a 3 dB increase is roughly a doubling of sound energy, but it takes a 10 dB increase for something to sound twice as loud.

In addition, the human ear is not equally sensitive to all sounds in the entire frequency spectrum—it works most efficiently in the medium frequencies where speech is found. Thus, to make a sound measurement more meaningful, scientists have developed processes called *frequency weighting* whereby certain ranges where the ear is more sensitive are factored in more heavily than others where the ear is less sensitive. Consequently, when looking at decibel levels it is important to recognize whether the measurements are weighted or *peak* (i.e., unweighted).

Frequency weighting is a type of filtering and, in the context of this plan, the two important filters are *A-weighting* (dBA) and *C-weighting* (dBC). A-weighting is used most often and particularly for higher frequency sounds such as aircraft and ground transportation. C-weighting is used for low-frequency events such as large arms and demolition explosions. This weighting becomes important when creating the noise zones discussed later in this section.

Yet, there are other sound characteristics that are important when determining how a sound becomes a noise. This is where the importance of the means of sound measurement (i.e., by what "yardstick") comes to the forefront.

2.3.1.1 SOUND PROPAGATION

When thinking about mitigation strategies, it should be kept in mind there are many factors affecting sound *propagation*, or the how and where of sound travel.

As stated, sound travels through air. So, anything that affects the density or composition of the air, or interrupts the sea of air between the source and receiver will have an effect on what sounds that receiver ultimately hears. This is a good news/bad news situation.

The good news is that physical barriers can greatly reduce the travel of certain kinds of noise. These barriers can be as large as a berm or a wall near the source, or as tiny as a change in the insulation in the receiver's home, and they can be quite effective at reducing complaints from the public. Due to their smaller wavelengths, physical barriers are most effective against high frequency sounds such as small arms fire and transportation sounds. Low frequency sounds from large arms and explosions have such large waves that they travel over almost anything smaller than a mountain.

The bad news is that one of the greatest influencers of sound propagation is the one over which humans have the least amount of control: the weather. Certain weather conditions make sound travel for great distances, and others barely at all. Temperature and wind velocity are the prime variables in this phenomena, and the swing at one place between the most favorable and least favorable weather conditions can be as much as 40-50 dB (equating to a 16-32x increase in loudness).

Since sound travels through air, a receiver downwind of the source will be subjected to higher sound levels than a receiver upwind; the breeze is actually helping move the sound to the downwind receiver, but upwind the sound must "swim against the current."

Combine wind direction with temperature variation (as a rule, sound usually travels further in cold temperatures) and one may observe the phenomena of *atmospheric refraction*. This is the process by which atmospheric conditions actually bend and/or focus sound waves toward some areas and away from others.

This makes predicting sound travel difficult, but the Explosives Research Group (ERG) and the University of Utah developed guidelines to help determine what would be "good" or "bad" firing times. These guidelines are summarized in Table 2-1.

Table 2-1. University of Utah Criteria for "Good" and "Bad" Firing Conditions

"Good" Firing Conditions	"Bad" Firing Conditions
Clear skies with billowy cloud formations, especially during warm periods of the year. A rising barometer immediately following a storm.	Days of steady winds (5-10 mph) with gusts of greater velocities (above 20 mph) in the direction of nearby residences. Clear days on which "layering" of smoke or fog are observed. Cold, hazy, or foggy mornings. Days following a day when large extremes of temperature (about 36°F) between day and night are observed. Generally high barometer readings with low temperatures.

2.3.2 NOISE METRICS

There are several metrics that may be used to measure sound to make it relevant to a situation. Certainly few people would complain if a plane flew over their house at 15,000 feet once a year at 2:00 in the afternoon. Yet, if that plane flew over a house at 500 feet once a day at 2:00 in the morning, it would be a different story entirely.

So, questions such as "what time?" and "how often?" are just as important as "how loud?" when it comes to making sound measurements meaningful for the purposes of complaint management. The following are the primary metrics that USAPHC and the Construction Engineering Research Laboratory (CERL) use for measuring military noise (please see Appendix A for more in-depth definitions):

- Equivalent Sound Level (L_{eq}) – Sound exposure "averaged" over a prescribed time period (usually 24 hours).

- Sound Exposure Level (SEL) – the total energy of a sound event normalized to a specific amount of time (e.g., one second) so that sounds of different durations may be compared directly.

- Day-Night Level (DNL) – An average like the L_{eq} but with a 10dB "penalty" inflicted on sounds occurring between the hours of 2200 and 0700 (a particularly intrusive time when people are usually sleeping). As discussed above, the DNL may be A-weighted (ADNL) or C-weighted (CDNL) depending on the noise being measured. This average is calculated over a "year," or typically 250 (for active military) and 104 (National Guard) training days.

  Note: Since they are based on averages, DNL noise contours (see next Section) grow larger the more shots are fired.

- PK15(met) – the peak sound level, factoring in the statistical variations caused by weather, that is likely to be exceeded only 15% of the time (i.e., 85% certainty that sound will be within this range). This exists only in modeling—one cannot take a PK15(met) reading on the ground—and it is used for land use planning with small arms and as additional information for large arms and other impulsive sounds.

  Note: If there are multiple weapon types fired from a particular location (or multiple firing locations), the single event level used to create a noise contour (see next Section) is the loudest level that occurs at each receiver location. As such, PK15(met) contours are the same size no matter how many shots are fired.

- Unweighted Peak – the peak, single event sound level without weighting, on the ground. This measurement takes into account everything from berms, to weather, to the length of the grass—but it is only good for that moment in time under those exact conditions. Consequently, there is no particular confidence built in that the number is reliable in other situations, such as with the 85% certainty built into the PK15 (met) above.

There is no single perfect way to measure noise because different entities have different preferences for what is important. Still, combinations of the above metrics give the clearest picture of a noise environment currently available, and in them most people will find the information they need.

2.3.3 NOISE ZONES

When it comes to land use planning, there needs to be a way to use the above-mentioned metrics and represent the results visually on a map so that people can readily see what areas are impacted and to what degree. This is accomplished by employing computer modeling programs to create *noise zones* that, using Geographic Information Systems (GIS), may be overlaid onto maps showing installations, airports, neighborhoods, and the like. Once this is done, it becomes readily apparent which areas in and around an installation are or could be (if improperly developed) exposed to unacceptable noise levels.

2.3.3.1 NOISE ZONES AS THEY RELATE TO LAND USE

The Army uses a system which partitions noise into three zones, each labeled by Roman numerals and each representing an area of increasing noise. As particular uses such as schools, residences, and churches are more sensitive to noise than other more industrial uses, the zones help create a picture of where things should be located. Though there may be existing noise-sensitive uses in high noise areas, the Noise Zone guidelines may be used to avoid further such development. Please see D for more details regarding which uses should be permitted in each Noise Zone.

Noise Zone I: Noise Zone I includes all areas in which the PK15(met) decibels are less than 87 dB (for small arms), the ADNL is less than 65 (for aircraft), or the CDNL is less than 62 (for large arms and explosions)—it is usually the furthest zone from the noise source, and it is basically all areas not in either of the next two zones. Noise Zone I is not depicted on noise contour maps. As a rule, this area is suitable for all types of land use.

Noise Zone II: This is the next closest area to the noise source where the PK15(met) decibels are between 87 and 104 (for small arms), the ADNL is between 65 and 75 (for aircraft), or the CDNL is between 62 and 70 (for large arms and explosives). Land in this zone should generally be limited to activities such as manufacturing, warehousing, transportation, and resource protection. Noise-sensitive land uses in Noise Zone II are normally not recommended.

Noise Zone III: Noise Zone III is the area closest to the source of the noise where the PK15(met) decibels are greater than 104 (for small arms), the ADNL is greater than 75 (for aircraft), or the CDNL is greater than 70 (for large arms and explosions). The noise level in this area is considered severe enough that no noise-sensitive uses are recommended.

One final zone is the more informal *Land Use Planning Zone* (LUPZ). This zone is at the upper end of the Noise Zone I and is defined by a CDNL of 57-62 (for large arms and explosions) or an ADNL of 60-65 (for aircraft). The LUPZ is 5 dB lower than the Zone II. Within this area, noise-sensitive land uses are generally acceptable. However, communities and individuals often have different view regarding what level of noise is acceptable or desirable. Many local jurisdictions have discovered that some people consider themselves impacted below the Zone II levels and have implemented land use planning measures out beyond the Zone II limits. Additionally, implementing planning controls within the LUPZ can develop a buffer in the event that military operations increase.

Table 2-2 shows all of the noise zones by the respective noise levels.

Often, there are existing “noise-sensitive” land uses in areas exposed to levels above those recommended. In most cases, this is not a problem. Neighbors acknowledge that they hear the training, but many report they are not bothered by it. The value of the AR 200-1 guidelines is earned when they are applied to future planning initiatives both on and off of the installation.

Table 2-2. Noise Zone Decibel Levels (AR 200-1)

Noise Zone	Aviation (ADNL)	Small Arms (PK15(met))	Large Arms, Demolitions, Etc. (CDNL)
Land Use Planning Zone (LUPZ)	60-65	N/A	57 – 62
Zone I	<65	<87	<62
Zone II	65-75	87 – 104	62 – 70
Zone III	>75	>104	>70
Legend: > = greater than, < = less than, N/A = not applicable			

Army Regulation 200-1 contains the specific regulations governing operational noise. As stated, the noise section of AR 200-1 may be found in Appendix E, and it is a must for any personnel responsible for the creation or mitigation of operational noise to familiarize themselves with this document.

Average noise levels over a protracted period of time may be the best tool for long-term land use planning, but they may not adequately assess the probability of community noise complaints. As recommended in AR 200-1, the SONMP includes supplemental metrics to identify where operational noise may at times reach levels high enough to generate complaints.

Though Noise Zones are used to delineate land use compatibility, factors such as meteorological conditions and the receiver's perception of the source can influence the level or impact of noise from day to day. The Noise Zones are intended to provide the best available solution to quantify noise impacts and assist in the land use policy decision making process.

2.3.4 THE SPECIFICS OF MILITARY NOISE

The previous section briefly touched on military noise when it introduced the concept of A- and C-weighting for different types of sounds. But, military operations produce several different kinds of sounds that could be construed as noise under the right conditions, and understanding where the noise is coming from is critically important to mitigation efforts by both the installation and the community.

2.3.4.1 SMALL ARMS

Small arms firing (that is, weapons less than 20 mm) is one of the most common sources of military noise. Given that small arms ranges take up relatively little space, and that all members of the military must qualify at least annually with their weapons, it is little surprise that nearly every installation has at least one small arms range.

The computer model used to create the noise contours for small arms ranges is the Small Arms Range Noise Assessment Model (SARNAM), and it uses the peak noise level to create noise zones. SARNAM incorporates the latest available information on weapons noise source models, directivity, sound propagation, and the effects of noise mitigation and safety structures such as berms, wall, and ricochet barriers.

For reference, Table 2-3 shows the *unweighted* peak sound pressure levels (i.e., no filters, and not taking into account any mitigation or safety structures) for an M-16 rifle so that the reader may get a feel for the directivity and distance decay of small arms noise. Note: the 180° azimuth is directly behind the weapon.

Table 2-3. Predicted Unweighted Peak Decibels (dBP) for an M-16 (5. 56 mm) Rifle

Distance (meters)	**Predicted Level, dBP Azimuth**		
	0°	**90°**	**180°**
50	135-150	112-127	102-117
100	113-128	106-121	95-110
200	106-121	99-114	89-104
400	93-108	86-101	78-93
800	85-100	77-92	69-84
1600	75-90	67-82	59-74

This table is useful in conveying two pieces of information: First, when dealing with small arms ranges, the direction of fire has a large impact on noise levels. Second, the impact of a small arms range is relatively localized and thus, under most weather conditions, once a receiver is 1,000 meters from the range, levels should not be high enough to annoy people.

2.3.4.2 LARGE ARMS, DEMOLITION, AND OTHER IMPULSIVE SOUNDS

The sounds from large arms, demolitions, and other impulsive sounds create the largest complaint issues because the sound can travel so far, it is so difficult to stop, and it can be accompanied by vibration that may increase the public's annoyance.

This type of noise is modeled using the BNOISE2 computer modeling program and contours are shown on maps in both the average (C-weighted DNL) and PK15(met) iterations. AR 200-1 states that the CDNL should be used for the purposes of land use planning (Table 2-2).

However, members of the public often view "averages" incredulously, so the PK15(met) contours are shown to give an idea with 85% certainty of how loud at any particular location single events are likely to get.

The unweighted peak threshold of physiological hearing damage to the human ear is approximately 140 dBP, but the threshold for annoyance varies greatly among individuals. Based on the experiences of the Naval Surface Warfare Center (Dalhgren, VA), USAPHC uses the set of guidelines shown in Table 2-4.

Table 2-4. Complaint Risk Guidelines

Predicted Sound Level (dBP)	**Risk of Complaints**
<115	**Low** risk of complaints
115-130	**Moderate** risk of complaints
>130	**High** risk of noise complaints

Pairing these guidelines with the following tables (Tables 2-5 and 2-6) give an example of what noise levels to expect at specific distances, and whether or not those levels have a risk of generating complaints. Again, an azimuth of 180° means that the listener is behind the gun.

Regarding vibration, studies (Siskind, 1989) have shown that homeowners become concerned about the structural rattling and potential damage when the peak decibels exceed 120 dBP, but actual damage is not likely to occur at decibel levels lower than 150 dBP.

Table 2-5. Predicted Peak Sound Levels for 120 mm Tank Gun Firing

Distance (meters)	**Predicted Level (dBP) Azimuth**		
	0°	90°	180°
500	138-148	137-147	133-143
1,000	127-137	126-136	122-132
2,000	115-127	114-126	110-122
3,000	108-121	107-121	103-116
4,000	103-117	103-116	98-112
5,000	100-114	99-113	94-109

Table 2-6. Predicted Peak Sound Levels for 155 mm Howitzer Firing

Distance (meters)	**Predicted Level (dBP) Azimuth**		
	0°	90°	180°
500	136-146	131-141	122-132
1,000	125-135	120-130	111-121
2,000	113-125	108-120	99-111
3,000	106-119	101-114	92-105
4,000	101-115	96-110	87-101
5,000	97-112	92-107	83-98

2.3.4.3 AIRCRAFT

Aircraft noise is also very common at military installations now that the use of helicopters has become so important in modern warfare, and since even the smallest installations can employ them (since they do not need space for a runway). So, between classic propeller, jet, and rotary aircraft, the possibilities for aircraft noise complaints is growing.

Several computer models are used to visualize aircraft noise but the most common is NOISEMAP/BASEOPS. Table 2-2 defines the AR 200-1 ADNL aircraft Noise Zones used for land use planning.

But, as stated before, the ADNL is an average; Scandinavian Studies (Rylander 1974) found that a good predictor of annoyance at airfields with 50 to 200 operations per day is the maximum level. The study found that up to 5% of the population would consider itself highly annoyed when the maximum level exceeds 70 dBA. For reference, Table 2-7 shows the maximum noise levels for common Army aircraft at various above ground level (AGL) altitudes.

Table 2-7. Maximum Sound Level by Aircraft Type (dBA)

ALG (Feet)	**Maximum Sound Level by Aircraft Type (dBA)**						
	AH-64	**CH-47**	**OH-58D**	**UH-60A**	**UH-72**	**C-12**	**C-130**
1,000	77	78	74	69	69	73	85
1,500	73	74	70	65	65	69	80
2,000	70	71	67	62	62	67	77

2.3.4.4 MANEUVER TRAINING AND OTHER TRANSPORTATION

At most installations, noise from maneuver training is not a problem because noise from vehicles does not travel for long distances. Occasionally convoys or special circumstances can be disruptive, but usually not to the point where it would cause a complaint about noise.

Additionally, maneuver training rarely creates enough noise to create a Noise Zone that can be shown on a map, so nearly any adjacent land use is technically compatible (though not always desirable).

2.3.4.5 MISCELLANEOUS

Other military noise sources include generators, production facilities, research and development facilities, and repair operations. For the most part, complaints from these types of sources are rare and are often resolved at an installation-level.

2.4 OPERATIONAL NOISE MANAGEMENT AND MITIGATION

The fact that military training makes noise will not change for the foreseeable future. But, it is possible for both the military and civilian communities to work together for mutual benefit to change how noise is handled.

As has been said previously, noise management on the community's side of the fence is best accomplished through an intelligent, common-sense approach to land use planning next to the installation, entailing a willingness to be creative with how to use the land to accommodate the community's growth needs.

On the military side of the fence, successful operational noise management is generally tackled on two fronts: physical mitigation measures and procedural changes.

2.4.1 PHYSICAL NOISE MITIGATION

Physical mitigation is the idea of putting something in between the source and the receiver, or otherwise orienting the source so that noise is directed away from the receiver to the greatest extent possible. Physical mitigation is best planned for prior to construction, but it may also be employed after construction in some situations. Examples of physical mitigation are:

- Constructing artificial berms or enclosing a small arms range within walls and baffles.

- Orienting noise sources toward the interior of the installation property.

As alluded to in the section on propagation (Section 2.3.1.1), physical noise mitigation generally feasible only on the higher frequency sounds such as small arms fire, because impulsive noise tends to have wave characteristics that make ineffective all but the largest obstacles.

2.4.2 PROCEDURAL NOISE MITIGATION

Physical noise mitigation (where feasible) may also be coupled with procedural changes that lessen either the noise itself, or the likelihood that the noise will impact the community.

Procedural mitigation includes such steps as:

- Implementing fly-neighborly programs that adjust aircraft training times and routes to lower the impact on the community to the greatest extent possible given mission requirements.

- Adjusting the timing, where feasible, of particularly disruptive activities to avoid conflicts with local events such as church times or holidays.

- Keeping the community informed regarding unusual increases in the intensity of training or if training is to be resumed after a period of inactivity.

- Proper review of Environmental Assessments (EAs) and Environmental Impact Statements (EISs) to ensure that noise impacts of proposed actions are addressed and consistent with the current ONMP.

- Noise environment monitoring (as opposed to computer modeling) when the noise environment is controversial, when a Noise Zone III exists in a noise-sensitive area, or when a noise is unique and cannot be modeled.

- Incorporating noise contours as a layer on the facility's GIS system so the contours may be combined with other layers (such as land use) and referenced when siting new facilities.

Obviously, efforts at reducing noise impacts through procedural means can only be effective if they are adhered to. As such, the proper training of personnel about noise mitigation procedures that are in place is vitally important.

2.5 SUMMARY

This section provided the scientific basics of sound itself, the reasons that a sound may become noise, the sources of operational noise, the basics of mitigation, and the big picture of how all of these relate to encroachment and complaints.

Operational noise and development pressures will continue to create the possibility of friction for the foreseeable future. However, sensible planning and the appropriate, timely management of problems can prevent localized pockets of discontent from destroying a mutually beneficial relationship between an installation and its surrounding community.

The following sections will provide the noise complaint management procedures, and address in detail the specific noise environments at relevant area.

3 VERMONT ARMY NATIONAL GUARD

3.1 GENERAL

The Army National Guard (ARNG) exists in all 50 states, three territories and the District of Columbia. The state, territory, or district leadership is the Commander in Chief for each Guard. Their Adjutants General are answerable to them for the training and readiness of the units. At the state level, the governors reserve the ability, under the Constitution of the United States, to call up members of the National Guard in time of domestic emergencies or need.

During national emergencies; however, the President reserves the right to mobilize the National Guard, putting them in federal duty status. While federalized, the units answer to the Combatant Commander of the theatre in which they are operating and, ultimately, to the President. Even when not federalized, the Army National Guard has a federal obligation (or mission). That mission is to maintain properly trained and equipped units, available for prompt mobilization for war, national emergency, or as otherwise needed.

Typically, National Guard members are required to attend one drill weekend each month and one annual training period (usually 2 weeks in the summer) each year, although a significant number serve in a full-time capacity, in a role called Active Guard and Reserve, or AGR. Weekend drills usually consist of one Saturday and Sunday each month, but occasionally include reporting for duty on Friday night. Training time is precious to Army National Guard soldiers. The Army National Guard uses many unique training methods, from "real-life" training exercises, like rotations at the National Training Center in Fort Irwin, California, to high-tech simulation training and distributed learning.

The ARNG is organized as an operational force that is fully capable of accomplishing state, national, and international missions during war and peace. To meet these requirements, the ARNG maintains a balanced mix of combat, combat support, and combat service support units. These units are structured to integrate seamlessly with active component units as needed, and are located in nearly 3,000 communities throughout the United States, which enables them to respond rapidly to domestic emergencies.

Major ARNG command and control elements include the Army National Guard elements of 54 state and territory Joint Force Headquarters, as well as six infantry division headquarters. Major units include over 100 brigades, including 28 Brigade Combat Teams. The ARNG force structure continues evolving to best support the National Military Strategy (NMS). Ongoing ARNG initiatives will ensure the best mix of forces available to accomplish missions directed by the NMS, while also ensuring that the ARNG is ready to answer the call for state missions.

The state mission of the Vermont National Guard (VTNG) is "Soldiers and Airmen of the Vermont National Guard serve, protect, and defend the citizens of our Communities, State and Nation; ensuring our security and preserving our freedoms." The State of Vermont Military Department commands and supports the National Guard as mandated by state and federal constitutions. The department is also required by State law to provide support to Vermont Veterans. The Department is administered by the Adjutant General and includes the Vermont Army and Air National Guard as well as a State work force integrated into these organizations.

The VTNG serves as a military force available to the governor in the event of state emergencies which exceed the capability of civil authorities and as a federal force, providing an immediate operational force for both the U.S. Army and U.S. Air Force in times of national emergency or war.

The VTNG is composed of the Vermont Army National Guard (VTARNG) and the Vermont Air National Guard (VTANG). Together, they are collectively known as the Green Mountain Boys, despite the inclusion of women in both branches since the mid-twentieth century. Both units use the original Revolutionary War era Flag of the Green Mountain Boys as their banner.

The modern VTNG was formed in the 1920s. Prior to that state militia units were mustered in wartime, and deactivated in peacetime, going back to the 1760s.

In Fiscal Year (FY) 2010, the Military Department received approximately $197,143,384 combined Federal and State dollars to administer the military and state work force, maintain facilities, as well as train and equip the military force. The State of Vermont provided $3,340,462 of that total amount in general funds.[1] The department manages a force of about more than 45 full time ARNG military personnel and 42 state employees. The VTARNG is composed of approximately 2,900 soldiers and represents one of the highest Guard per capita participation rates of any state in the country.

The major units of the VTARNG are the following:

- 86th Infantry Brigade Combat Team (Mountain)
- C Company 3-126th Aviation Regiment (Air Ambulance)
- 172nd Armor Regiment

The VTARNG maintains 26 armories, and is present in 22 communities. The major training facilities which have the ability to generate operational noise are as follows:

- Camp Ethan Allen Training Site (CEATS)
- Army Aviation Support Facility (AASF) – located at Burlington International Airport
- Camp Johnson (VTNG Headquarters) – located at Ethan Allen Air Force Base

Figure 3-1 shows the general location of CEATS and the AASF.

[1] http://www.mil.state.vt.us/pdf/FY_2012_Budget_Narrative.pdf

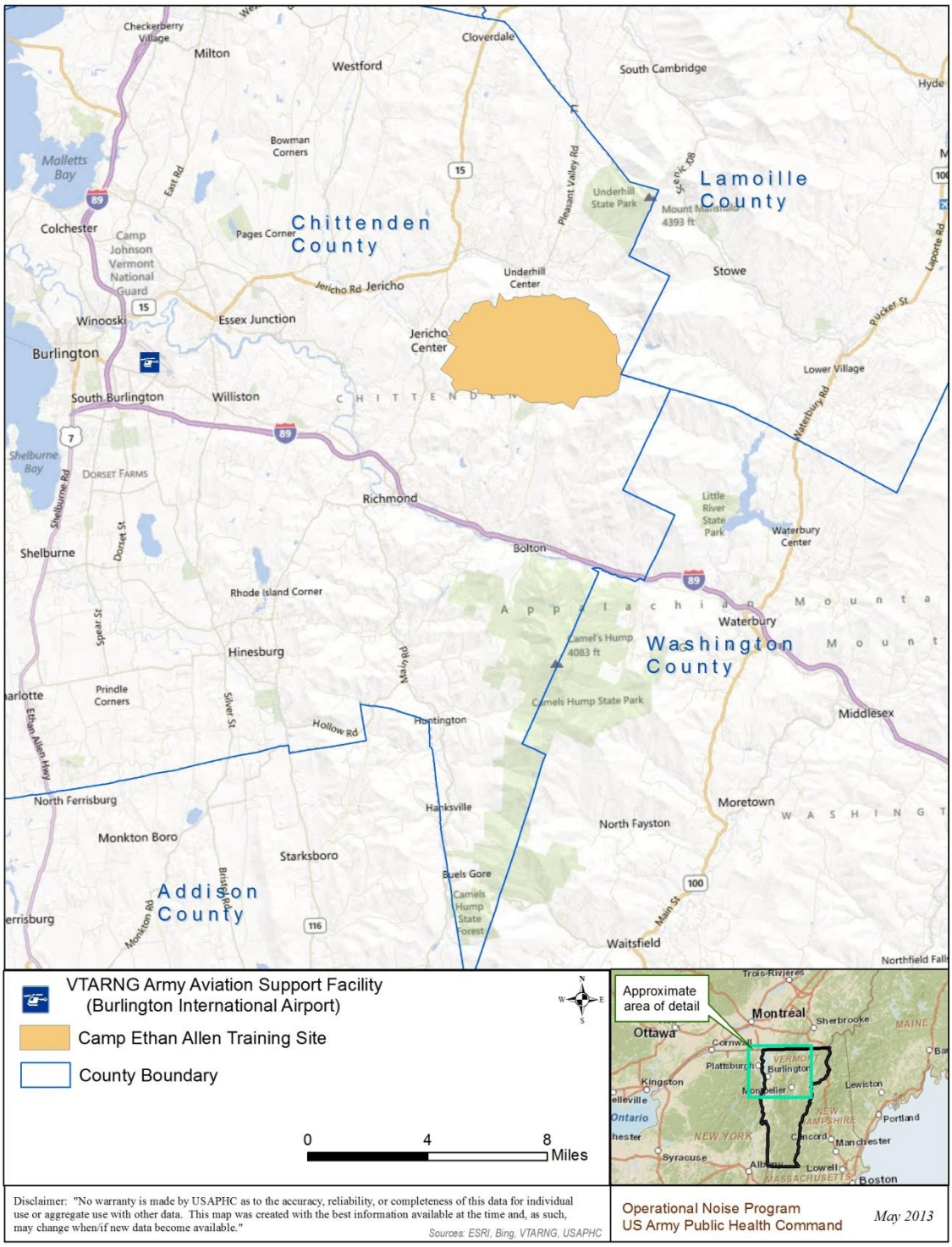

Figure 3-1. VTARNG General Location

3.2 VTARNG ECONOMIC IMPACT

The operations at VTARNG facilities generate revenue to local economies through military and civilian wages, equipment rentals, utilities, telephone, office supplies, as well as construction contractor payments and other prime contract awards.

A second measure of the relative impact of the VTARNG upon the economies of the surrounding communities is the number of jobs that are induced in the private sector as a direct result of military troop levels, as well as civilian workers and their off-post expenditures. Personnel working on these facilities and their dependents at home make considerable use of retail and service businesses in the local communities.

The concept of induced employment related to military installations has been addressed in a number of studies which can be used to estimate the number of jobs which are created based upon an installation's military population and the number of civilians employed. Conservative estimates often put these multipliers at a one to one, or one to two ratio. Table 3-1 shows a brief accounting of the VTARNG's economic impact in the State of Vermont, based on these multipliers.[2]

Table 3-1. VTARNG Economic Impact

Military pay and Allowances	$ 109,188,051
Civilian Payroll	$ 32,800,026
Goods and Services	$ 56,857,150
Military Construction	$ 48,412,240
Total Economic Impact	$ 247,257,467

Impact multiplier of 1.84 has been applied

3.3 VTARNG NOISE MANAGEMENT PROGRAM

A Noise Management Program is the system by which installations address noise issues. These issues range from addressing noise complaints, to advising local planning commissions or developing action plans which limit future encroachment.

In accordance with AR 200-1, the VTARNG has implemented a Noise Management Program. A part of this program as stated in AR 200-1 is to "*monitor, record, archive and address operational noise complaints*". As mentioned in Section Two, complaint management programs can vary from installation to installation or state to state (NGB) based on the noise characteristics, training site size, and the surrounding population. Through years of experience at Army installations, it has been found that a centralized procedure to log and investigate noise complaints is most effective. This makes monitoring, recording and archiving noise complaints more efficient and useful to the program manager.

[2] http://www.arng.army.mil/News/publications/fs/2010/States_webpages/Vermont.htm

The VTARNG follows the guidance of the NGB and has designated the Public Affairs Office (PAO) as the primary noise complaint Point of Contact (POC). At the time of publication, the PAO was in the process of updating the VTARNG Standard Operating Procedure (SOP). A copy of the Noise Complaint Form used by CEATS is depicted in Figure 3-2. At the time of publication, the AASF was in the process of developing an aircraft specific Noise Complaint Form. When the updated SOP and aircraft Noise Complaint forms are completed, a copy to will be added to Appendix I. The existing VTARNG SOP is summarized below (VTARNG 2012):

> The Public Affairs Office (PAO) is the designated Noise Complaint Point of Contact (POC). Noise Complaints are received by the PAO. If necessary, the PAO then investigates by contacting the noise producing proponent (airfield, range control, etc). The results of the investigation are then reported back to the complainant. There are times when calls are received at locations other than the PAO. As an example, calls are occasionally received at the Army Aviation Support Facility (AASF) at Burlington International Airport. If this occurs, the AASF will handle the complaint locally if possible. If staff decides the complaint cannot be resolved, then the AASF will contact the PAO for support. Whether the complaint is resolved locally or not, a copy of the noise complaint will be forwarded to the PAO for record. The Noise Complaint Reporting Form shall be used to record all noise complaints received by the VTARNG.

3.3.1 NOISE COMPLAINT PROCEDURES

Though the PAO is the primary POC for noise complaints, the AASF and CEATS may also receive and respond to noise complaints. When complaints are generated by activities at a large facility, the public is more likely to call the facility directly rather than place a call to the State Headquarters. CEATS has designated Range Control as a POC for noise complaints. At the Burlington AASF, noise complaints generally go to the AAF Flight Operations Center.

Department of Military Affairs
Vermont Army National Guard
Public Affairs Office
(802) 338-3324

Camp Ethan Allen Training Site
Range Control
(802) 899-7074

Vermont Army National Guard - AASF
Burlington International Airport
(802) 338-3527

Camp Ethan Allen
Installation Operational Noise Management Plan
Complaint Investigation Report Form

Complainant: _____ Date: _____
Address: _____
Phone (Home): _____ (Work): _____
(Cell): _____
Reason for Complaint: _____

History of Problem: _____

Damage Claimed: Yes / No _____

Investigation/Coordination

Training Site or Facility: _____ Unit: _____
Weather Conditions: _____
Results of Investigation: _____

Action to Correct or Alleviate Noise Problem: _____

Additional Information: _____

Response to Complaint: _____

Complainant Satisfied: Yes / No _____

Follow Up: _____

Received By: _____ Time: _____

Remarks: _____

Figure 3-2. CEATS Noise Complaint Form

3.3.2 PUBLIC AFFAIRS OUTREACH

The PAO supports all VTARNG training sites and facilities (armories, AASF, etc.). If there is going to be an activity that has the potential to generate concerns about noise levels, such as a large convoy moving through an area, the PAO can help by disseminating pertinent information. The PAO maintains a public website which is used to convey information to the public. http://www.vtguard.com/publicaffairs/pressreleases.htm

In addition to informing PAO of noise complaints, VTARNG training sites, armories, and AASFs notify the PAO when training is scheduled that has potential to impact neighbors. Examples of activities where notification should be used are late night training, training at a new Local Training Area (LTA), anticipated high levels of aircraft activity, early morning activity, or activity resuming after a period of inactivity. The PAO can then determine the best means to use to disseminate this information to the public. The PAO has the expertise to ensure that enough information is given out to notify neighbors about potential noise effects, while at the same time ensuring that there are no security risks posed by the information released.

The PAO provides notice to the public for noise generated by unusual flight patterns or training operations; atypical use of munitions; convoys; nighttime firing; increases in operations tempo; and atypical or new use of areas. This public outreach effort incorporates multimedia options (such as radio, television, and newspaper) and post-event notifications.

Informing the PAO about upcoming training will also give the PAO the needed information to respond to people if they do call with a complaint or inquiry during the exercise. The Training Notification Form will be used to notify the PAO of upcoming training that has the potential to generate complaints.

CEATS

CEATS provides notices of non-routine training events (i.e. artillery firing) and the routine upcoming two month firing schedule (small caliber) to the surrounding communities. The Towns of Jericho and Underhill post the notices on the town websites.

Jericho:
http://www.jerichovt.gov/index.asp?Type=B_BASIC&SEC=%7B3BE2B559-C0C0-4AB1-8873-410258FD376B%7D

Underhill:
http://www.underhillvt.gov/index.asp?Type=B_BASIC&SEC=%7B556B39FD-E3F9-4F13-A212-880106A7CD06%7D

AASF

The AASF flying schedule is published on the VTARNG PAO website:
http://www.vtguard.com/publicaffairs/pressreleases.htm

3.4 DISCUSSION

The VTARNG will:

- Continue issuing press releases regarding noise generated by unusual flight patterns or training operations; atypical use of munitions; convoys; nighttime firing; increases in operations tempo; and atypical or new use of areas.
- Maintain a copy of the VTARNG Noise Management Program and SOP with Reporting Form at any facility that may receive a noise complaint (i.e. airfield, armories, range control, headquarters, PAO).
- Respond to noise complaints by completing a Noise Complaint Form and following the SOP.
- Ensure that a follow-up is conducted for noise complaints, as necessary.
- Summarize the noise complaint log and provide quarterly or annually to the Airfield, Commander/Headquarters, Environmental Quality Control Committee, Master Planner, Noise Manager, and Range Control.

3.5 SUMMARY

This section covered general information pertaining to the VTARNG structure, economic impact, and the VTARNG Noise Complaint Procedure. The following sections will discuss specific VTARNG facilities including an assessment of the noise generated by operations at these facilities and their impacts on the surrounding environments.

4 CAMP ETHAN ALLEN TRAINING SITE

4.1 LOCATION

Camp Ethan Allen Training Site (CEATS) is located in the northwestern region of the State of Vermont, approximately 20 miles east of Burlington, Vermont (Figure 4-1). CEATS occupies approximately 11,000 acres of mountainous land in the Green Mountains of Chittenden County. The area is characterized by steep and rolling terrain.

4.2 HISTORY

Primary land use prior to the establishment of the firing range was agricultural. The U.S. Government acquired 6,026 acres for the range in 1926 and expanded to its current size of 11,218 acres in 1941.

4.3 LOCAL COMMUNITY

Within one mile of CEATS lie the Towns of Jericho to the west, Underhill to the north, and Bolton to the south. There are two schools located within one mile of CEATS. The majority of the land to the east and south of CEATS is forested, mountainous, and/or undeveloped.

The population growth rate for the majority of the surrounding area is less than half the national rate (Table 4-1).

Table 4-1. Population Surrounding CEATS

	2000	2010	Change
Jericho	5,015	5,355	6.8%
Underhill	2,980	3,016	1.2%
Bolton	971	1,182	21.7%
Vermont	608,827	625,741	2.8%
United States	281,424,602	308,745,538	9.7%

Source: Census Bureau, 2010 census data

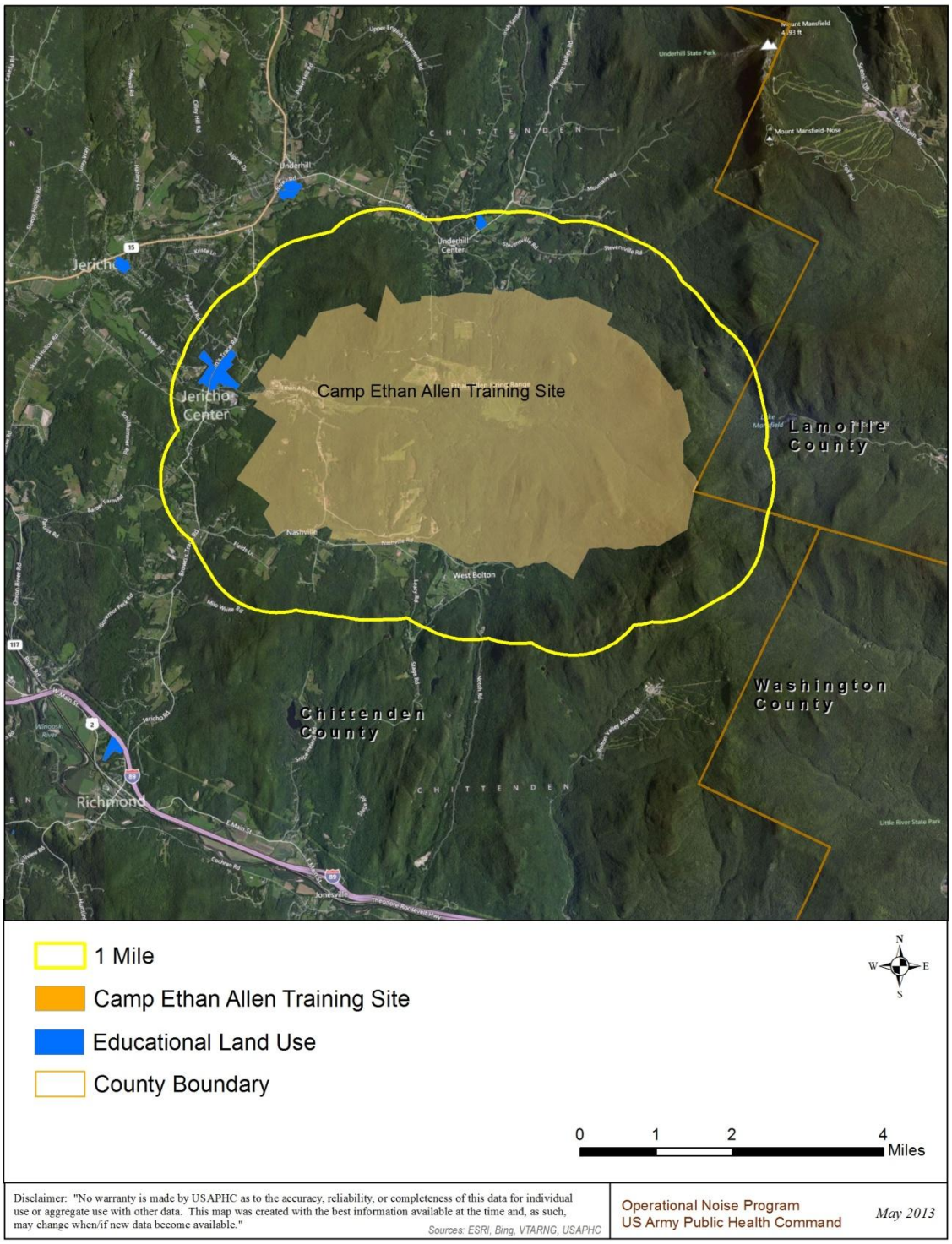

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Figure 4-1. Camp Ethan Allen Training Site Vicinity Map

4.4 MISSION AND TRAINING

The primary mission of CEATS is to provide training support to upwards of roughly 20,000 troops every year. CEATS is a training site of the Infantry Training Center (ITC) and the Army Mountain Warfare School (AMWS).

The ITC offers four courses, each approximately two weeks long. The ITC leader course prepares Infantry Non-commission Officers in the skills necessary to lead, train, and direct subordinates to maintain, operate, and employ weapons and equipment. One course teaches the combat critical tasks of the Infantryman, and presents them in a sequence of training to prepare them to be effective members of an Infantry squad. Another course trains soldiers in small arms weapon systems up to .50 caliber and another course in long-range marksmanship in 5.56mm and 7.62mm.[3]

The AMWS provides tactical and technical training for mountain warfare and cold weather operations. The AMWS currently consists of four progressive courses of instruction (Basic Summer, Basic Winter, Assault Climber Summer, and Assault Climber Winter). The AMWS curriculum is broken down into four two-week courses with three general type of mountain-specific skills taught in each; individual, small unit and medical.[4]

Training activities at CEATS includes small arms fire, demolitions, bivouac, artillery fire, mortar fire, land navigation, and maneuver training.

The existing ranges are shown in Table 4-2 and Figure 4-2.

Table 4-2. CEATS Existing Range Facilities

RANGE TYPE	RANGE
Combat Pistol/Military Police Qualification Course	Ranges 3-3; 5-1; 6-1; 6-2
Grenade Launcher Target Practice (TP)	Range 4-2
General Dynamics	General Dynamics
High Angle Range (HAR)	Range HAR
Infantry Squad Battle Course (ISBC)	Range 4-3
Known Distance Range	Ranges 3-2; 4-1
Machine Gun Transition Range	Ranges 6-3; 6-5
Modified Record Fire Range	Range 7-1
Multi-purpose Machine Gun Range (MPMG)	Range MPMG
Multi-purpose Training Range	Range 6-6
Non-standard Small Arms Range	Ranges 3-1; 5-2
Zero Range	Ranges 4-3 (10-25M); 6-6 (10-25M)
Artillery/Mortar Firing Points	FPs 6, 8, 15, 93
Demolition Range	Range 5-3

[3] http://www.vtguard.com/itc/index.htm
[4] https://www.benning.army.mil/infantry/amws/

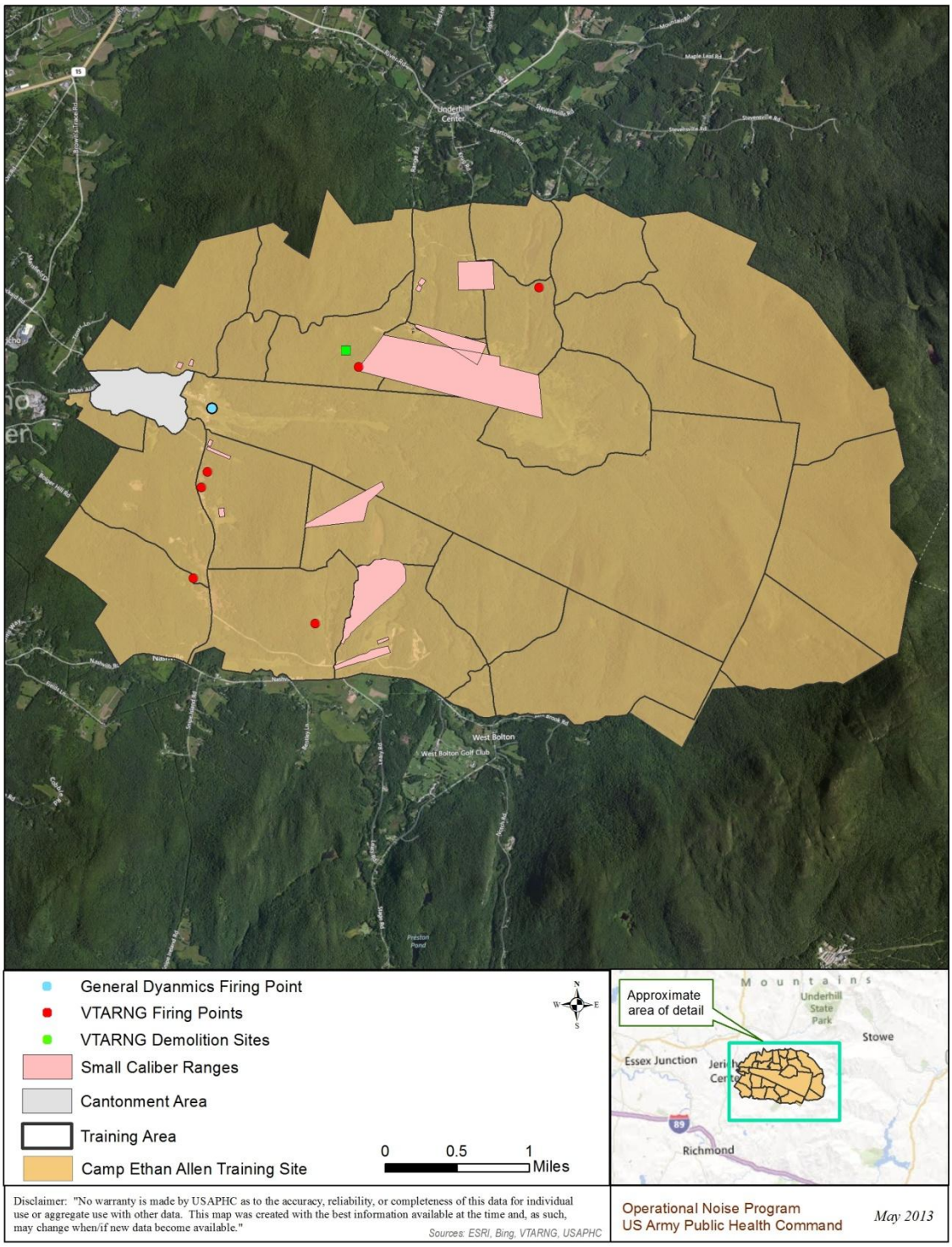

Figure 4-2. CEATS Existing Range Facilities

CEATS also features a weapons testing area for development, qualification, and testing of armament systems. General Dynamics (GD) Armament Systems uses CEATS to provide a wide variety of unique weapons and munitions testing services in support of its customers; expanding the ranges capabilities to include field support, engineering evaluation system qualification, and customer demonstrations. This firing range encompasses 6,500 meters of CEATS, in addition to an approximate 564-acre area used exclusively by GD, with 2,328 acres shared by both the GD and VTARNG.

4.4.1 NOISE ABATEMENT PROCEDURES

CEATS has taken several steps to reduce the amount of noise generated by training operations (VTARNG 2011). These actions include the following:

- The firing of ammunition is generally prohibited between the hours of 2200 – 0730.

- Live Fire Operations are generally conducted during the following standard duty hours:
    - Monday-Friday: 0730-1630
    - Saturday: 0700-2200
    - Sunday: 0700-1600
    - Hours maybe extended for annual training cycles and special unit requests.

- Blank Fire and Simulators/Pyrotechnics are conducted during the following hours:
    - Monday-Friday: 0730-1630
    - Saturday: 0700-2200
    - Sunday: 0700-1600
    - Activity is restricted within:
        - 100 meters of the Cantonment Area
        - 100 meters of the installation boundary between the Well Cache east to the West Bolton Cemetery
        - 100 meters of the installation boundary between Guard Post 2 east to Bear Town Road
        - The use of pyrotechnics, CS, or blank ammunition is prohibited within 100 meters of the boundary and will cease no later than 2200 from Monday through Saturday.

- The Light Demolition Range is limited to 0.5 lbs of TNT or its equivalent. A waiver is granted on a per unit basis if exceeding the current weight limit is required to meet training requirements.

- Indirect Live Fire (Artillery/Mortar)
    - 155mm Field Artillery (FA) is limited to a total of 90 rounds per day (all gun systems)
    - 105mm FA is limited to a total of 120 rounds per day (all gun systems)
    - 120mm Mortars are limited to a total of 120 rounds per day. (all tubes/gun systems)
    - 81mm and 60mm Mortars are limited to a total of 180 rounds per day.
    - Firing Times
        - Monday-Friday - 0730-1700
        - Saturday - 0700-2200
        - Sunday - 1100-1600 (Only 60mm and 81mm mortar allowed)

- The firing of live ammunition, blanks, and pyrotechnics will cease no later than 10:00 PM Monday through Saturday and 4:00 PM on Sunday.

- Sunday firing between the hours of 7:30 AM and 11:00 AM is restricted to small arms and single shot .50 caliber.

- Sunday firing of .50 caliber, M203, is only permitted from 11:00 AM to 4:00 PM.

Exceptions to these limitations may be requested in writing through Range Control for approval in writing by the Garrison Commander.

4.5 NOISE ENVIRONMENT

The noise environment discussion is divided into two separate sections. First is the current noise environment, addressing existing range/training operations and aviation activity. Second is the future noise environment, addressing forecast noise conditions due to a new range, planned range additions, or aviation changes.

Army guidelines pertaining to recommended and non-recommended land use around military installations have been addressed briefly in other parts of the plan. By determining the locations of the Noise Zones and applying the Army guidelines to these zones, present land use can be evaluated as to acceptability for various types of activities.

Army Regulation (AR) 200-1 lists housing, schools, and medical facilities as examples of noise-sensitive land uses. Guidelines in the regulation state that for land use planning purposes, noise-sensitive land uses are acceptable within the Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III. See section 2.3.3.1 for a full description.

Often, there are existing “noise-sensitive” land uses that could be defined as non-conforming. In most cases, this is not a risk to community quality of life or mission sustainment. Long-term neighbors often acknowledge that they hear training, but most are not bothered by it. The intent of AR 200-1 is to offer land use recommendations, which if adopted both on and off the installation, would facilitate future development that is unaffected by military noise.

4.6 CURRENT NOISE ENVIRONMENT

The current noise generating activities are:

- Small Caliber Weapons (.50 caliber and below)
- Demolition and Large Caliber Weapons (20mm and greater)
- Aviation Activity

4.6.1 SMALL CALIBER NOISE

Small caliber noise is divided into subsections based on the type of range facility:

- Live-fire Ranges (a defined range with fixed firing points and/or targets).
- Non-fixed Firing Points (an area or range with non-fixed firing points and/or targets).
    - Includes Live-fire facilities and non-live fire activity.

4.6.1.1 LIVE FIRE AND FIXED SMALL ARMS RANGES

The small caliber live-fire range ammunition utilization inputs are shown in Appendix B.

<u>All CEATS Activity</u>

Figure 4-3 contains the cumulative small caliber Noise Zones for CEATS. The Zones are based on the General Dynamics and existing VTARNG activity.

<u>VTARNG Activity</u>

Figure 4-4 illustrates the small caliber contours attributable to VTARNG activity.

For both the cumulative CEATS activity and the VTARNG activity, the Zone II extends beyond the northern boundary up to 2,200 meters (1.24 miles) and beyond the southern boundary up to 1,000 meters (0.6 miles). Zone III extends beyond the southern boundary up to 250 meters (0.15 miles) and into a wooded portion of the cantonment area. On-post, Zone II encompasses the cantonment area including the transient barracks complex. Off-post, Zone II encompasses residential land use in the Towns of Underhill Center and West Bolton.

Currently there are “noise-sensitive” land uses that could be defined as non-conforming within Zone II. The intent of the guidelines is to offer land use recommendations, which if adopted both on and off the installation, would facilitate future development that is unaffected by military noise.

Though Noise Zones are used to delineate land use compatibility, factors such as meteorological conditions and the receiver's perception of the source can influence the level or impact of noise from day to day. The Noise Zones are intended to provide the best available solution to quantify noise impacts and assist in the land use policy decision making process.

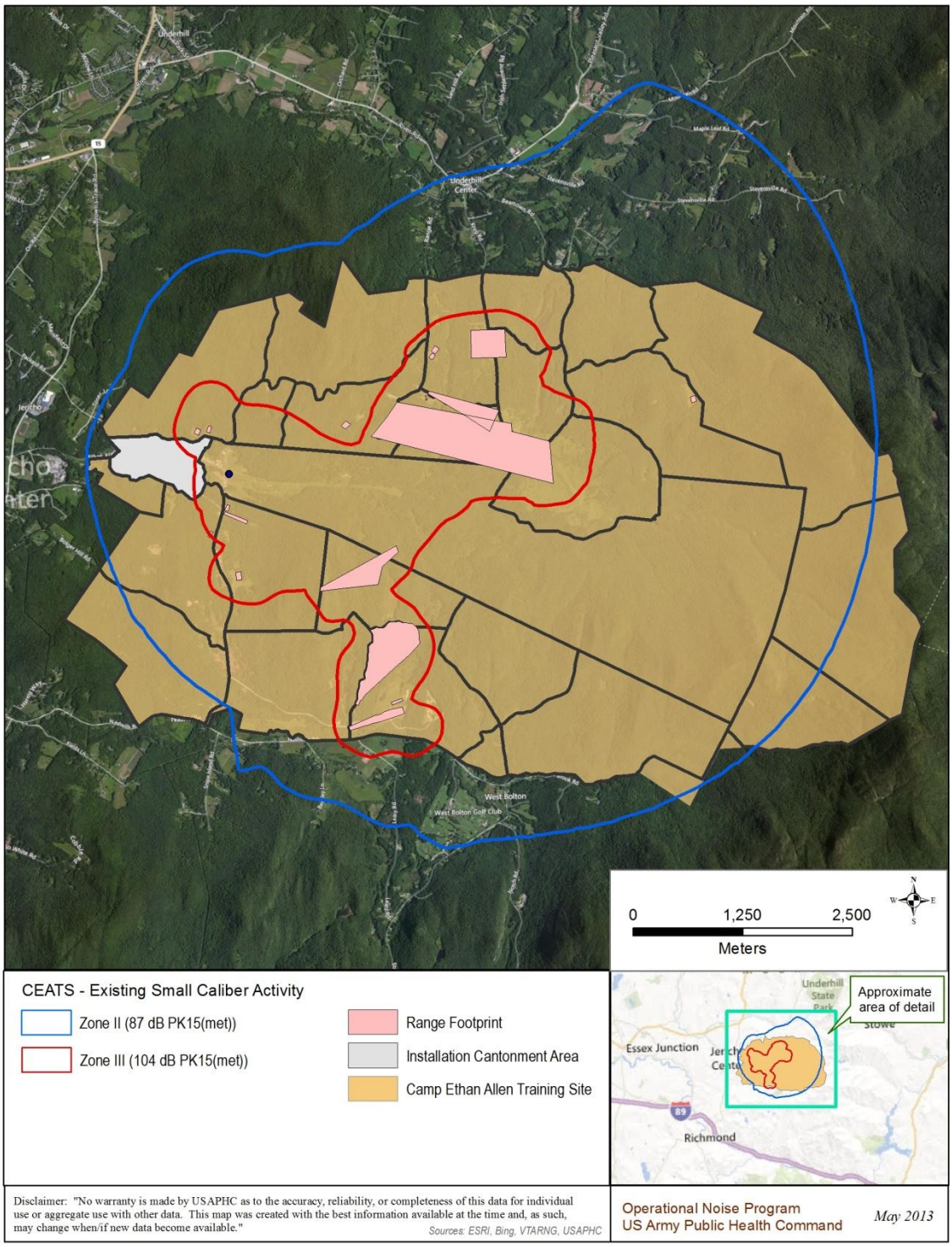

Figure 4-3. CEATS Small Caliber Operational Noise Zones

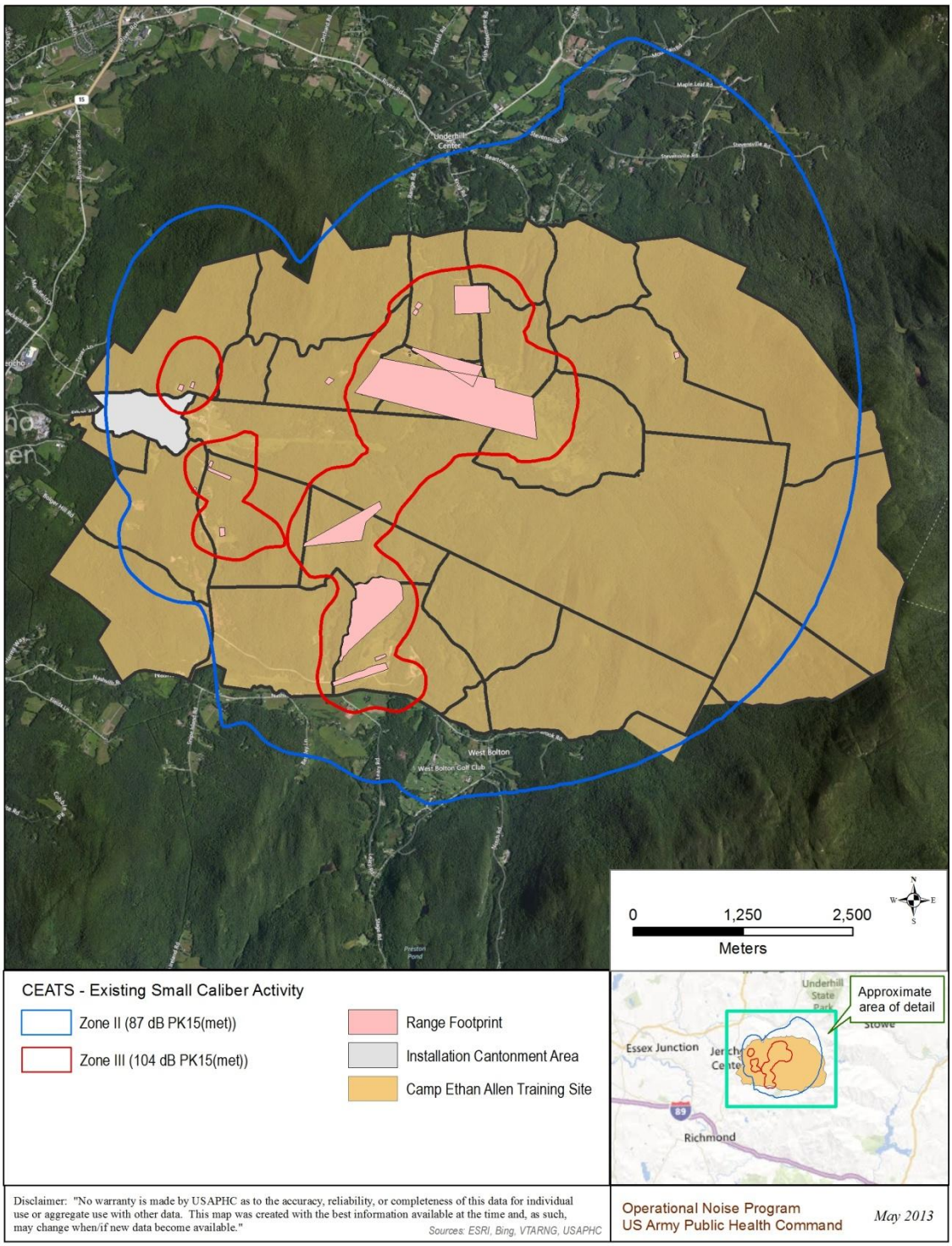

Figure 4-4. Existing VTARNG Small Caliber Operational Noise Zones

4.6.1.2 NON-FIXED RANGES AND NON-LIVE FIRE ACTIVITY

As discussed previously, to generate noise contours using the SARNAM, specific firing point and target point locations must be entered into the program. Firing occurring within a Training Areas or at a Military Operations in Urban Terrain (MOUT) do not have set firing point or target point locations; firing can occur at multiple locations and in multiple directions of fire. Therefore, noise contours for this activity cannot be modeled using SARNAM. However, by looking at the predicted peak levels in Tables 4-7 through 4-10, we can see were noise would approach a Zone II level. For example, in Table 4-3 noise approaches Zone II levels [PK15(met) 87 dB] approximately 800 meters for the 5.56mm ball round.

If needed, a "buffer" could be developed based on the information in these tables. The "buffer" would depict the distance where noise would approach Zone II levels for a particular ammunition or range.

The following describes common non-fixed firing point ranges and the type of activity. Although the Urban Assault Course (UAC) is a proposed range, it was included in this section to prevent duplication of information.

Convoy Live Fire (CLF)

A CLF provides a facility to train and evaluate units during a live fire exercise. Units are trained and evaluated on their ability to move tactically, engage targets, improvised explosive devices, and practice target discrimination. A typical facility contains seven objectives. Objectives are typically laid out along a road and firing may occur in multiple directions. The ammunition expenditure may include live fire of 5.56mm, 7.62mm, and .50 caliber ammunition and the 40mm Training Practice (TP) round.

Live-Fire Shoot House (LFSH)

The LFSH is a multi-room live-fire facility, designed for close-quarter room and building clearing operations. Most weapon firing occurs inside the structure. Buildings of this type would be expected to provide up to 25 dB noise level reduction (NLR) on the exterior of the building. The ammunition expenditure inside the structure may include simunitions, pistols, 5.56mm Ball and the 12 gauge shotgun. Ammunition expenditure outside of the structures may also include the .50 cal Short Range Training Ammunition (SRTA).

Military Operations in Urban Terrain (MOUT)

A MOUT is a non-live fire facility with a mixture of buildings developed in a setting to replicate an urban environment. The ammunition expenditure includes small caliber blank rounds up to .50 caliber. The .50 cal SRTA round is not authorized. A MOUT facility may also use small explosive charges to breach doors/windows/walls.

Urban Assault Course (UAC)

The UAC is a live-fire facility consisting of five training stations which are designed for individual tasks and small-unit collective task training. See Table 4-11 for a description of UAC activity.

Table 4-3. Predicted Peak Levels For 5. 56mm Ball Round

Distance (meters)	Predicted Level, dBP Activity Outside of the Shoot House Azimuth				Predicted Level, dBP Activity Inside the Shoot House* Azimuth		
	0°	90°	180°		0°	90°	180°
100	118-128	111-121	100-105		93-103	86-96	75-80
200	111-121	104-114	99-104		86-96	79-89	74-79
400	98-108	91-101	83-93		73-83	66-76	58-68
800	90-100	82-92	74-84		65-75	57-67	49-59

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon.
*NLR of shoot house estimated at 25 dB.

Table 4-4. Predicted Peak Levels for 12 Gauge Shotgun

Distance (meters)	Predicted Level, dBP Activity Outside of the Shoot House Azimuth				Predicted Level, dBP Activity Inside the Shoot House* Azimuth		
	0°	90°	180°		0°	90°	180°
100	117-127	105-115	106-116		92-102	80-90	81-91
200	110-120	98-108	100-110		85-95	73-93	75-85
400	99-109	88-98	90-100		74-84	63-73	65-75
800	90-100	79-89	82-92		65-75	54-64	57-67

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon.
*NLR of shoot house estimated at 25 dB

Table 4-5. Predicted Peak Levels for .50 cal SRTA Round

Distance (meters)	Predicted Level, dBP Activity Outside of the Shoot House Azimuth		
	0°	90°	180°
100	109-119	106-116	101-111
200	103-113	100-110	94-104
400	92-102	89-99	85-95
800	84-94	81-91	77-87

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon.

Table 4-6. Predicted Peak for 7.62mm Live Round

	Predicted Level, dBP Azimuth		
Distance, meters	**0°**	**90°**	**180°**
100	109-119	106-116	101-111
200	103-113	100-110	94-104
400	92-102	89-99	85-95
800	84-94	81-91	77-87

Target at 100 meters

Table 4-7. Predicted Peak for .50cal Live Round

	Predicted Level, dBP Azimuth		
Distance, meters	**0°**	**90°**	**180°**
100	132-142	120-130	115-125
200	119-129	113-123	108-118
400	108-118	102-112	94-104
800	100-110	93-103	86-96

Target at 100 meters

Table 4-8. Predicted Peak Levels for 5.56mm Blank Round

	Predicted Level, dBP Azimuth		
Distance, meters	**0°**	**90°**	**180°**
50	94-104	92-102	92-102
100	87-97	86-96	87-97
200	80-90	79-89	80-90
400	69-79	68-78	69-79

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon.
Blank is defined as any round that contains propellant but no bullet.

Table 4-9. Predicted Peak for 7.62mm Blank Round

	Predicted Level, dBP Azimuth		
Distance, meters	**0°**	**90°**	**180°**
50	116-126	113-123	106-116
100	109-119	106-116	101-111
200	103-113	100-110	94-104
400	92-102	89-99	85-95
800	84-94	81-91	77-87

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon
Blank is defined as any round that contains propellant but no bullet.

Table 4-10. Predicted Peak for .50 Caliber Blank Round

	Predicted Level, dBP Azimuth		
Distance, meters	**0°**	**90°**	**180°**
100	116-126	110-120	111-121
200	109-119	103-113	104-114
400	97-107	92-102	91-101
800	89-99	84-94	84-94
1600	81-91	75-85	75-85

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon. Blank is defined as any round that contains propellant but no bullet.

Table 4-11. UAC Station Description and Activity

STATION	AMMUNITION	NOISE OUTPUT RESULTS
1 – Shoothouse (Individual and Team)	5.56mm blank	Peak Noise Levels Table
	Practice grenades	Not included (no noise)
2 – Shoothouse (Squad and Platoon)	5.56mm blank	Peak Noise Levels Table
	Practice grenades	Not included (no noise)
3 – Grenadier Gunnery	5.56mm ball/plastic	Included in Small Caliber Noise Contours
	40mm target practice	Grenade Buffer (See Section 4.6.2)
4 – Shoothouse (Urban Offense/Defense)	5.56mm blank	Peak Noise Levels Table
	7.62mm blank	
	Practice/Stun/Smoke Grenade	Not included (no noise)
5 – Underground	5.56mm blank	Not included (no noise)

Additional non-live fire activity could include simunitions (marking rounds). These rounds have reduced noise levels; generally the noise level of simunitions at 1 meter (3 feet) is 135 dB Peak. Based on a 6 dB reduction for doubling of distance, Zone II levels would be exceeded out to approximately 250 meters. These distances for the simunitions are conservative as the initial noise level measurements were taken near field. At far field distances, the noise level decay is greater than 6 dB per distance doubled. Preliminary measurements indicate the Zone II levels would be exceeded out approximately 75 meters.

The non-fixed ranges and non-live fire facilities are located within the Noise Zones for the existing small caliber ranges.

4.6.2 GRENADE LAUNCHER NOISE

Range 4-2 and the proposed Station 3 activity at the UAC is approximately 360 meters from the boundary. The Multi-purpose Machine Gun (MPMG) Range is approximately 1,300 meters from the boundary. Each facility's activity could include the firing of 40mm Target Practice (TP) rounds. Although the 40mm would be classified as a large caliber round for noise assessment, it was included in this section for ease of disclosure in relating the launch noise of the 40mm on the ranges where it is utilized.

Table 4-12 and Table 4-13 contain the complaint risk criterion for the launch noise of the 40mm grenade launchers. The distances and levels listed represent a conservative approach and were calculated based upon hearing conservation criteria (U.S. Army 1999) and a known measurement (U.S. Army 1984). This data represents the best available scientific quantification for assessing the complaint risk for the launch noise of the 40mm grenade launcher.

Table 4-12. Complaint Risk to the Side of the 40mm Grenade Launcher, Inert Round

Risk of Complaints	**Distance from Grenade Launcher**	**Noise Level dBP**
Low	> 300 meters^	< 115 dB
Moderate	65 - 300 meters^	115 dB
High	< 65 meters^	>130 dB
Risk of hearing damage for unprotected ears	< 19 meters+	>140 dB

* *-- Inert is defined as any round that does not make noise upon impact, such as smoke, illum, TP*
^ *– Calculated value*
\+ *– Known value, hearing conservation criteria.*

Table 4-13. Complaint Risk to the Rear of the 40mm Grenade Launcher, Inert Round

Risk of Complaints	**Distance from Grenade Launcher**	**Noise Level dBP**
Low	> 110 meters^	< 115 dB
Moderate	25 - 110 meters^	115 dB
High	< 25 meters^	>130 dB
Risk of hearing damage for unprotected ears	< 7 meters+	>140 dB

* *-- Inert is defined as any round that does not make noise upon impact, such as smoke, illum, TP*
^ *– Calculated value*
\+ *– Known value, hearing conservation criteria.*

Based on the location of the ranges and the levels in Table 4-12 and Table 4-13, the risk of complaints from the 40mm grenade launcher would be low.

4.6.3 LARGE CALIBER AND DEMOLITION NOISE

The computer simulation program used to assess demolition and large caliber weapons (20mm and greater) noise is the Blast Noise Impact Assessment (BNOISE2) program (U.S. Army 2009). The BNOISE2 program requires operational data concerning the types of weapons fired from each range or firing point (including demolitions), the number and types of ammunition fired from each weapon, the location of targets for each range or firing point, and the amount of propellant used to reach the target. The BNOISE2 program accounted for the terrain at CEATS.

Not all of the CEATS firing points and ranges are used over the course of year. Which ranges are utilized varies from year to year depending upon training mission requirements, such as the type

of training to be completed; the unit being trained; and deployment status. Due to deployments during the past few years, a single annual ammunition expenditure would not be considered representative of the normal/routine or baseline operating tempo. Therefore, an amalgamation of the typical unit activity occurring was created using Fiscal Years (FY) 2009 - 2011. This three year period provides the routine training, pre-deployment training, the recertification training, and return to routine training activity.

The demolition and large caliber (20mm and greater) noise contours were developed based on the ammunition utilization chart located in Appendix B.

4.6.3.1 LAND USE COMPATIBILITY

Typical assessment periods used in the C-weighted Day-Night average sound Level (CDNL) contours are 104 days for ARNG facilities and 250 days for active facilities. CEATS activity fits both criteria. The ARNG training occurs approximately 104 days per year and the General Dynamics Range is used approximately 250 days per year. Therefore, two sets of contours were generated for CEATS.

<u>All CEATS Activity</u>

Figure 4-5 contains the cumulative land use compatibility contours for CEATS. These contours are based on a 250 day average of the General Dynamics and VTARNG activity. Based on annual average noise levels, the noise environment attributable to large caliber and demolition activity is compatible with the surrounding land uses. Only very small portion of LUPZ extends beyond the western boundary into a wooded area. On-post, Zone II encompasses the cantonment area including the transient barracks complex.

<u>VTARNG Activity</u>

Figure 4-6 contains the Noise Zones for the VTARNG activity over 104 days. The annual average noise levels environment attributable to VTARNG large caliber and demolition activity are contained within the CEATS property indicating compatibility with the surrounding land uses.

Although the Noise Zones indicate compatibility between CEATS activity noise and the surrounding land uses, individual events have the potential to generate noise complaints.

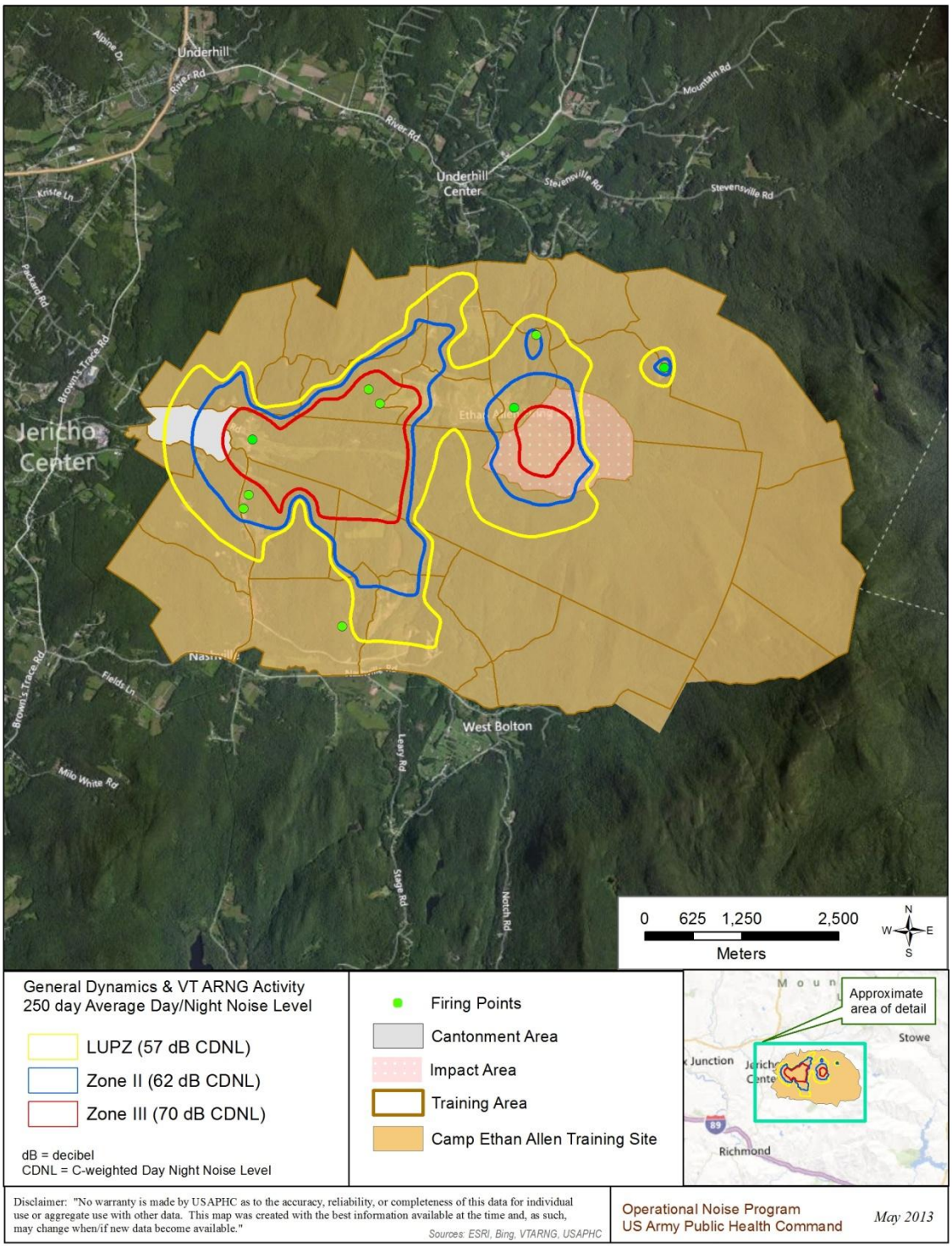

Figure 4-5. General Dynamics and VTARNG Demolition and Large Caliber Noise Zones

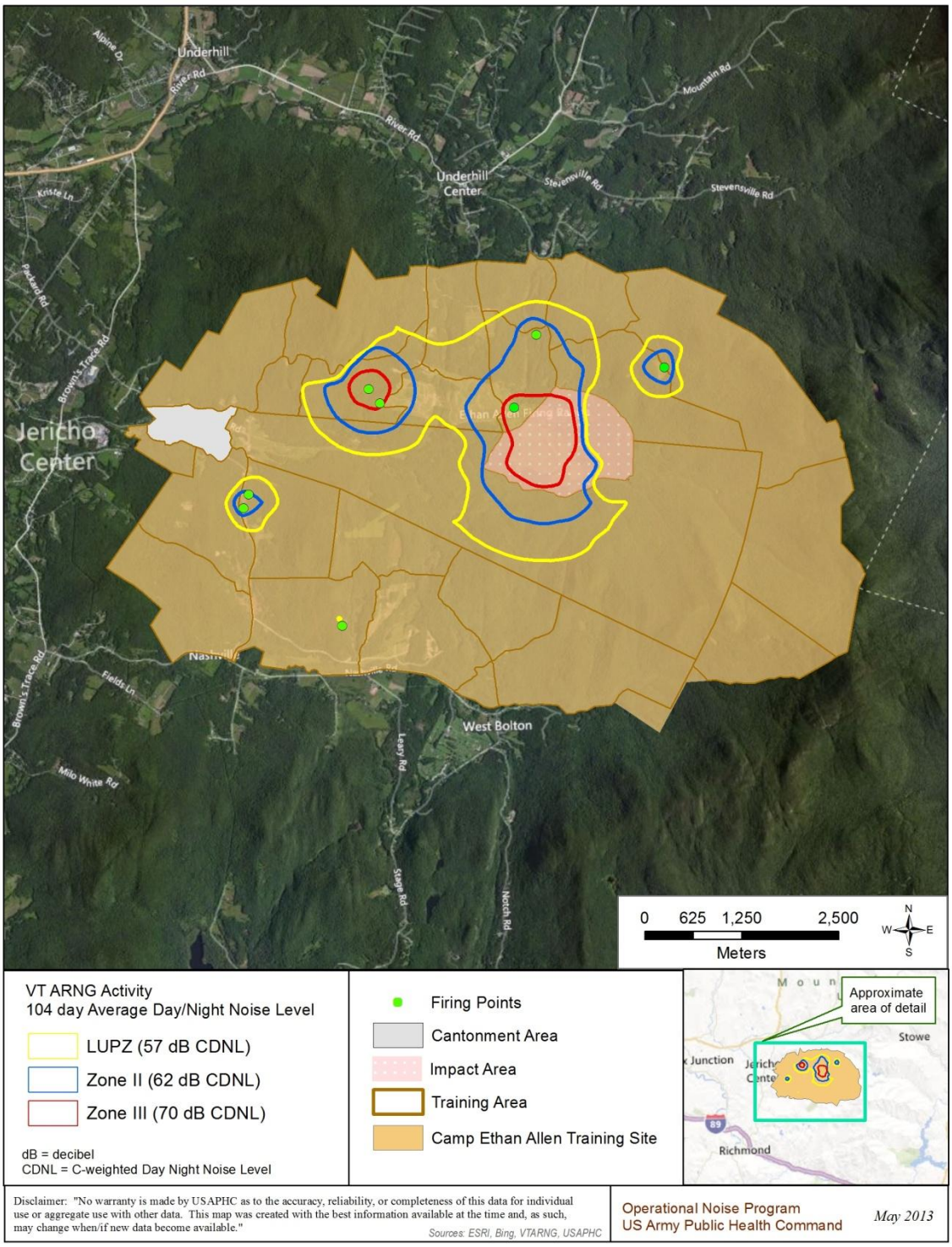

Figure 4-6. VTARNG Demolition and Large Caliber Noise Zones

4.6.3.2 COMPLAINT RISK AREA

For long-term planning, annual average noise levels are the primary metric considered. However, noise complaints typically are attributable to a specific event rather than annual average noise levels. Peak levels are appropriate for estimating the risk of receiving a noise complaint as they correlate with the receiver's perception of noise levels (Table 4-14).

Table 4-14. Complaint Risk Guidelines

Perceptibility	dB Peak	Risk of Receiving Noise Complaints
Audible	< 115	Low
Noticeable, Distinct	115 - 130	Moderate
Very Loud, May Startle	> 130	High

Peak levels can vary significantly for the same activity dependant on weather conditions. Therefore, two sets of contours were plotted for the CEATS noise environment.

- Unfavorable Weather Conditions: The PK15(met) is the peak sound level, factoring in the statistical variations caused by weather, that is likely to be exceeded only 15 percent of the time (i.e., 85 percent certainty that sound will be within this range). This "85 percent solution" gives the installation and the community a means to consider the areas that at times may be impacted by training noise. The PK15(met) levels would occur under unfavorable weather conditions that enhance sound propagation.

- Neutral Weather Conditions: The PK50(met) is the Peak level that would be expected 50 percent of the time. These levels would be seen during neutral weather conditions. It should be noted that if activities take place under favorable weather conditions, such as the wind blowing away from the receiver, noise levels would be lower.

The unfavorable weather conditions [PK15(met)] complaint risk area is a good tool to use to indicate areas that may at times be exposed to high noise levels from individual events. When land use planning programs such as real estate disclosure, a Joint Land Use Study or the Army Compatible Use Buffer are implemented, the unfavorable weather conditions [PK15(met)] complaint risk areas can be used to delineate areas of focus. However, since the complaint risk areas are based on individual event levels and are not dependant on the number of events, planners should also consider frequency of operations when making land use decisions.

General Dynamics Complaint Risk Area

Figure 4-7 depicts the complaint risk from the General Dynamics Range under unfavorable weather [PK15(met)] conditions. Under unfavorable weather conditions, levels correlated with moderate complaint risk extend beyond the western boundary; this area is primarily undeveloped. The high complaint risk area does not extend beyond CEATS.

Due to the small size of the complaint risk areas under unfavorable weather conditions, it was not necessary to generate complaint risk areas under neutral weather conditions.

The complaint risk guidelines indicate a low probability of receiving noise complaints from the General Dynamics large caliber activity.

VT ARNG Complaint Risk Area

Figure 4-8 depicts the complaint risk from the artillery and mortar firing.

- Under unfavorable weather conditions [PK15(met)] the moderate complaint risk area encompasses the Towns of Underhill Center to the north and to the south the Village of West Bolton. The high complaint risk area does not extend beyond the CEATS boundary. The moderate complaint risk levels extend less than 500 meters (0.3 miles) beyond the western boundary, this area is primarily undeveloped.

- Under neutral weather conditions [PK50(met)], there is a moderate risk of generating noise complaints along the northern boundary. The high complaint risk areas remain limited to the area surrounding the firing points and ranges.

Figure 4-9 depicts the complaint risk from the demolition activity.

- Under unfavorable weather conditions [PK15(met)] the moderate complaint risk area encompasses the Town of Underhill Center to the north and to west portions of Jericho Center. The high complaint risk levels extend less than 300 meters (0.19 miles) beyond the northern boundary; within this area are several residential properties. The off-post high complaint risk area to the north is driven by demolition activity at FP60 which occurred twice in the past 3 years.

- Under neutral weather conditions [PK50(met)], there is a moderate risk of generating noise complaints along the northern boundary. The high complaint risk areas remain localized to the demolition sites.

Overall, the complaint risk guidelines indicate a moderate probability of receiving noise complaints from the VT ARNG activity.

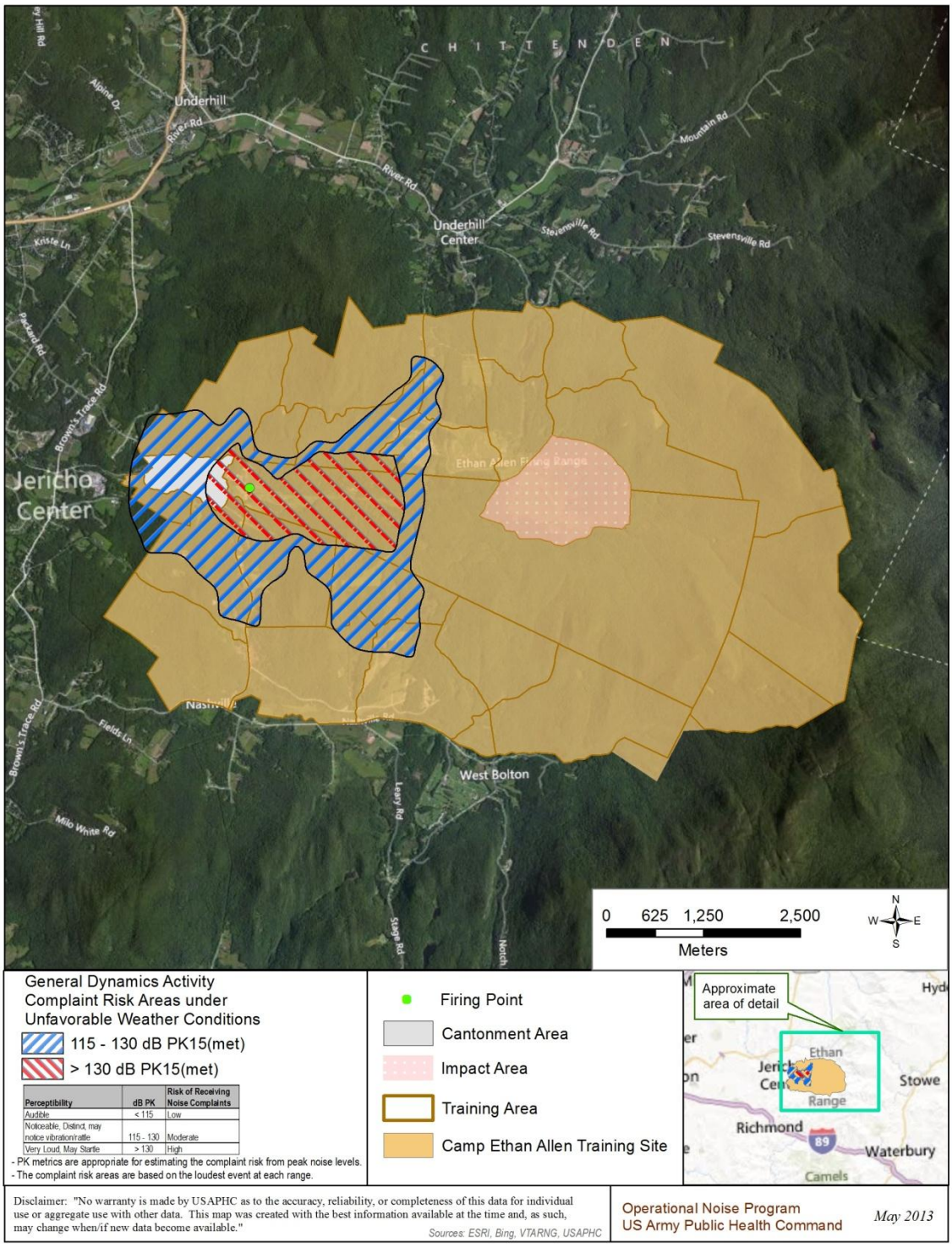

Figure 4-7. General Dynamics Complaint Risk Areas under Unfavorable Weather Conditions

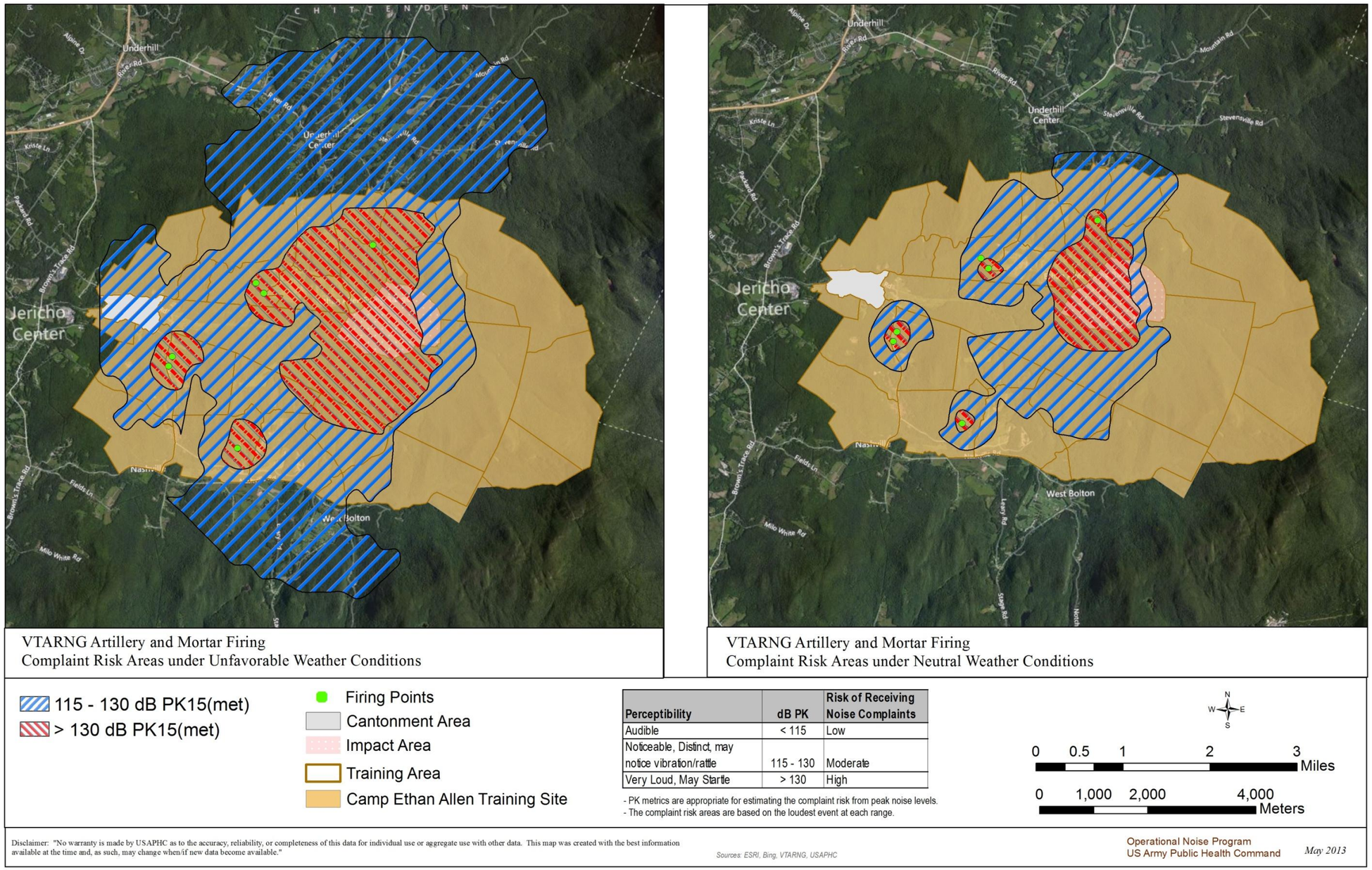

Figure 4-8. VTARNG Artillery and Mortar Firing Complaint Risk Areas

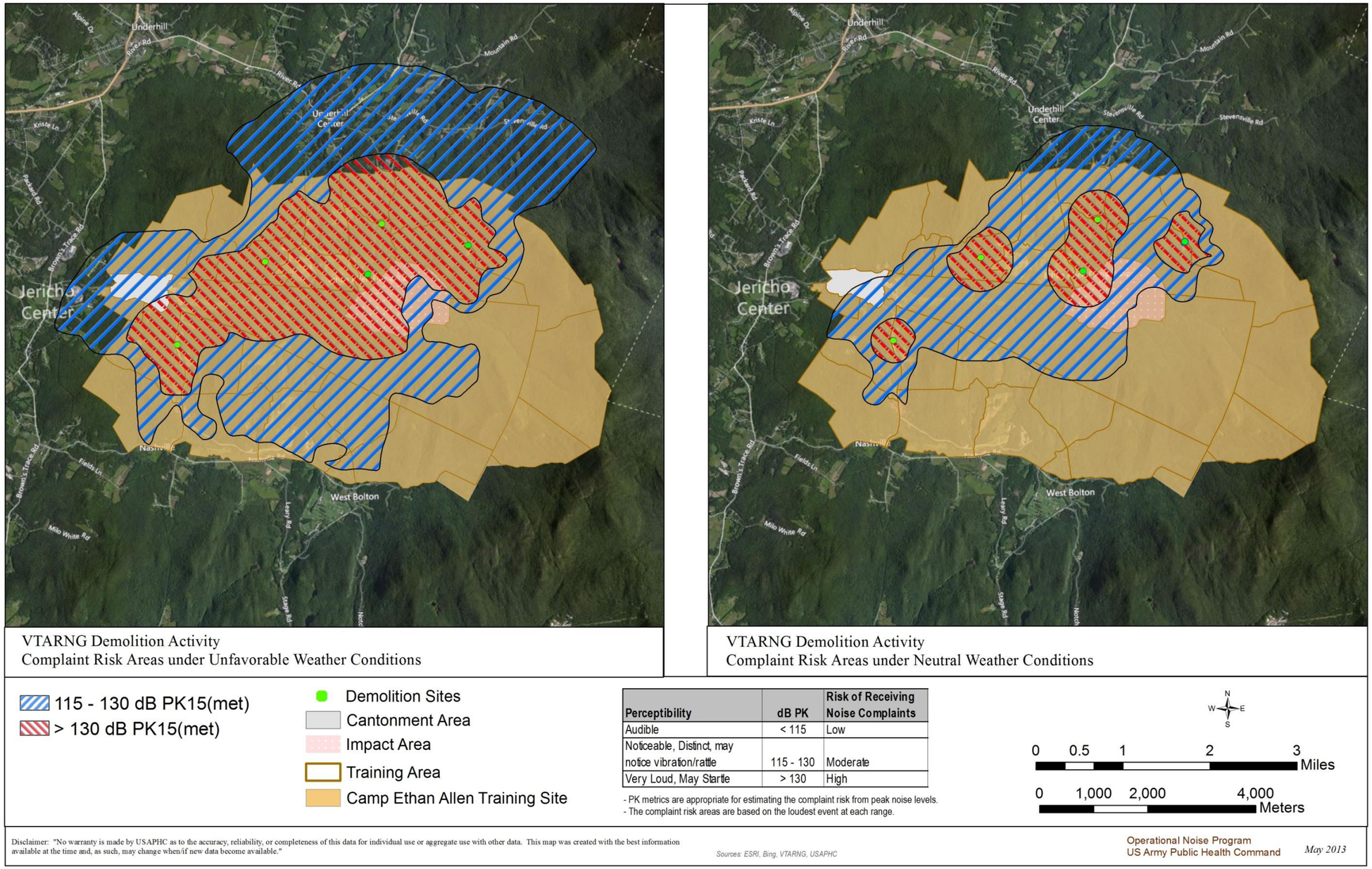

Figure 4-9. VTARNG Demolition Activity Complaint Risk Areas

Pyrotechnic/Simulators Complaint Risk

Pyrotechnic simulators that produce little to no noise (i.e. flash bang, illum, smoke) were not included in the land use noise analysis.

Simulator noise levels will vary depending on the type (i.e., artillery, ground burst, and grenade) but typically the variation will be limited to a few decibels. Table 4-15 gives an approximation of noise levels that would be anticipated under average weather conditions and under weather conditions that favor sound propagation. The levels were generated using the BNOISE2 computer program, and then verified by comparing the levels with results from various noise monitoring studies (U.S. Army 1983, U.S. Army 1984, U.S. Army 1989).

Based on the levels below, it can be inferred that under neutral weather conditions, the risk of complaints will be low beyond 500 meters. Under unfavorable weather conditions, such as during a temperature inversion, or when there is a strong wind blowing in the direction of the receiver, the distance increases to approximately 800 meters.

These complaint distances may be applied wherever simulator activity occurs.

Table 4-15. Predicted Peak Noise Levels for Typical Army Simulators

Distance from source (meters)	Neutral Weather Conditions (PK50(met))	Unfavorable Weather Conditions (PK15(met))
100	134	136
200	125	130
300	120	127
400	117	123
500	114	121
600	111	118
700	109	116
800	107	114

4.6.4 AVIATION ACTIVITY

Currently, no aircraft are assigned to CEATS. The VTARNG helicopters are stationed at the Vermont Flight Facility at Burlington International Airport (approximately 9 miles west of CEATS). Within CEATS there are nine landing zones and are seven designated Standard use Army Aircraft Flight Routes (SAAFR) (Figure 4-10).

The rotary-wing aircraft operations which take place at CEATS include: 1) Post Headquarters' business, 2) external load training, 3) rappel operations, and 4) occasionally medical transports. Rotary-wing training flight tracks (i.e. rappel, sling load) associated with CEATS are not predetermined but are based on indirect firing operations and other air traffic within the surrounding areas. Administrative flights follow the SAAFRs.

Each flight (often referred to as a sortie) consists of a takeoff, a landing, and at least one interim training event. At CEATS, 74 sorties were conducted during FY11 and 60 sorties during FY12. The majority of those sorties were associated with the HH-60.

At the time of publication, there were no proposed aviation projects for CEATS.

4.6.4.1 NOISE ABATEMENT PROCEDURES

There are no specifically designated aviation noise-sensitive areas near CEATS; however, the following procedure and policy will be utilized where practical to reduce noise complaints:[5]

- Maintain a minimum altitude of 1,500' Mean Sea Level (MSL) when arriving or departing CEATS. Elevation surrounding CEATS varies from 700-1000' MSL.
- Avoid overflight or close proximity flying to built-up areas or large groups of personnel.
- Avoid passing over or near civilian structures or livestock below 500' AGL.
- Do not operate within 500 meters (1,640 feet) of the CEATS boundary.

4.6.4.2 OVERFLIGHT ANNOYANCE

Although the CEATS aviation activity will not generate a Zone II [65 dB A-weighted average Day-Night Level (ADNL)], there is still the potential that individual aircraft overflights could annoy people and possibly generate complaints. Annoyance potential from overflights is discussed in detail in Section 5.5. Annoyance potential is based on research at locations with 50 to 200 overflights per day. Although CEATS has less activity, it can be a tool in providing some indication of annoyance level.

Up to 20% percent of the population would consider itself highly annoyed from a direct overflight of a HH-60 at 500 feet AGL; if the receiver is 1/4 of a mile to the side, 4% of the population would consider itself highly annoyed.

To date there have no complaints associated with overflights to/from CEATS.

[5] VTARNG Pam 385-63 dated 1 June 2011

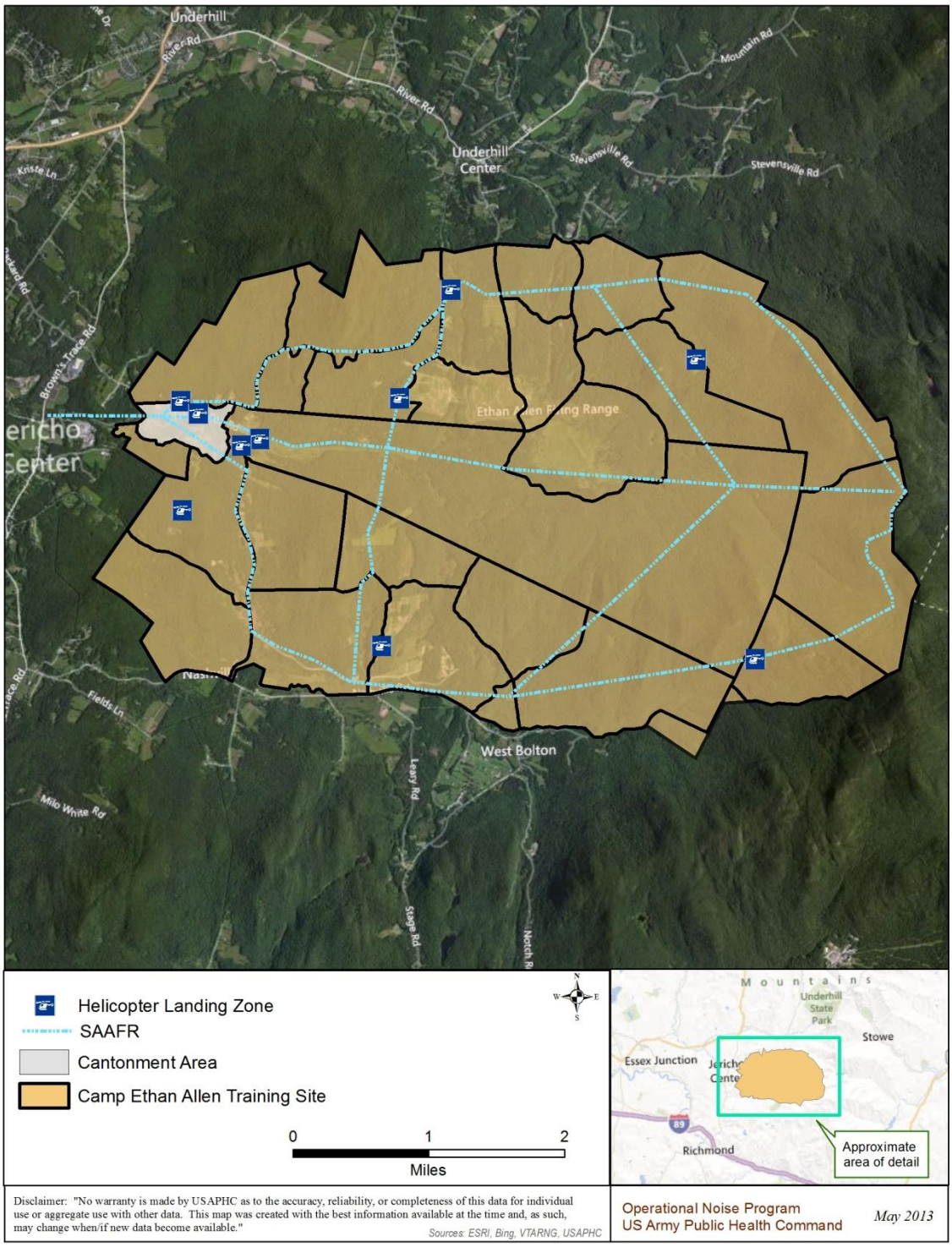

Figure 4-10. CEATS Helicopter Landing Zones and SAAFRs

4.7 FUTURE NOISE ENVIRONMENT

CEATS proposes increasing the allowed ammunition size on the High Angle Range (HAR) and the construction of an Urban Assault Course (UAC) over existing range footprints.

4.7.1 HAR CONSIDERATIONS

Currently the maximum ammunition size on the HAR is 7.62mm. This analysis will address the utilization of the .300 Win Mag and the .50 caliber ammunition.

HAR .300 Win Mag. Figure 4-11 depicts the cumulative Noise Zones for the existing VTARNG activity and the addition of the .300 Win Mag at the HAR. The addition of the .300 Win Mag would not change Zone II. Zone III would enlarge slightly behind the HAR firing line.

HAR .50 caliber Option. Figure 4-12 depicts the cumulative Noise Zones for existing VTARNG activity and the addition of the .50 caliber at the HAR. The addition of the .50 caliber would increase the southern Zone II area off-post to 1,900 meters and encompass a wooded area to the north. Zone III would expand near the HAR.

4.7.2 PROPOSED UAC

As mentioned previously, the UAC is a live-fire facility consisting of five training stations designed for individual tasks and small-unit collective task training (Table 4-11). The proposed UAC Stations 1, 2, and 4 would be constructed over the existing Firing Point 4 area located approximately 800 meters from the boundary. The proposed UAC Station 3 would be constructed over the existing Range 4-2 located approximately 360 meters from the boundary (Figure 4-13).

UAC Stations 1, 2, and 4. The noise from small caliber blank firing would not increase the size of the existing small caliber Noise Zones. Section 4.6.1.2 address the peak noise levels associated with these facilities.

UAC Station 3 Small Caliber Activity. At Station 3, firing includes the 5.56mm ball/plastic rounds at fixed-firing points. Figure 4-14 depicts the cumulative Noise Zones for the existing VTARNG activity and the 5.56mm ball/plastic Station 3 activity. The addition of the proposed Station 3 5.56mm activity would not change Zone II. Zone III would enlarge minimally behind the targets.

UAC Station 3 Grenade Launcher. The noise from the proposed Station 3 40mm Training Practice grenade activity is comparable to the existing activity on Range 4-2. The Station 3 activity would also include the 40mm TP rounds with a different firing and target layout than the existing Range 4-2 layout.

Based on the location and the levels in the Tables 4-12 and 4-13, the risk of complaints from the launch noise would be low. Section 4.6.2 addresses the peak noise levels associated with the 40mm TP rounds.

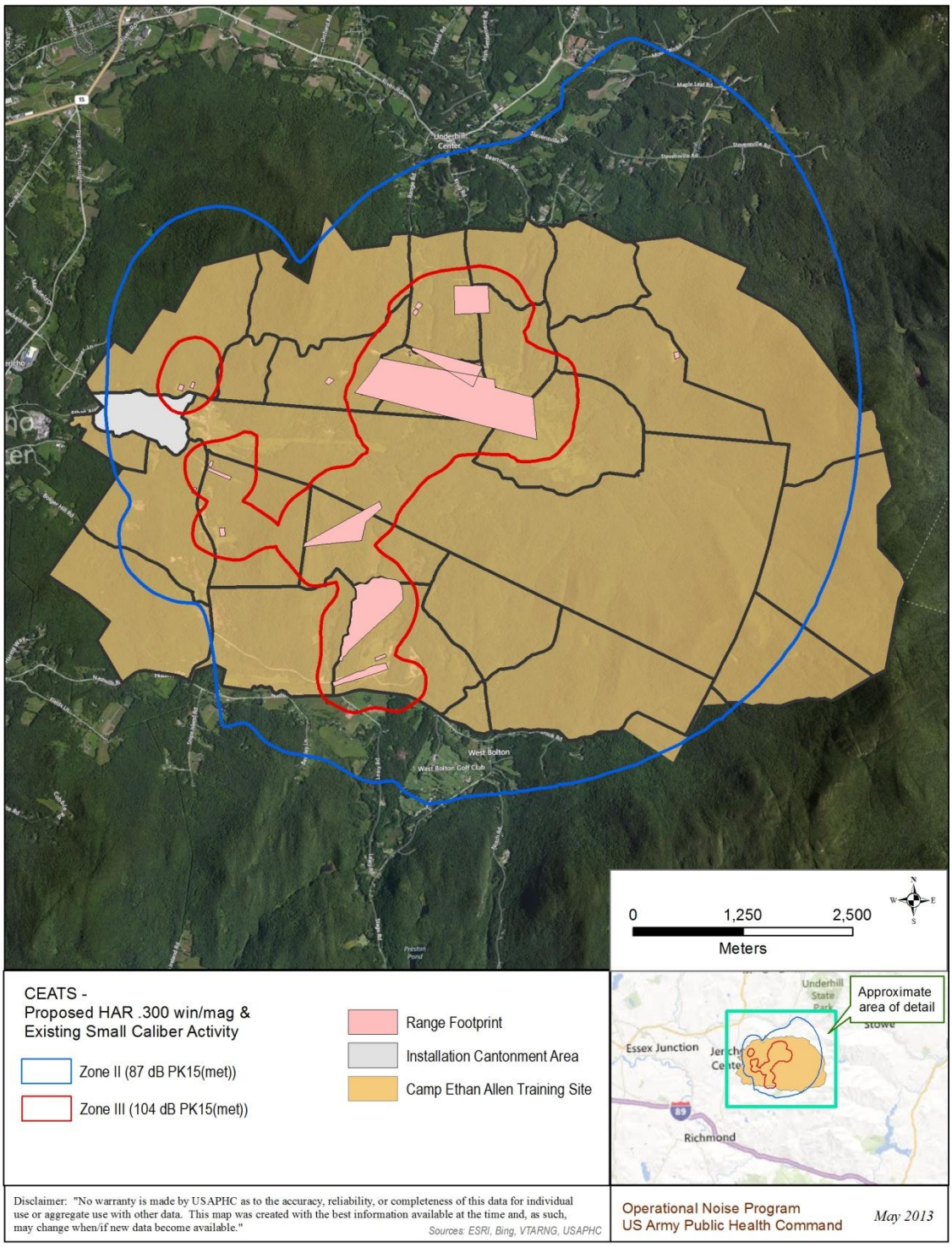

Figure 4-11. Proposed HAR .300 Win Mag and Existing VTARNG Small Caliber Noise Zones

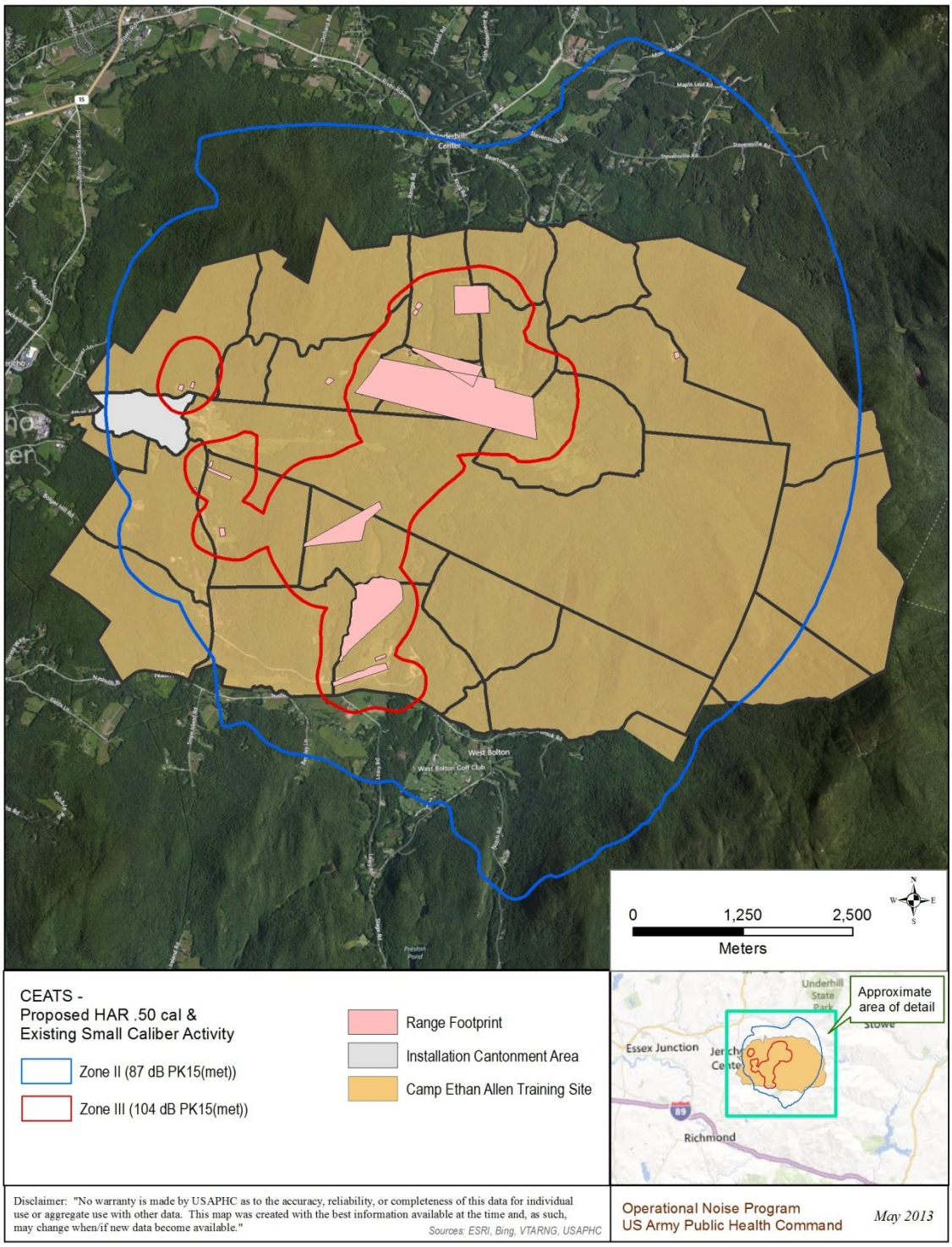

Figure 4-12. Proposed HAR .50 caliber and Existing VTARNG Small Caliber Noise Zones

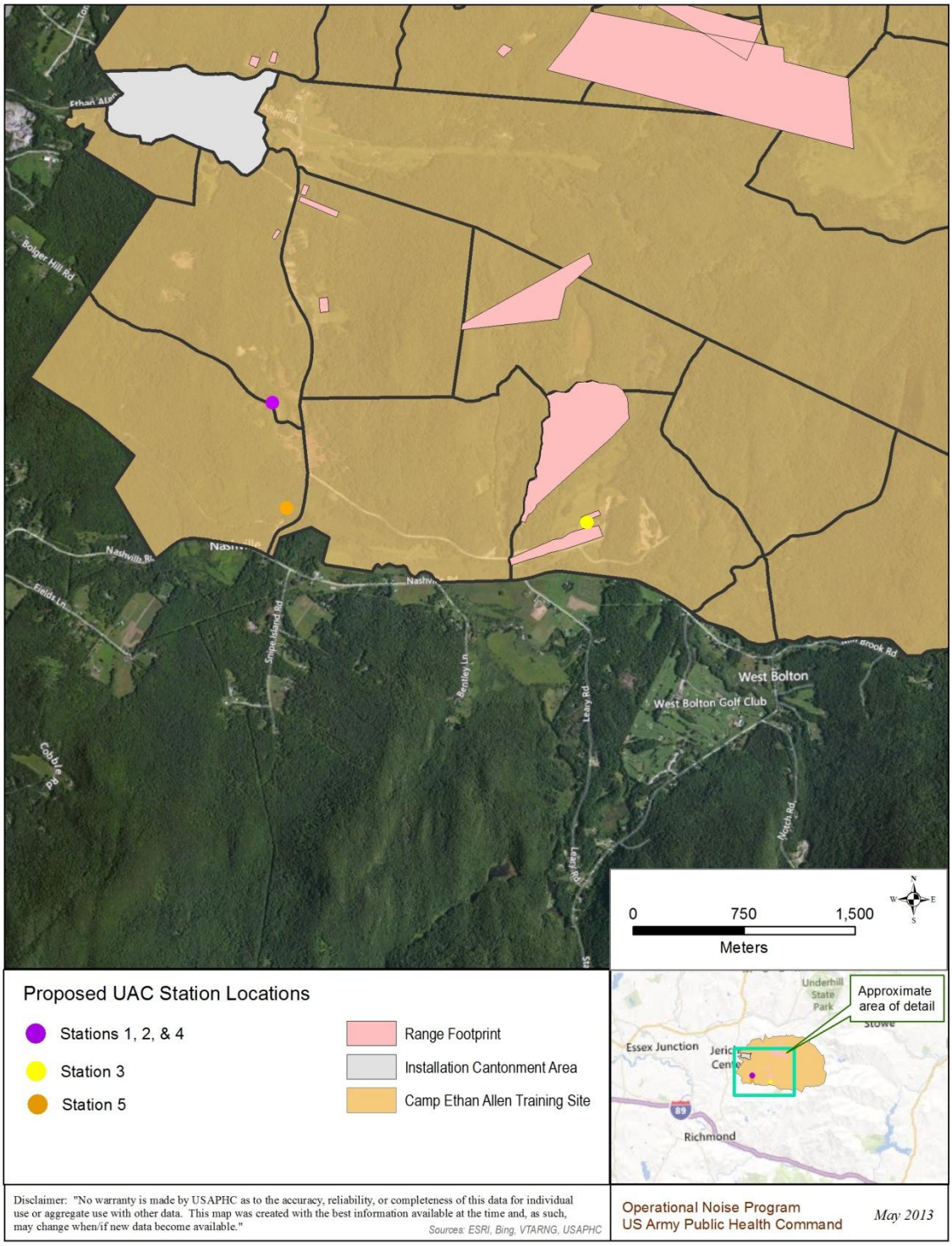

Figure 4-13. Proposed UAC Locations

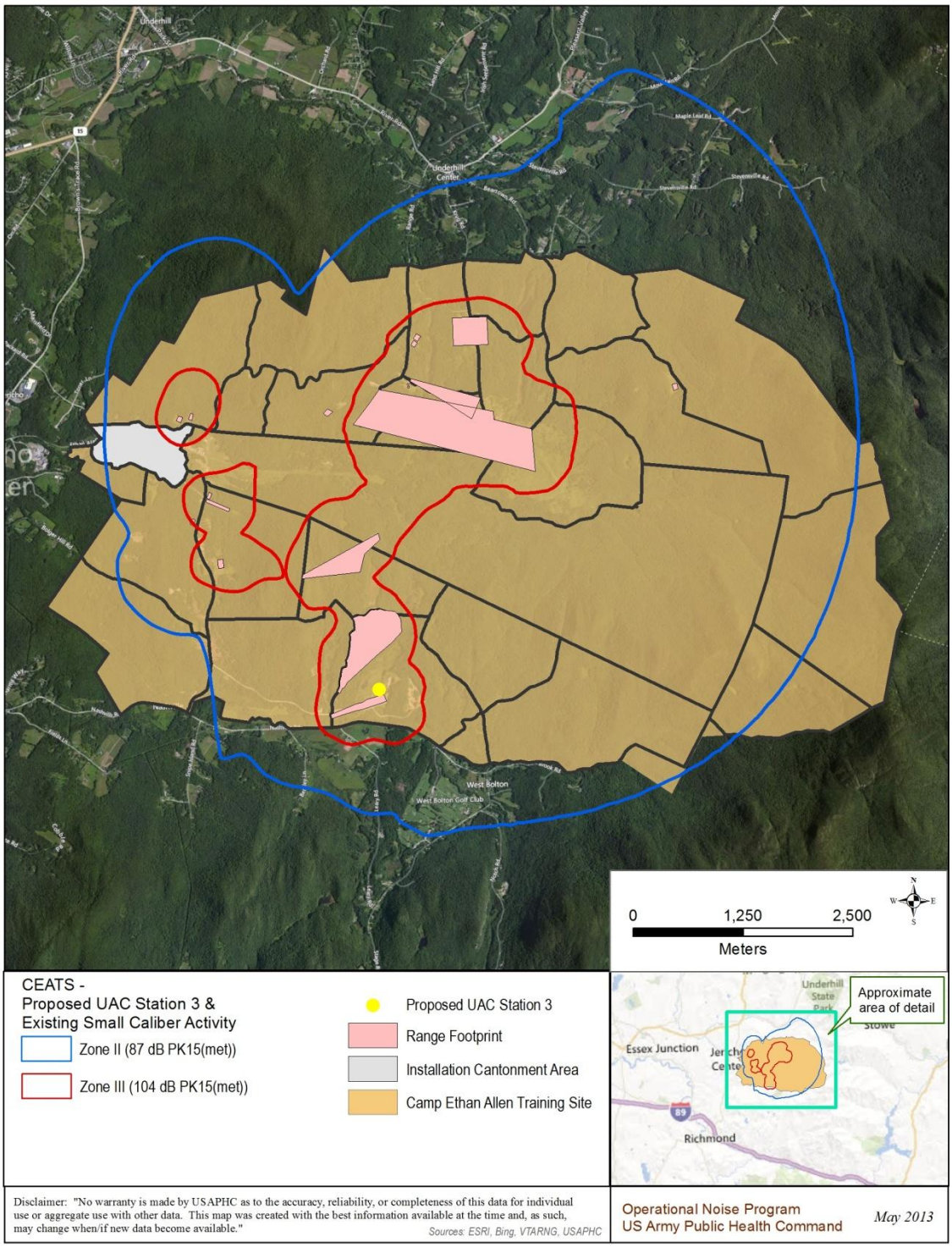

Figure 4-14. Proposed UAC Station 3 and Existing VTARNG Small Caliber Noise Zones

4.8 DISCUSSION

Guidelines in AR 200-1 state that for land use planning purposes, noise-sensitive land uses are acceptable within the Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III. The value of AR 200-1 guidelines is earned when they are applied to future planning initiatives both on and off of the installation.

AR 200-1 lists housing, schools, and medical facilities as examples of noise-sensitive land uses. Noise-sensitive receptors in the vicinity of CEATS include the Towns off Underhill Center to the north, West Bolton to the South and Jericho Center to the West. There are two schools located within one mile of CEATS.

SMALL CALIBER WEAPONS

Existing Activity

For both the cumulative CEATS activity and the VTARNG activity, Zone II extends beyond the northern boundary up to 2,200 meters (1.24 miles) and beyond the southern boundary up to 1,000 meters (0.6 miles). Zone III extends beyond the southern boundary up to 250 meters (0.15 miles) and into a wooded portion of the cantonment area. On-post, Zone II encompasses the cantonment area including the transient barracks complex. Off-post, Zone II encompasses residential land use in the Towns of Underhill Center and West Bolton.

Projected Activity

The proposed activity would not cause significant changes to the Noise Zones.

HAR .300 Win Mag. The addition of the .300 Win Mag would not change Zone II. However, Zone III would enlarge slightly behind the HAR firing line.

HAR .50 caliber. The addition of the .50 caliber at the HAR would enlarge the southern Zone II area off-post from 1,000 to 1,900 meters and encompass a wooded area to the north. Zone III would expand in size near the range itself.

UAC Activity. Zone II levels from Station 1, 2, and 4 small caliber blank activities would be contained within the existing small caliber Noise Zones. The addition of the proposed Station 3 5.56mm activity would not change Zone II. Zone III would enlarge minimally behind the targets. The noise from the proposed Station 3 40mm TP grenade activity is comparable to the existing activity on Range 4-2.

LARGE CALIBER WEAPONS AND EXPLOSIONS

Land Use Compatibility

All CEATS Activity Land Use Compatibility: Based on annual average noise levels, the noise environment attributable to large caliber weapons firing and demolition activity at CEATS is compatible with the surrounding land use. Only very small portion of the LUPZ extend beyond the western boundary. Although the Noise Zones indicate compatibility between CEATS activity and the surrounding land uses, individual events have the potential to generate noise complaints.

VTARNG Activity Land Use Compatibility: The Noise Zones attributable to VTARNG large caliber weapons firing and demolition activity are contained within the CEATS property.

Complaint Risk

General Dynamics Complaint Risk Area: Under unfavorable weather conditions, the complaint risk guidelines indicate a low probability of receiving noise complaints. Along the western boundary there is a small area in which the guidelines indicate a moderate complaint risk. However, this area is primarily undeveloped.

VTARNG Activity Complaint Risk Area: According to the complaint risk guidelines, depending upon the weather conditions, there is a low to moderate risk of complaints from the baseline large caliber weapons and explosives training. Noise from individual large caliber and demolition activity may at times be noticeable, or even deemed loud by those in the community.

Artillery and Mortar Firing

Under unfavorable weather conditions, the complaint risk guidelines indicate a moderate probability of receiving noise complaints from the Towns of Underhill Center and West Bolton.

Under neutral weather conditions, the complaint risk guidelines indicate a low probability of receiving noise complaints. Along the northern boundary there is a small area in which the guidelines indicate a moderate complaint risk.

Demolition Activity

Under unfavorable weather conditions, the complaint risk guidelines indicate a moderate probability of receiving noise complaints. Along the northern boundary near Beantown Road, there is a small area in which the guidelines indicate a high complaint risk.

Under neutral weather conditions, the complaint risk guidelines indicate a low probability of receiving noise complaints. Along the northern boundary there is a small area south of Stevensville Road in which the guidelines indicate a moderate complaint risk.

Helicopter Overflights:

Although the CEATS aviation activity would not generate a Zone II (65 dB ADNL), there is still the potential that individual aircraft overflights could annoy people and possibly generate complaints. However, to date, the VTARNG has no history of noise complaints related to aviation at CEATS.

4.9 SUMMARY

This chapter provided a discussion of CEATS's noise generating activities and identified areas where noise-sensitive land uses would not be recommended based on the noise environment.

5 VERMONT ARMY NATIONAL GUARD AVIATION SUPPORT FACILITY

5.1 GENERAL

One of the primary functions of the Army Aviation Support Facility (AASF) is to maintain the flight proficiency of its assigned personnel through training. Most supported ARNG pilots must fly between 86 to 110 hours each year. In addition to training activities, the AASF also provides aviation support as required by The Adjutant General (TAG) and as required by the Governor to support State emergency management operations. This support includes hoist operations (i.e., airlifting equipment and troops) and fire bucket operations (using aircraft to pick up water in buckets to deal with forest fires). Additionally, in wartime, the AASF units will be available to provide aviation support to airlift and combat operations, as required to accomplish the Federal military mission.

The other major activities performed by the AASF are the refueling, maintenance, and repair of the unit's aircraft and ground vehicles. Refueling operations are conducted on-site by AASF personnel. The majority of aircraft maintenance and repair is performed at the unit level (on-site), but some is performed at the intermediate and depot levels (at other installations). AASF wheeled vehicles are maintained at the Field Maintenance Shop level (on-site) with no major overhauling.

5.2 AASF – BURLINGTON INTERNATIONAL AIRPORT

The VTARNG maintains and operates an Army Aviation Support Facility at the Burlington International Airport (BTV) (Figure 5-1). The BTV airport is a joint-use public and military airport in Chittenden County, Vermont. The airport is located in South Burlington, three miles east of the central business district of Burlington and three miles west of Essex Junction. The area surrounding BTV is developed and varies from commercial/industrial to residential.

In addition to the VTARNG's 1st Battalion 103rd Aviation Regiment and the 86th Medical Company (Air Ambulance) Company C, BTV is utilized by the 158th Fighter Wing Vermont Air National Guard (VTANG).

Company C 3-126th performs Medical Evacuation, which is the timely, efficient movement and en route care by medical personnel of the wounded, injured and ill from the battlefield and other locations to medical treatment facilities. The State mission is to provide aviation mission support such as Medical Evacuation, search and rescue, and Command and Control assets when ordered by the Governor of Vermont.[6]

[6] http://www.vtguard.com/airambulance/index.htm

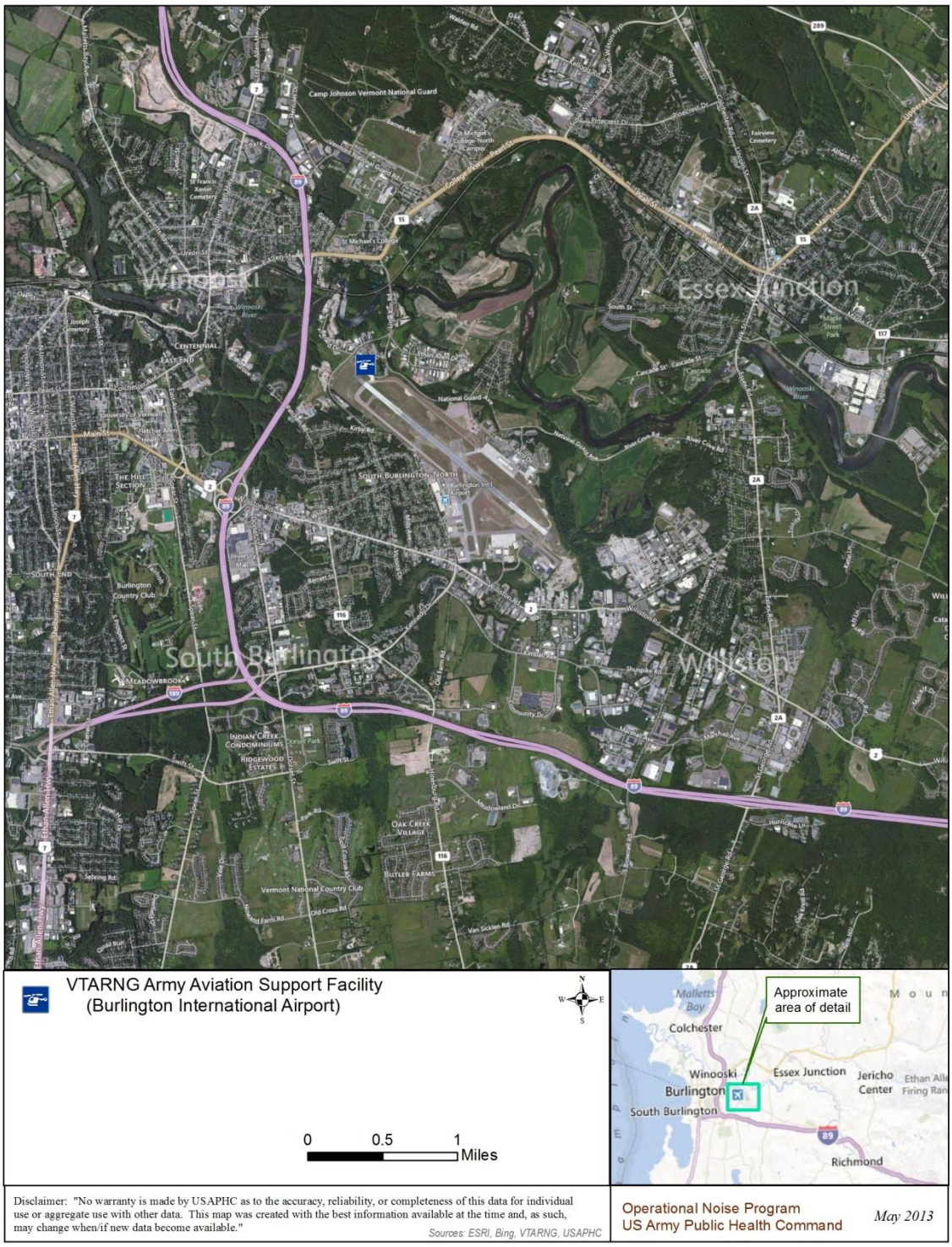

Figure 5-1. VTARNG AASF Location

The VTARNG owns and operates six HH-60 Blackhawk, two OH-58 Kiowa, and two UH-72 Lakota helicopters. Additionally, the VTARNG has one C-12 Huron Fixed-wing Transport Aircraft. Figures 5-2 through 5-5 show examples of the VTARNG aircraft.

Figure 5-2. Example of a HH-60 Black Hawk Helicopter

- The HH-60 Black Hawk is a medium-lift utility or assault helicopter. The Black Hawk series of aircraft can perform a wide array of missions, including the tactical transport of troops, electronic warfare, and aero-medical evacuation.

Figure 5-3. Example of a UH-72 Lakota Helicopter

- The UH-72 Lakota is a twin-engine helicopter with a single, four-bladed main rotor. The UH-72 is a militarized version of the Eurocopter EC145. The UH-72 is intended to be a Light Utility Helicopter (LUH) and is designed to take on a range of missions, from general support and medical evacuation (MEDEVAC) to personnel recovery and counter-narcotics operations. They are planned to replace aging UH-1H and OH-58A/C helicopters in the Army and Army National Guard fleets.

Figure 5-4. Example of a OH-58 Kiowa Warrior Helicopter

- The OH-58 is a scout helicopter that can carry up to four passengers. The OH-58's primary missions are reconnaissance, surveillance, and intelligence gathering.

Figure 5-5. Example of a C-12 Huron

- C-12 variants are used by the United States Air Force, United States Army, and the United States Navy. These aircraft are used for various duties, including embassy support, medical evacuation, passenger and light cargo.

5.3 ACTIVITY

The AASF is a tenant activity at BTV. For the 12-month period ending 31 May 2011, BTV had 70,492 aircraft operations, an average of 193 per day: 6% military (4,360); 27% local general aviation (18,949); 26% transient general aviation (18,949); 25% air taxi (17,725); and 16% commercial (11,362).[7]

The majority of the military operations at BTV are tied to VTANG activity which takes place on an almost daily basis. The VTANG has 18 F-16 Falcons which results in multiple F-16s flying six to seven days each week.

In general, AASF operations occur daily; however, the number and frequency of these operations varies from day-to-day for an approximate total of 90 flights per month. The State Aviation Officer (SAO) estimates that the C-12 is generally flown five to six days each week and the HH-60s are generally flown 4 days with most flights taking place between Tuesday and Friday each week, except during one training weekend per month when the number and frequency of flight activity increases considerably.

After takeoff, approximately 10% of the flights stay local to conduct air traffic patterns. Within the local air traffic pattern, aircraft fly at 1,300 feet Mean Sea Level (approximately 1,000 Above Ground Level (AGL). However, the majority fly of the aircraft will leave the AASF vicinity and go to approved training sites or areas to conduct various types of aviation training. It is estimated that 20% of the flights train at Camp Johnson and 60% use other sites and areas which are located statewide.

At the time of publication, there were no proposed aviation projects for the AASF.

5.4 AASF NOISE MANAGEMENT

There has been very few noise complaints received related to VTARNG AASF activity. During the past five years, the AASF averaged two or three complaints a year from overflight activity. The State Aviation Officer indicated that the VTARNG typically responds to aviation-related noise complaints by instructing pilots to avoid flying over areas that have been the sources of previous complaints. Additionally, to keep the public informed, the flying schedule is published on the VTARNG PAO website: http://www.vtguard.com/publicaffairs/pressreleases.htm

Though the AASF operations are not sufficient enough to generate Noise Zone II levels on their own, the noise contours developed for the 2006 BTV Part 150 Noise Compatibility Update did account for VTARNG operations. Additionally, although the VTARNG activity accounts for a small portion of the flights at BTV, there is the potential that individual helicopter overflights could annoy people near the flight tracks and generate complaints.

[7] http://www.gcr1.com/5010web/REPORTS/BTV.pdf

5.5 AVIATION ANNOYANCE POTENTIAL

Scandinavian Studies (Rylander 1974) have found that a good predictor of annoyance at airfields with 50 to 200 operations per day is the maximum level of the 3 loudest events. The maximum noise levels for the aircraft utilized by the VTARNG are listed in Table 5-1. These maximum levels are compared with the levels listed in Table 5-2 to determine the percent of the population that would consider itself highly annoyed.

Table 5-1. Maximum A-Weighted Sound Levels for Aircraft

Slant Distance (Feet)	Maximum Sound Level by Aircraft Type (dBA)			
	HH-60	OH-58	UH-72	C-12
200	88	87	84	88
500	80	79	75	79
1,000	73	72	69	73
1,500	69	68	65	69
2,000	66	65	62	67

Table 5-2. Percentage of Population Highly Annoyed from Aircraft Noise

Maximum, dBA	Highly Annoyed
90	35%
85	28%
80	20%
75	13%
70	5%

Table 5-3 indicates the percent of population that would consider itself highly annoyed correlated with maximum noise levels for specific aircraft overflights. The correlation is based on the Rylander studies which investigated airfields with 50 to 200 operations per day.

Also based on Rylander's results, Figure 5-6 depicts the percent of population which would be annoyed by a HH-60. If the receivers are directly under a HH-60 at 500 foot AGL, 20% of the population would consider itself highly annoyed. If the receivers are 1/4 of a mile to the side of a HH-60 overflight, 4% of the population would consider itself highly annoyed.

While annoyance levels will most likely be much lower at flight corridors with less than 50 operations per day, it can be a tool in providing some indication of annoyance level.

Table 5-3. Overflight Annoyance Potential[1]

Source	Ground Track Distance[2]	dBA Maximum[3]	Population Highly Annoyed[4]
HH-60 – 500’ AGL	0’	80	20%
	1320' (1/4 mile)	69	4%
	1760’ (1/3 mile)	66	<1%
HH-60 – 1000’ AGL	0’	73	10%
	1320' (1/4 mile)	68	2%
	1760’ (1/3 mile)	65	<1%
OH-58 – 500’ AGL	0’	79	19%
	1320' (1/4 mile)	68	2%
	1760’ (1/3 mile)	65	<1%
OH-58 – 1000’ AGL	0’	72	8%
	1320' (1/4 mile)	67	1%
	1760’ (1/3 mile)	64	<1%
UH-72– 500’ AGL	0’	75	13%
	1320' (1/4 mile)	70	5%
	1760’ (1/3 mile)	65	<1%
UH-72 – 1000’ AGL	0’	69	4%
	1320' (1/4 mile)	67	1%
	1760’ (1/3 mile)	63	<1%
C-12 – 500’ AGL	0’	79	19%
	1320' (1/4 mile)	69	4%
	1760’ (1/3 mile)	66	<1%
C-12 – 1000’ AGL	0’	73	10%
	1320' (1/4 mile)	68	2%
	1760’ (1/3 mile)	66	<1%

[1] Percent annoyance shown is based upon 50 to 200 overflights per day. (Rylander 1974)
[2] Distance between receiver and the point on Earth at which the aircraft is directly overhead.
[3] Obtained via SelCalc Program (U.S. Air Force 2005)
[4] Calculated percentage based upon regression using the known values in Table 5-2.

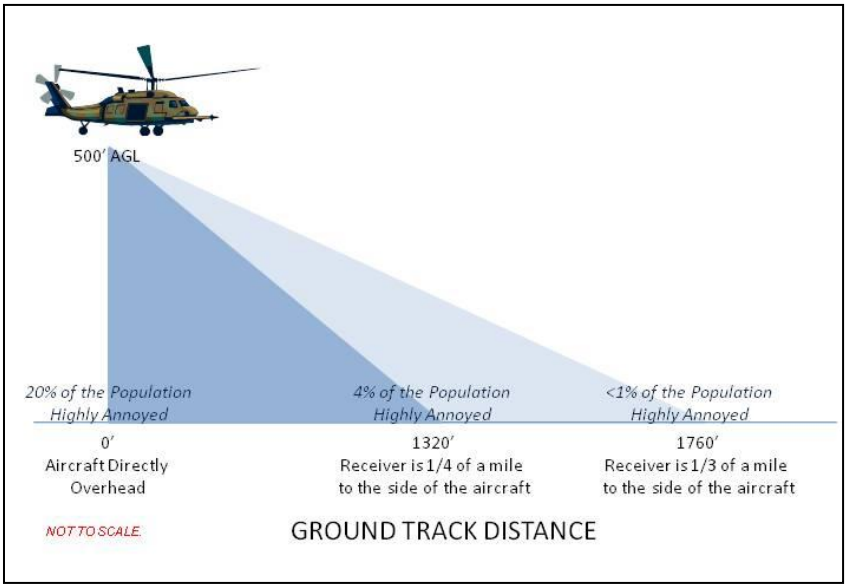

Figure 5-6. HH-60 Overflight Annoyance Potential

5.6 SUMMARY

On their own, the VTARNG operations at BTV are not high enough to generate Noise Zones. The aircraft utilize the open space beyond the airport boundary as well as approved training sites to conduct necessary aircraft training. Although the noise from training activities at the AASF is compatible with Army guidelines for noise-sensitive land use, there is the potential that individual helicopter overflights could annoy people near the flight tracks.

6 NOISE RELATED LAND USE POLICY AND CONTROL

6.1 GENERAL

The key to the mutually beneficial coexistence of military installations and communities is sensible land use planning around the installation. In the end, the installation can do everything possible within its mission to limit noise, but if the planning around the installation is not prudent, incompatible uses will find their way to the installation's boundary and the installation's existence could become jeopardized.

Sensible, proactive land use planning (i.e., **before** there is a problem) can create a win-win situation for all parties.

6.2 LAND USE PLANNING AND THE ARMY

A great part of the success of the United States of America can be attributed to its strong laws protecting personal property rights. The United States military is a constitutionally charged protector of those rights and has no interest in dictating what an owner may or may not do with his/her property, what a community should put in any particular place, or what value any given parcel of land should have. With that said, an installation would be remiss if it did not point out the benefits it brings to a community and how those benefits may be imperiled by the decisions (or lack thereof) of local community planners.

Communities all over the country have employed various means to protect entities that they deem to be valuable. This protection has ranged from implementing building codes to ensure that new construction in popular historic areas maintains the existing architectural heritage, to guarding the small-town feel of a Main Street by restricting the size of businesses that may enter a "downtown" business district. What all of these initiatives have in common is that they are intended to steer new development in a direction that is most appropriate given a need to preserve the value to the community of what has already come before. Sensible initiatives to ensure compatible land use around military installations are no different.

6.3 ACHIEVING LAND USE COMPATIBILITY

Achieving land use compatibility requires both flexibility and creativity from land use planners, installation commanders, and the citizenry. The previous sections of this document have detailed the existing and imminent encroachment threats, and given focused recommendations for how to remedy them. But, what do installations and communities do to tackle problems in the future?

In general, USAPHC uses the Federal Interagency Committee on Urban Noise (FICUN, 1980) guidelines (shown in Appendix D) when recommending land use options for areas near noise producing activities. While these guidelines only apply to noise measured in the A-weighted DNL (not blast noise), they apply to the noise produced by many of the most common sources such as transportation and maintenance/testing operations.

The following sections detail land use planning tools available to installations and communities.

6.3.1 LAND USE PLANNING OPTIONS

The following is a list of the major land use planning tools available to help local governments create areas of compatible use around military installations. These may be used individually or in combination, and a detailed explanation of the pros and cons of each is available in Appendix C. Appendix F contains sample noise disclosure forms.

1. Zoning
2. Overlay Districts
3. Easements
4. Transfer of Development Rights (TDR)
5. Land Purchase
6. Building Codes
7. Subdivision Regulation
8. Disclosure of Noise Levels
9. Land Banking
10. Sales Agreement
11. Deed/Covenants
12. Purchase of Development Rights
13. Purchase Option

While this is a substantial portion of the options available, installations and local governments are strongly encouraged to be creative to find the equitable solutions that best work for their situation.

6.3.2 ENVIRONMENTAL JUSTICE

Environmental Justice (EJ) is an important consideration in any land use plan. It is defined by the U.S. Environmental Protection Agency as the “fair treatment of people of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies”.

Over the last decade, there has been growing attention focused on the impact of environmental pollution on particular segments of our society. The concern that some populations bear a disproportionate amount of adverse health and environmental effects led President Clinton in 1994 to issue Executive Order 12898 focusing federal agency attention on these issues. To this end, installations and local governments should ensure that the EJ philosophy is embraced when any new measures are enacted to ensure compatible development around military installations. Decisions should be based strictly on the operational, safety, and environmental considerations

of both the installation and the community, not on whether a particular group is more or less likely to complain.

6.4 THE ARMY COMPATIBLE USE BUFFER (ACUB) PROGRAM

Along with the aforementioned noise zones, the Army has a specific program designed to limit the effects of encroachment. The ACUB program was borne out of a 2002 expansion of the Private Lands Initiative (10 USC §2684a) and it allows military departments to partner with private organizations to establish buffer areas around active installations. These partnerships benefit the citizens of the United States in a number of ways:

- Military readiness is maintained when training days are not lost to encroachment issues.
- Open spaces are protected from development and many times may be used by the public for recreational purposes.
- The military need not buy and maintain more land in order to meet its training needs.
- Critical habitat for threatened and endangered species is preserved or created.

An example of the success that the ACUB program is capable of garnering can be found at Fort Carson, Colorado. Through good will and cooperation between Fort Carson, the Nature Conservancy and private land owners, Fort Carson was able to put into motion mechanisms to protect its entire southern boundary and a large portion of its eastern boundary from incompatible development, and thus protect the training at its southern ranges.

More information on the ACUB program and other issues of range sustainability can be found at:

http://www. sustainability. army. mil/

6.5 JOINT LAND USE STUDY

The JLUS is a collaborative land use planning effort involving the military installation and adjacent local governments that evaluates the planning rationale necessary to support and encourage compatible development of land surrounding the installation. Put another way, it is a means for the installation and local governments to develop a land use plan that effectively addresses the long-term land use needs of the of the surrounding communities, yet still provides the military with the mission flexibility it needs to meet training doctrine.

The JLUS program is sponsored by the Department of Defense Office of Economic Adjustment (OEA) (DODI, 1983), and it provides technical and financial assistance to the planning agencies for developing master plans that are consistent, when economically feasible, with the noise, accident potential, and safety concerns from an installation's training and operations. The cost of the plan is split between the OEA and the jurisdictions involved.

The scope of the program is divided into three major tasks:

1. Impact Analysis. Impact analysis provides an in-depth review of existing and proposed land use patterns; drainage (as it effects land use designations); mission encroachment (particularly noise); transportation improvements, existing and proposed routes; and noise/vibration.

2. Land Use and Mission Compatibility Plan. Examines the above findings to identify conflicts in land use and provide alternative land use solutions; to project the impact on growth potential for adjacent areas; and to project the impact of military missions on the surrounding jurisdictions.

3. Implementation. Lists a series of actions and proposals for adoption by local jurisdictions to resolve land use conflicts and move toward a compatible land use plan for the installation, the adjacent counties, and the communities therein.

While the study report makes certain recommendations, it must be kept in mind that each participating jurisdiction must decide which recommendations are best suited to their particular needs. Implementation follows the final recommendations at the discretion of elected officials in each jurisdiction and the installation military command.

Many states and individual installations have had success utilizing the JLUS program to direct their land use strategies year after year.

6.6 STATEWIDE LAND USE POLICY

The State of Vermont does not have any statutes regarding military installations, their associated activity, or designations as a state area of interest and compatibility. The purpose of a Military Area Compatibility is to promote communication, cooperation and collaboration between any military installation and any municipality adjacent to or surrounding the military installation.

Examples of State Statutes for Military Area Compatibility or Military Installation State Area of Interest can be found at:
http://kslegislature.org/li/b2011_12/statute/012_000_0000_chapter/012_007_0000_article/012_007_0072_section/012_007_0072_k/ or http://data.opi.mt.gov/bills/mca_toc/10_1_15.htm

6.7 LOCAL LAND FUNCTION, COMPREHENSIVE PLANS AND POLICY

Generally speaking, there are three categories of land function surrounding Camp Ethan Allen Training Site (CEATS): traditional village centers, residential lands, and open/agricultural lands. Traditional Village Centers are characterized by denser, mixed-use development. *"Village Center" means a traditional center of the community, typically comprised of a cohesive core of residential, civic, religious, and commercial buildings, arranged along a main street and intersecting streets. Industrial uses may be found within or immediately adjacent to these centers."*

Figures 6-1 through 6-3 depict the land function surrounding CEATS. According to the Chittenden Regional Planning Commission, predominant land function within one mile of CEATS is residential.[8] Though the land function shown in the figures may be deemed residential, not all of the property is developed as such. The majority within the one mile area of the Towns of Underhill and Bolton are heavily wooded and undeveloped.

The three towns surrounding CEATS do not have any policies or procedures that impact the installation and their associated activity or address the interaction between the town and the military. However, in the 2011 Jericho Comprehensive Town Plan, the Town requested proactive communication and coordination between the Town and CEATS.

An open dialog allows for the Camp to inform the communities of activities occurring at the Camp and how those activities may affect the residents. It also allows for the communities to inform the Camp of proposed development or zoning changes and seek the Camp's input.

<u>2011 Jericho Comprehensive Town Plan</u>

In the Jericho plan, the name Ethan Allen Firing Range is used instead of the current name of Camp Ethan Allen Training Site (CEATS). Key sections of the plan are summarized below.

> *Although tours of the site are offered to local officials on a regular basis, the Town of Jericho has neither taxing nor regulatory authority over the Range land or its associated*

[8] http://www.vcgi.org/dataware/?page=./search_tools/search_action.cfm&query=theme&theme_id=201-0005

activities. It is generally felt that more interaction between Town and Range officials would be desirable, both to keep residents informed of activities occurring in the Range and how those activities might affect Jericho residents, as well as to explore possible beneficial aspects of the Range.[9]

Goal 3.2: Jericho's planning efforts will consider the regional context. Planning decisions will be made in part based on coordination with adjacent towns, entities within Jericho, and regional and State agencies[10]

Strategy 3.2.3: Improve communication and coordinate land use planning with major institutions within Jericho, such as the Ethan Allen Firing Range and UVM Research Forest.

Implementation 3.2.3.1: The Selectboard and Planning Commission should seek to meet annually in public session with Range and University officials.

Examples of proactive community involvement policies follow.

Example.
_____ County Planning Goals & Land Use & Growth Coordination Policies with _____ Range

The following policies are intended to protect operations at the _____ Range by discouraging activities adjacent to the Range that would negatively impact operations. These policies do not apply to development within the Range itself.

Policy 1. Restrict the conversion of agricultural land to more intense uses within one (1) mile of the Range. Encourage open space or clear areas within key safety areas adjacent to the Range to facilitate protection of the Range and reduce safety risk exposure to people on the ground and in the air.
Policy 2. Notify and provide an opportunity for ___ National Guard officials to comment on any proposed development applications received within ___ (_) miles of the Range.
Policy 3. Cooperate with the _____ National Guard, National Guard Bureau and U.S. Department of Defense to make improvements to roads providing access to the Range and to facilitate access while protecting County road investments.
Policy 4. Evaluate all proposed amendments to this Plan, the County Capital Improvements Plan, and any inter-local agreements with regard to possible increases in incompatible land uses or the potential for incompatible development adjacent to the Range.

[9] 2011 Jericho Town Plan, Page 18
[10] 2011 Jericho Town Plan, Page 21

Example:
_____ County and _____ Range: Communication and Cooperation Duties

To further communication, cooperation and collaboration:

The military installation shall:

1. Provide each municipality adjacent to or surrounding the installation with current Noise Zones and AICUZ or ONMP documents.
2. Notify and coordinate with each municipality adjacent to or surrounding the installation regarding any development, project or operational change on the military installation which will alter or amend a JLUS, ACUB, AICUZ or ONMP or any element therein.
3. Meet and coordinate at least annually with representatives of each municipality adjacent to or surrounding the installation for the purpose of determining any critical area within the area of interest.

Each municipality adjacent to or surrounding a military installation shall:

1. Meet and coordinate at least annually with the commander of the installation to jointly determine what portion, if any, of the area of interest is a critical area.
2. Provide notice to the commander of the installation located adjacent to or surrounded by a municipality at least 30 days prior to the adoption of any regulation, including any amendment thereof, or any amendment to any comprehensive planning document which affects any mutually agreed upon critical area.
3. Consider the impact of the land use interference with military operations, based upon information provided by the installation. Such as, release into the air of any substance such as steam, dust or smoke unless such substance is generated by agricultural use; light emission, that would interfere with pilot vision; potential to attract birds or waterfowl including, but not limited to, operation of any sanitary landfill and the maintenance of any large scale feeding station; whether or not structures would interfere or violate height restrictions associated with aircraft activity.
4. Consider the potential to expose persons to noise greater than Zone II levels based upon information provided by the installation.
5. Consider the adoption of a mandatory disclosure requirement for any property within any agreed upon critical area of a state area of interest, which would inform a buyer of the potential for impact from noise, smoke, dust, light, electromagnetic interference and aircraft safety zones on the landowner produced by normal military operations.

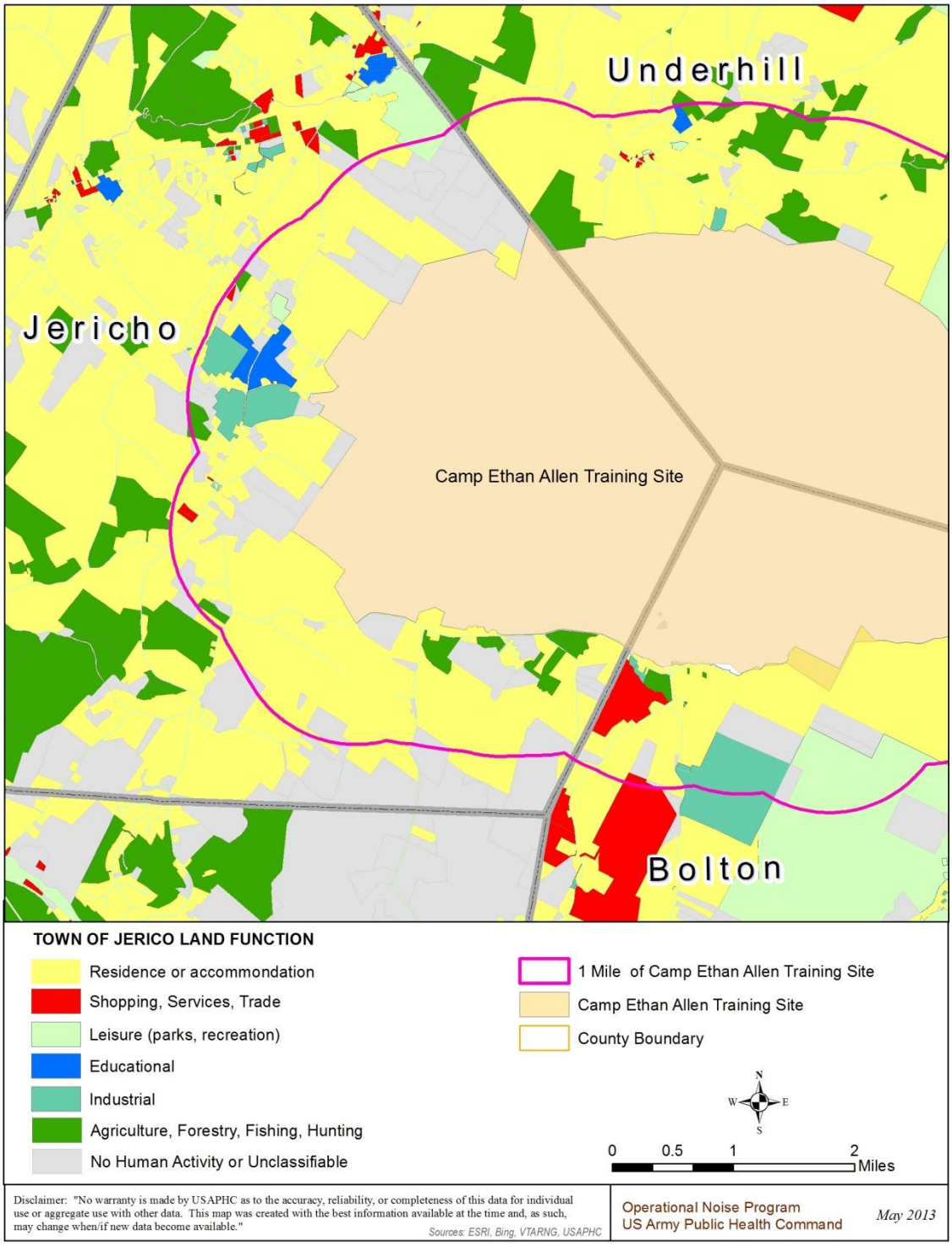

Figure 6-1. Town of Jericho Land Use

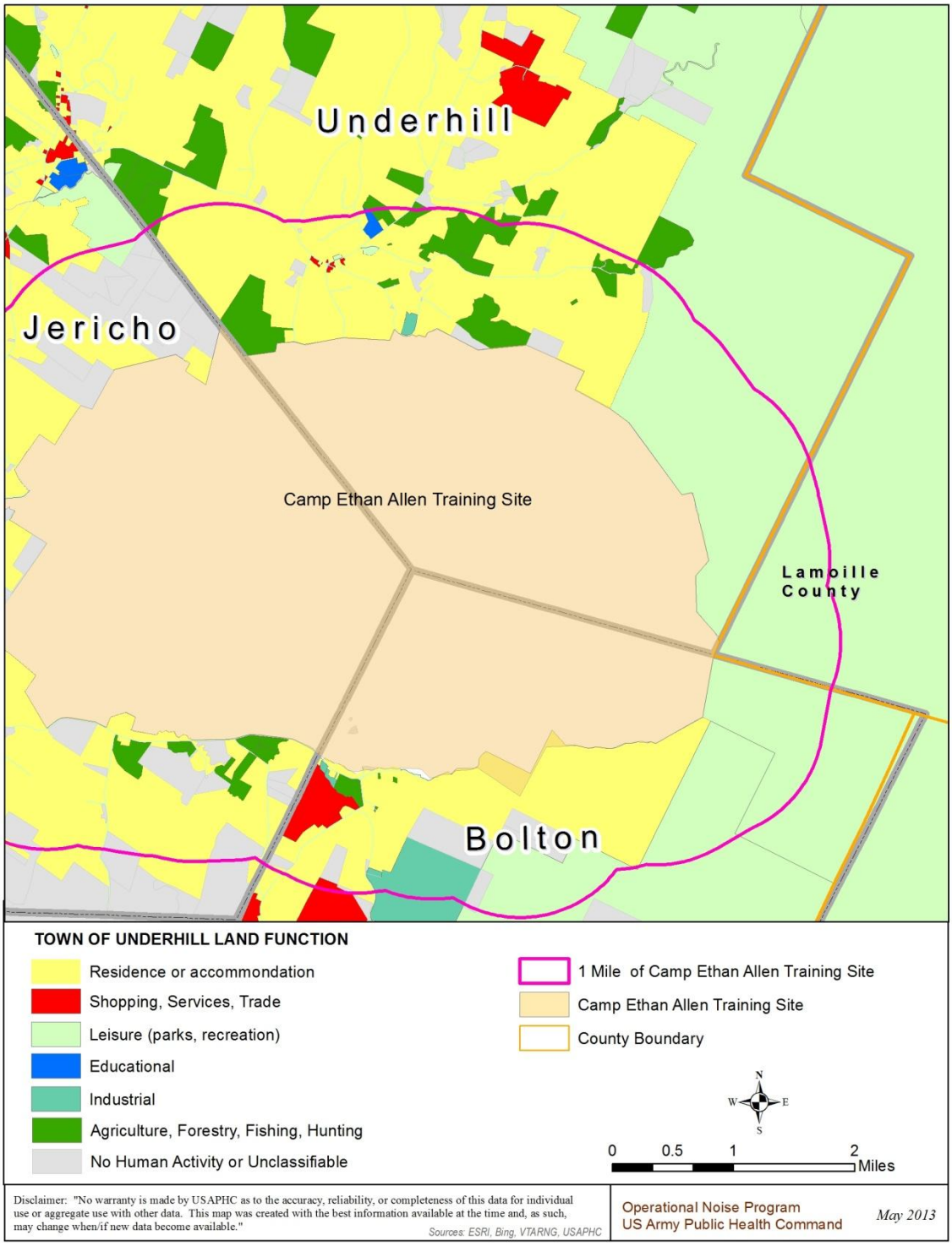

Figure 6-2. Town of Underhill Land Use

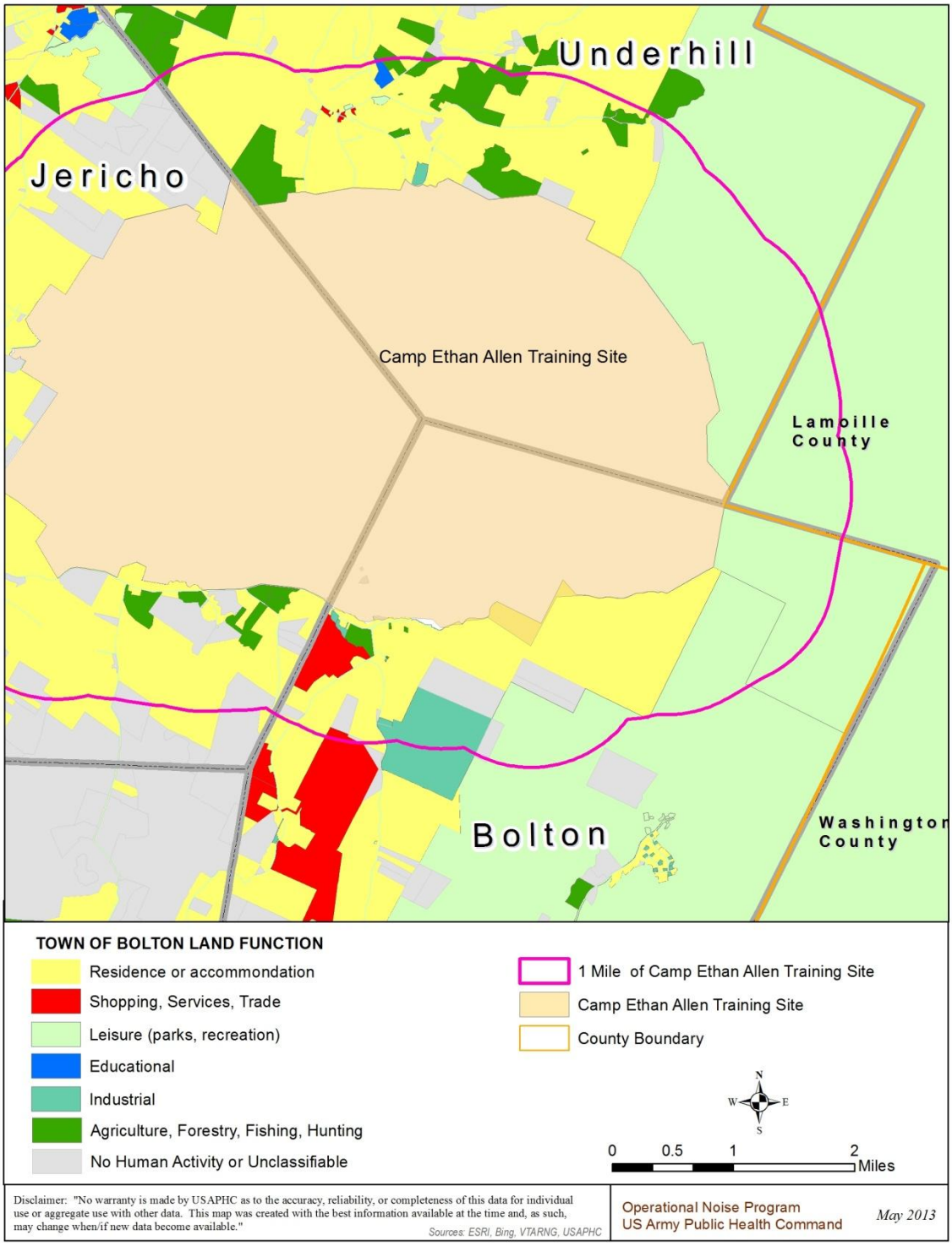

Figure 6-3. Town of Bolton Land Use

6.8 RECOMMENDATIONS

As suggested in the Jericho Town Plan, CEATS should implement and improve communication and coordinate land use planning with the Towns of Jericho, Underhill and Bolton. Proactive communication and coordination with local communities is vital. The open dialog allows for the Camp to inform the communities of activities occurring at the Camp and how those activities may affect the residents. It also allows for the communities to inform the Camp of proposed development or zoning changes and seek the Camp's input.

The CEATS and VTARNG can only make recommendations for compatible land use. This report's findings indicate what actions are appropriate to help guide future development of the adjacent properties.

At a minimum, local municipal governments are encouraged to support public disclosure of all Noise Zones in addition to any other information which may convey how military training operations may affect the noise environment.

6.9 CONCLUSION

The evenhanded resolution of any situation involving a disparate population of stakeholders requires flexibility, creativity, direction, good-will, and the most accurate information available. Effective land use planning is no different.

And, while the entire labyrinth of local regulations cannot be explained in this document, it is imperative that installation commanders and decision-makers become familiar with the local land use regulations and development climate around their installations in order to properly gauge the possibility of impending encroachment issues. Maintaining a familiarization with local regulations by visiting local government offices; a knowledge of federal/installation-initiated tools and programs (such as the ACUB); and a consciously cultivated relationship with local government officials (by making the Installation's views and preferences known at local planning and zoning meetings) are the best ways to address issues of encroachment before they in fact become issues.

This Operational Noise Management Plan provides the information and the direction, but it is up to the installations and communities to provide the other elements to ensure a mutually beneficial coexistence.

APPENDIX A

DESCRIPTION OF NOISE, NOISE EVALUATION, AND CONTOURING

A.1 INTRODUCTION

Military noise comes from a variety of sources and is a concern for a number of reasons. For the military, issues involving noise can be broken down into two components: hearing conservation as it pertains to the physical damage to the ear caused by sound, and operational noise as it relates to complaints and compatible land use.

The first involves the exposure to noise by individuals who are performing their duties. Since loud sounds are known to cause immediate and/or cumulative hearing damage, the military must be constantly monitoring the noise exposure of its employees and soldiers, both in day-to-day and combat situations.

The second, which this document addresses, centers upon the problems caused when military sounds are loud and/or frequent enough to disrupt those exposed to the noise.

In order to understand how military sounds become a problem, it is important to understand the science of sound, and what happens when a sound becomes a noise.

A.2 WHAT IS NOISE?

Noise is simply unwanted sound. So, in the context of hard science, there is no difference between the two. However, whether something is a “sound” or a “noise” has a great influence over the military’s everyday planning and policy decisions as it tries to fulfill its Constitutionally-charged duty to protect the citizens if the United States of America.

In short, sound isn’t noise until someone says it is; and when it is, it needs attention.

A.3 THE FUNDAMENTALS OF SOUND AND ACOUSTICS

Sound is a physical phenomenon created by minute variations about a mean pressure (or *vibrations*) that travel through a medium such as air or water. This variation in pressure takes the form of waves and, under ideal conditions, these waves travel evenly away from the source much like the ripples created when a pebble is dropped into calm water.

However, life on earth is rarely so perfect and the travel of these waves is always being influenced by variables such as temperature, terrain, and barriers. Add to those physical influences the fact that our human experience of audible sounds depends on the pattern of vibrations from the source, the way our hearing mechanism interprets these vibrations, and how our personalities affect how we feel about those vibrations and one can begin to grasp the complexity of issues involving sound and noise.

The field of science that deals with all of these variables as well as the production, control, reception, effects, and propagation is called *acoustics*.

A.3.1 THE CHARACTERISTICS OF SOUND

As an object moves back and forth in the atmosphere, it collides with the surrounding air particles creating a pressure disturbance. As those air particles collide with adjacent air particles, the pressure disturbance begins to spread away from the source of vibration. At the ear, this disturbance generates a vibration in the eardrum that is transmitted via a network of bones to the cochlea, which then converts the vibration into an electrical signal that the brain can interpret.

A sound is measured by gauging the alternate *compression* ("bunching") and *rarefaction* ("spreading") of the acoustic pressure disturbance above and below the normal atmospheric pressure, and is quantified in units called *Pascals* (Pa). Normal atmospheric pressure at sea level is 100,000 Pa, and sound waves generally travel at approximately 1,100 feet (335 meters) per second through air. For reference, the variation about this atmospheric pressure can be a little as 0.0006 Pa (or 60µPa) for a whisper at 2 meters, to 1,000 Pa for an M16 rifle shot at the firer's ear.

As with all waves, the energy and effects of a sound are dependent upon the sound wave's *frequency* and *wavelength*. Frequency is the number of compressions of rarefactions per unit of time. Wavelength is the distance between successive compressions or successive rarefactions (see Figure A-1).

Of course, sounds can bring us important information and/or pleasure. But, whether or not that is the case is dependent on two things: the content of the sound and the predisposition of the receiver to the sound.

When a sound brings neither pleasure nor information, it is safe to call it noise.

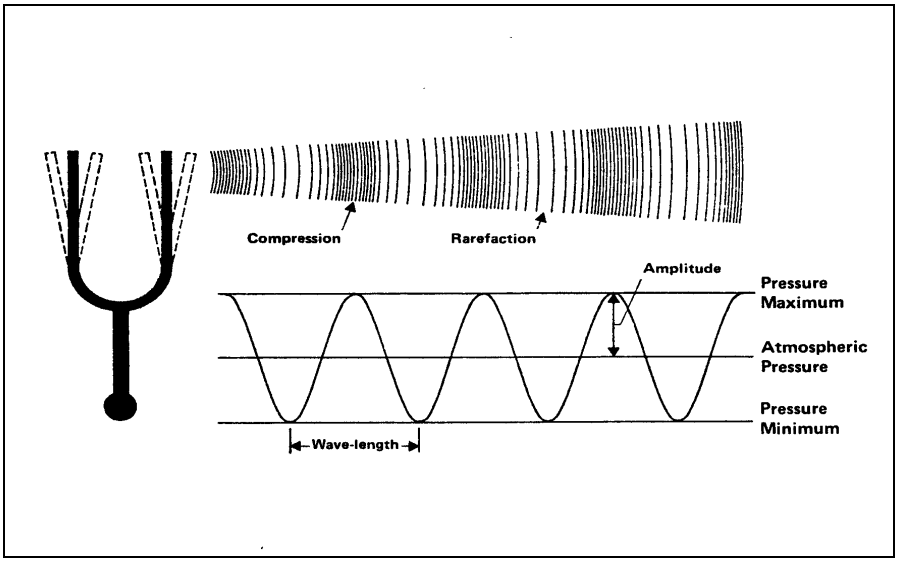

Figure A-1. Acoustics of a Pure Tone

A.3.1.1 SOUND CONTENT AND HUMAN HEARING

The content of a sound is determined by three defining characteristics:

(1) its spectral or frequency content;

(2) its loudness or intensity; and

(3) its time pattern

A.3.1.1.1 SPECTRUM AND FREQUENCY

Sound frequency is measured in terms of cycles-per-second or Hertz (Hz). The normal human ear can detect sounds ranging from about 20 Hz to 20,000 Hz (for reference, the average dog's hearing range is approximately 20-45,000 Hz). However, not all sounds in this wide range are heard equally well; the human ear is most sensitive to frequencies in the 1,000 to 4,000 Hz range.

As mentioned earlier, a vibrating object produces a sound wave with a characteristic frequency (a *tone*). However, there are no pure tones in the natural soundscape. Instead, any given sound found in nature is actually comprised of a complex combination of individual frequency components produced by the many different vibrational and oscillatory modes of the sound source. The total of all of these individual frequency components is known as a sound's *spectrum*, and knowledge of a sound's spectrum is a key in any attempt to mitigate the sound.

A.3.1.1.2 LOUDNESS AND DECIBELS

The concept of *volume* (i.e., relative loudness or quite) is fundamentally about the level of sound pressure hitting the eardrum. Historically, the first scientists to seriously study the ear's response to sound pressure were telephone engineers. These scientists soon discovered that the human ear responds to a very broad range of pressures and subsequently invented a logarithmic scale using the *decibel* (dB) as its unit of measurement.

The scale is zeroed at the beginning of human hearing (20µPa) and, since the scale is logarithmic, each one dB increase is a 10x increase in pressure (see Figure A-2).

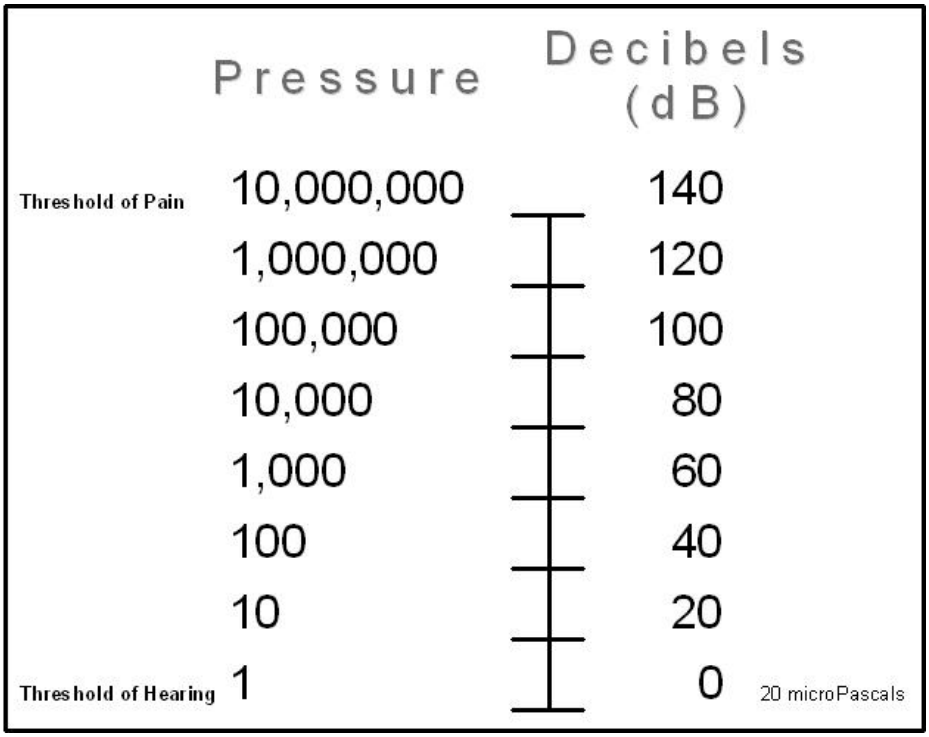

Figure A-2. Relationship between Sound Pressure and Decibels

For humans, the upper tolerable limit of loudness before hearing damage occurs depends on the frequency and duration of the sound. For example, a 20 millisecond rifle shot at a 140 dB level can damage the hearing in some unprotected ears. However, a howitzer shot at 140 dB, with its lower frequency (i.e., it's not as "sharp" as the rifle shot), is far less likely to cause hearing damage. Alternately, a passing sound at 120 dB is enough to cause only discomfort, while several minutes of such exposure can cause damage. And, moving further down the scale, one could tolerate as much as 8 hours of 85 dB before damage becomes a possibility.

Though laboratory studies have demonstrated a greater acuity, for practical purposes it takes a plus-or-minus three dB change in pressure (roughly a doubling or halving of energy) for a person to notice a difference across most audible frequencies.

But, because of the logarithmic nature of the decibel, dBs do not add directly. To get an exact answer, the root pressures of the sounds to be added must be combined and then converted to decibels using the following formula:

Pressure (dB) = 10 log (Measured Pressure/20 microPascals)

Table A-1 shows the short cuts to dB addition, but these are only to be used for quick approximations.

Table A-1. Shortcuts to Decibel Addition

When Two Levels Differ By:	Add the Following to the Higher Value:
0 to 1 dB	3
2 to 3 dB	2
4 to 9 dB	1
10 or more dB	0

A.3.1.1.3 VIBRATION

Often hand-in-hand with the discussion of loudness comes the phenomena of *vibration*. Vibration in the context of military training is caused by the impact of lower frequency sound waves on unsecured objects. In fact, there are situations where vibration can be the primary irritant to the public, because the sound making the vibration is too low for the human ear to hear. Thus, a citizen may have little idea that training operations are occurring at all until a picture falls off of the wall.

Vibration issues can largely be abated by appropriate construction techniques (e.g., heavy outer walls, suitable duct design, sealing of cracks, etc.) and prescient site planning. Additionally, while many citizens are fearful that vibration may damage their homes, the threshold for damage to even a poorly constructed house is far greater than the tolerance of the occupants is likely to be.

A.3.1.1.4 TIME PATTERNS

Time patterns are extremely important to the discussion of sound because it is so important in predicting annoyance.

Sound can be classified into four basic categories that define its basic time pattern:

(1) *Ambient.* Ambient sound is the ever-present collection of background sounds at any given place. Ambient sound can be strictly natural such as frogs and cicadas in the deep woods, strictly mechanical such as street noise in a busy city, or a combination of both like that which is found in the suburbs. It is important to consider the existing ambient soundscape because what exists already has much to do with how annoying people will find a new sound. For example, the hum of a generator will be much better tolerated by those already living in an area of high mechanized ambient noise than those living in the far woods.

(2) *Steady-state*. Steady-state sound is a sound of consistent level and spectral content such as that which originates from ventilation or mechanical systems that operate more or less continuously. From a military perspective, generators and aircraft run-up sounds are the most prominent steady-state sounds and, as a rule, the longer a steady-state sound persists, the more annoyed people will be.

(3) *Transient Sound*. Transient sound has a clearly defined beginning and end, rising above the background and then fading back into it. Transient sounds are typically associated with “moving” sound sources such an aircraft overflight or a single vehicle driving by, and they usually last for only a few minutes at the most. The annoyance caused by transient sounds is dependent upon both the maximum level and the duration.

(4) *Impulsive Sound.* Impulsive sound is of short duration (typically less than one second) high intensity, abrupt onset, rapid decay, and often a fast-changing spectral composition. It is characteristically associated with such sources as explosions, impacts, the discharge of firearms, the passage of supersonic aircraft (sonic booms), and many industrial processes. Impulsive sound can be particularly annoying because of the “startle factor” where the receiver has no warning that exposure to a loud sound is imminent.

The temporal aspect of a sound is important when it comes to predicting annoyance. Even a sound that is barely audible can be extremely irritating if it is continuous and is occurring at an inconvenient time (such as bedtime).

A.4 NOISE EVALUATION AND METRICS

There is little disagreement about the fact that noise must be regulated to some degree in order to maintain the quality of life for the public at large. However, noise is one of those things where everyone seems to know it when they hear it, but it has been historically difficult to define in words or numbers. This has been particularly irksome to lawmakers, because any laws regulating noise must be clearly understood to both producers and receivers in order to be effective. Consequently, over the past 30 years, a wide variety of acoustic measures and rating scales have been developed for the purpose of quantifying the sound generated by particular sources.

To date there is no perfect way to quantify noise for every circumstance and condition, but there are ways to assign meaningful numbers to sounds so that they can be compared from situation to situation.

A.4.1 WEIGHTING

As stated above, due to the natural response of the human ear, the perception of loudness is not consistent across frequencies. For instance, at any sound pressure less than 90 dB, a 1000 Hz tone would sound louder than a 100 Hz tone. While this is a bit of an oversimplification, essentially, as the frequency drops, it takes more pressure (volume) to maintain the same sense of "loudness".

Accordingly, weighting scales have been developed so that the intensity of a sound (or noise) can be equalized and brought in line with the actual human perception. The weighting scales that concern operational noise are the A-scale (A-weighting) and the C-scale (C-weighting), both specified by an American National Standards Institute standard (ANSI, 1983). Figure A-3 shows the relationship between the two scales.

<u>A-weighting</u>

The *A-weighting* of decibels (dBA) was designed to work primarily with higher frequency sounds. In military noise, this would encompass such sounds as those from generators, aircraft, maneuver drills, and general transportation.

<u>C-weighting</u>

The *C-weighting* of decibels (dBC) is used for intense signals containing low frequency sound energy like those that emanate from large gun blasts, sonic booms, and detonations.

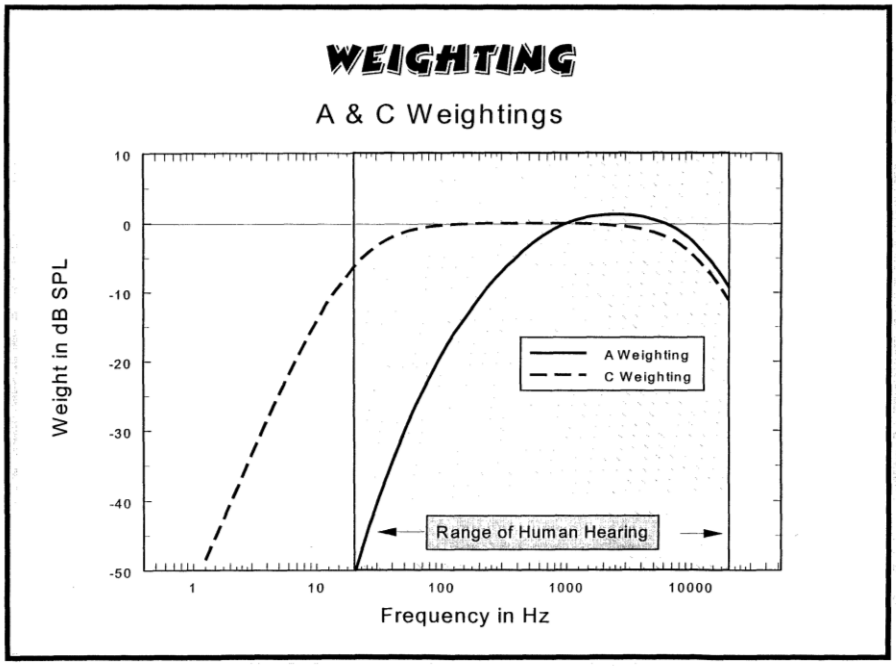

Figure A-3. A- and C- Weighting Scales

A.4.2 NOISE METRICS

The weighting scales are only one part of noise evaluation. In order to get a proper idea of the overall effect of noise, one must combine the weighting scales with the effects of a sound's time pattern to get a meaningful, all-encompassing cumulative noise measurement that can be used to compare noise exposure across a variety of situations.

Here, too, there are several choices of metrics depending on the noise environment to be measured and exactly for what the data is to be used. Many countries have their own standard metrics, but the U.S. military is concerned primarily with the following:

- Equivalent Sound Level (L_{eq})
- Day-Night Level (DNL)
- Sound Exposure Level (SEL)
- PK15(met)
- Unweighted Peak

A.4.2.1 EQUIVALENT SOUND LEVEL (L_{eq})

Since annoyance increases with the number of times an intrusive sound is experienced during a given period of time, the L_{eq} is a way of capturing the annoyance of a number of intrusions by "averaging" acoustical energy over a prescribed time period. The time period can be any length, but it is usually taken in some meaningful block of time such as an 8-hour L_{eq} for an office or a 24-hour L_{eq} for a residence. Figure A-4 illustrates how the daily variation of traffic noise can be summarized in terms of a single 24-hour L_{eq} value.

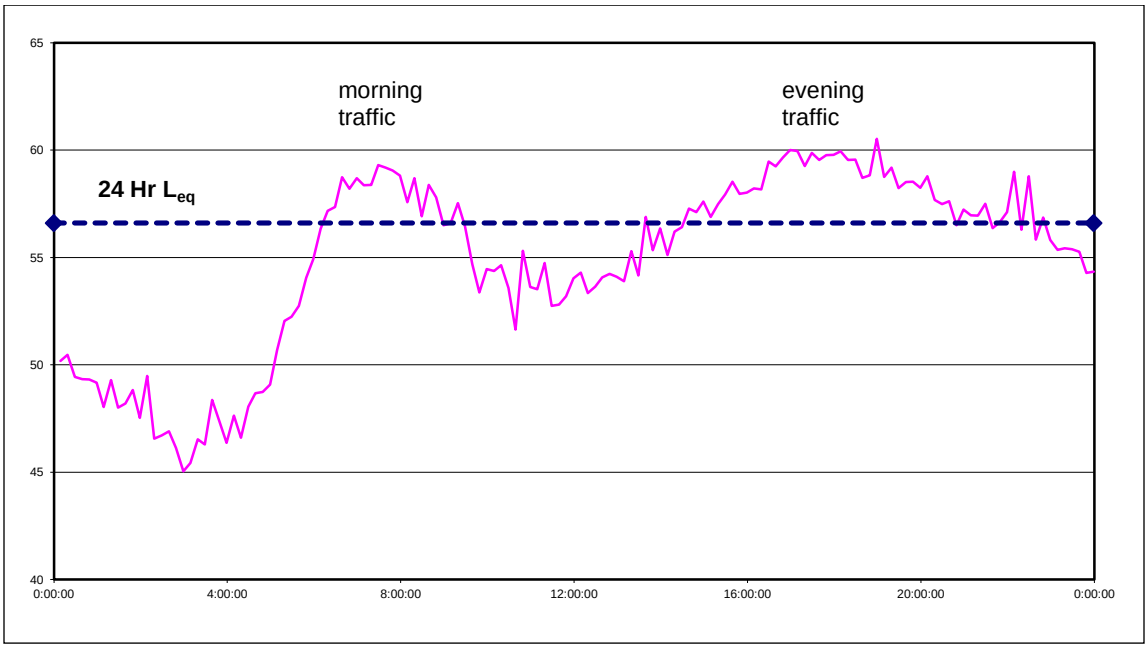

Figure A-4. Equivalent Noise Level (L_{eq})

A.4.2.2 DAY-NIGHT LEVEL (DNL)

The DNL is an average like the L_{eq} but with a 10dB "penalty" inflicted on sounds occurring between the hours of 10:00 p. m. and 7:00 a.m. (a particularly intrusive time when people are usually sleeping). As discussed above, the DNL may be A-weighted (ADNL) or C-weighted (CDNL) depending on the noise being measured. This average is calculated over any specified amount of time, but usually it is 250 training days for active military and 104 days for National Guard sites.

Also, within the DNL, there is a further penalty known as the *onset rate penalty*. For people living along aircraft flight routes, it was found that the DNL was underestimating their annoyance. So, this penalty (known as the L_{DNmr}) is used by the U.S. Air Force to take into account the sudden onset and sporadic nature of these sounds.

A.4.2.3 SOUND EXPOSURE LEVEL (SEL)

Since, prolonged, low-intensity events can be just as annoying as short, high-intensity events, the SEL is a way of capturing the annoyance of both variables in terms of a single number. It is the total energy of a sound event normalized to a specific amount of time (e.g., one second) so that sounds of different durations may be compared directly. Put another way, the SEL represents all the acoustic energy of an event as if it occurred within a one second period.

A.4.2.4 PK15(met)

PK15(met) is the peak sound level, factoring in the statistical variations caused by weather, that is likely to be exceeded only 15% of the time (i.e., 85% certainty that sound will be within this range). This metric exists only in modeling—one cannot take a PK15(met) measurement on the ground—and it is used for land use planning with small arms and as additional information for large arms and other impulsive sounds. It has gained popularity for military applications in recent years because it is a metric that works very well at showing just how loud things are likely to get at a particular location. Unfortunately, PK15(met) does not take duration or incidence into consideration, so it cannot tell how often things will be that loud.

A.4.2.5 UNWEIGHTED PEAK

One of the simplest ways to measure sound is through the use of unweighted peak (dBP). This is the peak, single event sound level on the ground, without any particular certainty–such as with the 85% certainty built into the PK15(met) above. This is a real-time measurement that is affected by everything from the weather to the length of the grass. As such, it is highly variable.

A.4.3 A BRIEF HISTORY OF NOISE EVALUATION IN THE U.S. GOVERNMENT

Before the 1970s, every organization had its own preferred set of noise evaluators (or metrics). Since each noise evaluator was developed for a specific purpose, data from one noise evaluator could not be reliably compared to that of another.

However, the field moved toward standardization when, in carrying out its responsibilities under the Noise Control Act of 1972 (PL 92-574 1972), the U.S. Environmental Protection Agency recommended the adoption of the LEQ (and its 24-hour cousin, the DNL).

In recommending the DNL, the EPA noted that most noise environments are characterized by repetitive behavior from day-to-day, with some variation imposed by differences between weekday and weekend activity, and seasonal fluctuations. Consequently, the DNL's annual average accounts for this variation and complements the fact that annoyance is generally caused by long-term dissatisfaction with the noise environment. It must be kept in mind, though, that the DNL is not an effective predictor of complaints, because complaints tend to represent an individual's immediate dissatisfaction with the noise environment, not a general annoyance.

So, the acceptance of the DNL helped to predict annoyance (and general disruption patterns), but it could not fully address the issue of complaint prediction. Consistent prediction of complaints is more achievable when dealing with peak noise levels rather than averages. As a result, in 2004, the U.S. Army Construction Engineering Research Laboratory and (USACERL) and USAPHC together helped to usher in the PK15(met) evaluator as a means to predict complaint potential and supplement the information given by the DNL figures.

A.5 NOISE CONTOURING

The various metrics described above produce numbers that can be compared to one another. But, it is difficult to make a number meaningful to someone interested in where the noise is going. To that end, the idea of noise contouring on maps was born.

Contours on a map are made by connecting points of equal values. Most commonly, points of equal elevation are connected to form the contour lines most typically found on topographical maps. But, points of many other themes can be detected to give a visual representation of the extent or degree of something. Computer programs have been developed that model the genesis and propagation of sound from particular sources, and then connect points of equal decibel value to show areas where a particular sound intensity can be expected.

Figure A-5 is an example of a map showing peak noise contours. The operator of the computer model may plot whatever values she/he wishes to show, but this example shows the 130 dBP line (red) and the 115 dBP line (blue). While the lines will never be absolutely exact (due to the nature of sound, they can fluctuate quite a bit as conditions change), what this map in effect says is that all of the area inside of the blue line will start at 115 dB and grow louder as it gets closer to the red 130 dB line. And similarly, once at the red 130 dB line, the sound level will grow louder still all the way to the source.

This is eminently useful because it shows both the installations and the public not only where the sound/noise is going, but at what levels. With that, installations, local governments, and individuals can use these maps to make informed choices based on their temperaments, tolerances, and philosophies concerning noise.

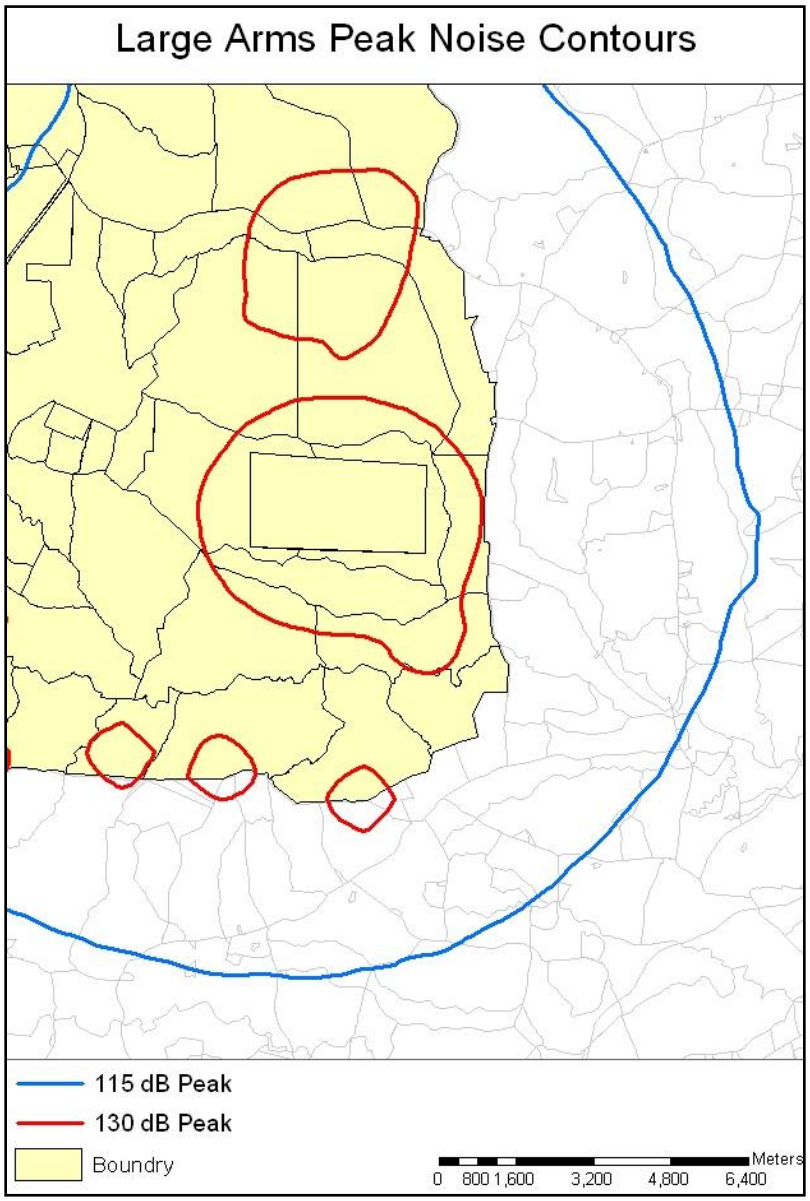

Figure A-5. Example of a Map Showing Peak Noise Contours

A.5.1 COMPUTER PROGRAMS

The relatively simple looking output of a map showing noise contour lines is actually the result of some comparatively complicated computer programs. In fact, most of these programs are in perpetual states of evolution as new data become available and advances in computing power allow for more variables to be factored into creating the final contour.

Table A-2 lists the most common noise mapping programs and some of their preferred usage characteristics featured in Operational Noise Plans created by USAPHC:

Table A-2. Noise Models and Their Uses

Model	Timeframe	Characteristic	Source	Use
NOISEMAP	Long-term	Transient	Fixed-wing aircraft	Airbase noise exposure, AICUZ
BNOISE2	Long-term & single events	Impulse	OD & large guns	Ranges and OD pits
SARNAM	Long-term & single events	Impulse/transient	Small arms	Firing range

- Small arms noise contours are generated by the Small Arms Range Noise Assessment Model (SARNAM). This model incorporates the latest available information on weapons noise source models (including directivity and spectrum), sound propagation, effects of noise mitigation and safety structures (walls, berms, ricochet barriers, etc.) and community response protocols for small arms noise. It also includes an extensive selection of weapons in the source library, can handle multiple ranges of various types, and is designed to maximize user productivity.

- Blast noise (i.e., explosions and large arms) contours are generated by the BNOISE2 program. It accounts for spectrum and directivity of both muzzle blast and projectile sonic boom while also considering issues of propagation including land/water boundaries and terrain.

- Aircraft noise contours are generated by NOISEMAP with inputs of aircraft type, altitude, power setting, speed, and number of operations.

All of the computer models work in generally the same fashion. The weapon type and number of rounds fired is combined with various geographic and atmospheric data (location, direction of fire, weather, etc.). The user then defines which contours he/she wishes to see, the program calculates how far the sound will travel under those conditions, and the resulting contours are then overlaid onto a conventional map of the area.

In spite of the research invested and the intricacies of the programs, outputs of the modeling programs are not always exactly what may be found “on the ground” at any given moment. The problem lies not with the calculations or algorithms, but with the number of variables that practical and computing considerations limit the user to inputting. There are far too many variables on the ground (even down to how long the grass is) to ever truly simulate the natural world.

When done properly, the contours produced can be relied upon to paint a clear picture of the general noise environment of an area, and show information that is of the integrity needed to make prudent planning and zoning decisions.

Additional information on noise models or contouring procedures can be obtained from the USAPHC's Operational Noise Group.

A.5.2 WHAT AFFECTS CONTOUR SHAPES?

In an ideal world, all noise contours would be perfect circles because the noise would travel from the source at the same speed and intensity in every direction. But, the geology, geography, climatology, and physics of our planet create an environment where external forces are acting on sound waves the second they are created. Those waves may be directed by the nature of the source, reflected by a wall, refracted by some mountains, attenuated by winds, intensified by atmospheric conditions, or absorbed entirely by a thick coniferous forest.

All of these situations then ply that theoretically perfect circle, stretching it in some places (e.g., pushing through a mountain gap), and smashing it in others (such as in the direction against a heavy breeze).

A.5.3 GUIDELINES FOR DISCUSSING NOISE CONTOUR MAPS

A.5.3.1 INTRODUCTION

Noise contour maps are the best way to show where noise is likely to go and at what intensity. Though much effort has been put into the creation of the computer programs that generate the noise contours, putting a highly variable concept onto a 2-dimensional piece of paper is a precarious science. Often, people viewing a noise contour map erroneously assume that the simplicity of the medium (i.e., the piece of paper) equates to the relative difficulty of the subject. The fact is, all of the intricacies of sound cannot be completely and accurately be portrayed in such a simplistic manner, but noise contour maps are the best way available and are quite effective if explained properly.

Note: If one is going to be charged with explaining noise contours (or any other potentially controversial subject) to the public on a regular basis, it is advised that the individual take a class in risk communication.

A.5.3.2 PREPARATION

Preparation is the primary ingredient needed to get any message across to an audience. Logically, one must first understand the message themselves before they can expect to credibly deliver it to anyone else.

It is not required that an individual be an expert on every aspect of the creation of the map. Proper preparations should include:

- Knowing inside and out the meaning of a particular set of contours (i.e., what the noise contours do say, and what they do not say).

- Familiarizing oneself with the basics of sound, how it travels, what effects travel, and the relationship between sound and annoyance.

- Familiarizing oneself with the computer modeling and Geographic Information System (GIS) applications used to create the contours and maps.

A.5.3.3 MEANING OF THE CONTOURS

A primary source of misunderstanding is how the contours are "interpreted". In reality, the contours are a stark picture of what is happening based on the parameters that have been input into the models, not an artist's rendition. Consequently, there is only one way to "read" the contours. Interpretation becomes a factor only when members of the audience are deciding if what the contours say is a good or a bad thing.

A.5.3.3.1 WHAT NOISE CONTOURS *CAN* TELL US

Noise contours are best at advising people of the approximate distribution of the noise coming from a particular source; in this case, military installations. Accordingly, if a person feels that there may be a chance that they are noise-sensitive, the contour map can give that individual an idea of where it might not be best for he/she to live.

Also, noise contours are excellent for making comparisons between the noises generated under one set of circumstances to those generated under another. This is especially useful when deciding such things as under what weather conditions it is best to train, whether a proposed location would work well for a new range, or to what degree troop deployments/reassignments will impact surrounding areas.

A.5.3.3.2 WHAT NOISE CONTOURS *CAN NOT* TELL US (WITH CERTAINTY)

Anyone explaining noise contours should first and foremost be aware that the noise levels do not stop at the line on the map. Most contours are averages of some sort and these averages are necessary because the infinite number of physical and meteorological variables at any given location would require an equally infinite number of maps to show them all. Thus, contours are representations of what someone is likely to experience under a given set of circumstances, and they cannot say that it is too loud for an assisted living center on one side of the road but not the other.

It must be pointed out that noise level can vary significantly due to weather, training schedules, deployments, technologies, etc. And, though what is shown on a map has a built in level of conservatism, it by no means suggests that things will never be louder or quieter at a given location.

Furthermore, contours cannot say whether or not the amount of noise shown to be in a particular area is going to be bothersome; this is up to individuals to decide and is a product of many variables. For instance, a relatively modest sound level at a house that is located next to a busy street is likely to be accepted quite differently than the same sound level at a house located on a canyon ridge all by itself.

A.5.3.4 THE BASICS OF SOUND AND ANNOYANCE

Explaining the limits of the noise contours inevitably generates questions regarding why it is so difficult to pin down exactly where noise is going to travel and at what levels. The answer is that the propagation of sound and human perceptions of sound are dependent on so many variables that it impossible to cement exactly what will irritate a particular person.

The physical propagation of sound is affected by weather, terrain, distance, barriers, and the nature of the sound itself (i.e., different frequencies have different travel characteristics). In fact, weather has a profound effect on the degree to which a sound "lands" at a particular location, and that is of course a variable that can literally change from hour-to-hour.

Human perception is even more challenging to account for on a single map. From county to county, ZIP code to ZIP code, and house to house, people's ideas of when a sound becomes noise can differ markedly. These differences in perception can attributed to such varied sources as:

- The physical state of the individual's hearing ability (i.e., is the individual's hearing health good or bad?)
- Past experiences (i.e., could the individual have experienced trauma in the past that makes them particularly sensitive to loud or sharp sounds?)
- Attitude toward the noise source (i.e., does the receiver dislike the military?)
- General temperament (i.e., is the individual "jumpy?")

By understanding the relationship between the physical behavior of sound and some of the human variables that can turn a sound into a noise, we can paint a clearer picture to an audience about how they can each use the noise contours to make the decisions that best suit their individual situations.

A.5.3.5 COMPUTER MODELING AND GIS

It is also difficult to explain with any validity what the noise contours mean if one knows nothing about the process that created them.

The specific process of creating noise contours varies by what is creating the noise and, accordingly, which model is used to make the picture. But, the general idea is that pertinent

information (such as the item making the noise, its location, the direction of fire/travel, weather conditions, etc.) is entered into the appropriate computer model, the model outputs a picture based on the noise metric specified, and then that picture is imported into a GIS program so that a map can be created.

However, while the computer models used by the military are some of the best available, they do have important limitations. First, no matter how sophisticated, no model can take into account every terrain variable at a given location unless models were specifically developed for every installation (which would cost an enormous amount, if it were even possible). Second, the databases of noise producers in the models are representative of the military's equipment, but may not contain individual specifications for every variety of a particular piece of equipment.

So, taken together, these two limitations further prevent the resolution of the noise contours from reaching the "street level," and they advance the idea that noise-sensitive persons must take into consideration all available information before making a choice that may conflict with an existing noise environment (such as buying a home next to a highway or military installation).

In summary, taking the time to explain how the models work will draw an audience's expectations more toward what the computer models can actually provide.

A.5.3.6 SUMMARY

By and large, people are either apathetic or fearful of things they do not understand, neither of which is good when it comes to issues involving noise

To that end, the way in which noise contours are presented (and to whom) can go a long way toward a state where installations and the public work together to each other's mutual benefit.

A.6 CONCLUSION

The science of measuring and modeling unwanted sounds is constantly evolving, just like the relationships between military installations and the communities that surround them. As defense spending continues to drive innovation and support a large sector of our nation's economy, the weapons are getting more powerful and louder, and population pressures are increasing around once-remote installations.

While evolving relationships always pose new challenges, they also always pose new opportunities. Understanding the way sound behaves and utilizing the noise monitoring and modeling tools available are critical to making proper land use decisions in and around installations, so that the installations and the surrounding communities continue to thrive in each other's presence.

APPENDIX B

DATA USED TO GENERATE NOISE CONTOURS

B-1. Table B-1 lists the existing fixed firing point small caliber ranges at Camp Ethan Allen Training Site (CEATS).

TABLE B-1. EXISTING SMALL CALIBER RANGES AT CAMP ETHAN ALLEN TRAINING SITE

RANGE TYPE	RANGE
Combat Pistol/Military Police Qualification Course	Range 3-3 Range 5-1 Range 6-1 Range 6-2
High Angle Range (HAR)	Range HAR
Infantry Squad Battle Course (ISBC)	Range 4-3
Known Distance Range	Range 3-2 Range 4-1
Machine Gun Transition Range	Range 6-3 Range 6-5
Modified Record Fire Range	Range 7-1
Multi-purpose Machine Gun Range (MPMG)	Range MPMG
Multi-purpose Training Range	Range 6-6
Non-standard Range	Range 3-1 Range 5-2
Zero Range	Range 4-3 10-25M Range 6-6 10-25M

B-2. The noise contours in Figure 4-3 represent all fixed point small caliber firing at CEATS. These contours were developed based on the activity in Table B-2 (General Dynamics Range) and Table B-3 [Vermont Army National Guard (VTARNG)].

TABLE B-2. GENERAL DYNAMICS RANGE SMALL CALIBER AMMUNITION UTILIZATION

RANGE	Ammunition
General Dynamics Range	.50 caliber
	.338 caliber

B-3. The noise contours in Figure 4-11 depict the existing VTARNG fixed point small caliber firing and were developed based on the activity in Table B-3.

TABLE B-3. VTARNG ACTIVITY BASELINE (EXISTING) SMALL CALIBER WEAPON UTILIZATION

	PISTOL, .38 CAL, LIVE	PISTOL, .45 CAL, LIVE	PISTOL, 9 MM, LIVE	TRAINER AT4, 9MM TPT	RIFLE, .22 CAL, LIVE	RIFLE, .30 CAL, LIVE	RIFLE, 5.56 MM, LIVE	RIFLE, 5.56 MM, BLANK*	MACHINE GUN, 7.62 MM, LIVE	MACHINE GUN, 7.62 MM, BLANK*	MACHINE GUN, .50 CAL, LIVE	SHOTGUN, 10 GAUGE, SALUTE	SHOTGUN, 12 GAUGE	SHOTGUN, 20 GAUGE
RANGE 3-1				✓										✓
RANGE 3-2	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	
RANGE 3-3	✓	✓		✓										
RANGE 4-1	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	
RANGE 4-3 10-25M		✓	✓			✓	✓	✓				✓	✓	
RANGE 4-3 ISBC						✓	✓	✓	✓			✓	✓	
RANGE 5-1	✓	✓	✓	✓						✓		✓	✓	
RANGE 5-2	✓	✓	✓	✓			✓					✓	✓	
RANGE 6-1		✓	✓		✓									
RANGE 6-2		✓			✓	✓	✓	✓				✓	✓	
RANGE 6-3							✓	✓	✓	✓		✓	✓	
RANGE 6-5							✓	✓	✓	✓	✓			✓
RANGE 6-6							✓	✓	✓	✓	✓			✓
RANGE 6-6 10-25M							✓	✓				✓		
RANGE 7-1				✓										✓
RANGE HAR						✓	✓	✓				✓	✓	✓
RANGE MPMG								✓		✓		✓	✓	✓

*Blank is defined as any round that contains propellant but no bullet.

B-4. The noise contours in Figure 4-11 depict the projected Range HAR .300 win/mag and the existing VTARNG fixed point small caliber firing. These contours were developed based on the activity in Table B-3 and the addition of the .300 win/mag to the Range HAR.

B-5. The noise contours in Figure 4-12 depict the projected Range HAR .50 caliber and the existing VTARNG fixed point small caliber firing. These contours were developed based on the activity in Table B-3 and the addition of the .50 caliber to the Range HAR.

B-6. The noise contours in Figure 4-14 depict the projected UAC Station 3 5.56mm and the existing VTARNG fixed point small caliber firing. These contours were developed based on the activity in Table B-3 and the addition of the proposed UAC Station 3 with the 5.56mm round.

B-7. The land use contours in Figure 4-5 represent all demolition and large caliber firing at CEATS. These contours were developed based on the activity in Table B-4 (General Dynamics Range) and Table B-5 (VTARNG).

TABLE B-4. GENERAL DYNAMICS RANGE AMMUNITION EXPENDITURE FISCAL YEARS 2009-2011

				3 Year Average*	
	Quantity Fired			Daytime	Nighttime
Nomenclature	**FY09**	**FY10**	**FY11**	**(0700-2200)**	**(2200-0700)**
20mm Gun, Inert	149,957	154,432	118,628	141,006	0
25mm Gun, Inert	1,300	2,880	6,420	3,533	0
30mm Gun, Inert	810	1,427	0	746	0

NOTES:
*Average expenditure is rounded to prevent fractional rounds.
Inert is defined as any round that does not make noise upon impact (i.e. armor piercing, target practice, etc…)
Quantity fired is based on the number of Acceptance Test Procedure (ATP) per FY times the number of rounds utilized per ATP.

B-8. The land use contours in Figure 4-6 depict the VTARNG demolition and large caliber firing and were developed based on the activity in Table B-5.

TABLE B-5. VTARNG DEMOLITION AND LARGE CALIBER WEAPON UTILIZATION

		Quantity Fired			3 Year Average*	
Facility	Nomenclature	FY09	FY10	FY11	Daytime (0700-2200)	Nighttime (2200-0700)
FP-6	120mm Mortar, HE	50			17	0
FP-6	120mm Mortar, Inert	11			4	0
FP-8	81mm Mortar, HE	2			1	0
FP-8	120mm Mortar, HE	18	36		18	0
FP-8	120mm Mortar, Inert	133	220		118	0
FP-8	105mm Howitzer, HE	120		120	80	0
FP-8	Demolition, TNT, 0.5 lb, M031	12			4	0
FP-15	120mm Mortar, HE	18			6	0
FP-15	120mm Mortar, Inert	93			31	0
FP-60	60mm Mortar, HE	239	196	37	157	0
FP-60	60mm Mortar, Inert	84	172	36	97	0
FP-60	81mm Mortar, HE	18	72		30	0
FP-60	81mm Mortar, Inert		83	72	52	0
FP-60	120mm Mortar, HE		36		12	0
FP-60	120mm Mortar, Inert		150	72	74	0
FP-60	Demolition, C-4, 1.25 lbs, M023	2			1	0
FP-93	81mm Mortar, HE	27			9	0
FP-93	120mm Mortar, HE	15			5	0
FP-93	120mm Mortar, Inert	34			11	0
LZ FEIGEL	Demolition, C-4, 1.25 lbs, M023			24	8	0

Notes: *Expenditure was rounded to prevent fractional round counts.
Inert is defined as any round that does not make noise upon impact (i.e. illumination, target practice, smoke, etc...)

TABLE B-5. VTARNG DEMOLITION AND LARGE CALIBER WEAPON UTILIZATION, cont'd

		Quantity Fired			3 Year Average*	
Facility	Nomenclature	FY09	FY10	FY11	Daytime (0700-2200)	Nighttime (2200-0700)
RANGE 5-3	Demolition, Booster, 0.0254 lb, MN69		24		8	0
RANGE 5-3	Demolition, C-4, 1.25 lbs, M023	60	13	20	31	0
RANGE 5-3	Demolition, C-4, 2.25 lbs, M037			1	1	0
RANGE 5-3	Demolition, Charge, SEMTEXA, 0.5 lb, MN82		2		1	0
RANGE 5-3	Demolition, Comp C-2, 0.5 lb, M041	141			47	0
RANGE 5-3	Demolition, Cutter, 0.2855 lb, ML04	1			1	0
RANGE 5-3	Demolition, Cutter, 1.1 lbs, ML05	1			1	0
RANGE 5-3	Demolition, PETN, 2 lbs, M024	4			1	0
RANGE 5-3	Demolition, Sheet 38 ft (NEW 0.5 lb per ft), M980		2		1	0
RANGE 5-3	Demolition, TNT, 0.25 lb, M030	108		2	37	0
RANGE 5-3	Demolition, TNT, 0.5 lb, M031		1		1	0
RANGE 5-3	Demolition, TNT, 1 lb, M032	16			5	0
RANGE 5-3	Dynamite, Military, 0.39 lb, M591	14			5	0
RANGE 5-3	Linear Charge, Flexible, 0.0714 lbs, ML14 (4ft - 0.0178 lb p/ft)	2			1	0
RANGE 5-3	Linear Charge, Flexible, 0.1714 lbs, ML16 (4ft - 0.0428 lb p/ft)	2			1	0
RANGE 5-3	Linear Charge, Flexible, 0.2857 lbs, ML18 (4ft - 0.0714 lb p/ft)	1			1	0
RANGE 5-3	Linear Charge, Flexible, 0.3429 lbs, ML19 (4ft - 0.0857 lb p/ft)	2			1	0
RANGE 5-3	Mine, Claymore M18A1, K143	4			1	0
RANGE 6-6	Demolition, C-4, 1.25 lbs, M023			6	2	0
TA-06C	Demolition, C-4, 1.25 lbs, M023			2	1	0
TA-06C	Demolition, C-4, 2.25 lbs, M037		2		1	0

Notes: *Expenditure was rounded to prevent fractional round counts.
Inert is defined as any round that does not make noise upon impact (i.e. illumination, target practice, smoke, etc...)

APPENDIX C

LAND USE PLANNING AND CONTROL TECHNIQUES

C.1 GENERAL

Several different planning and land use control techniques are available to local governments to ensure that compatible uses are located in and around areas of unique characteristics (such as the lands that border military installations). Some are more specialized than others, but wielded properly, every one of the following tools has the capability to limit the possibility of complaints due to encroachment.

C.2 ZONING

The most common method of land use control is *zoning*, or the partitioning of areas into sections reserved for different purposes. This method is an exercise of the police powers of state and local governments that designates the uses permitted in each parcel of land. It normally consists of a zoning ordinance that delineates the various use districts and a zoning map based on the land use element of the community's comprehensive general plan.

- **Uses of Zoning.** Zoning should be applied fairly and based on a comprehensive plan that considers the total needs of the community along with the specific needs of the installation. For example, it is not acceptable to zone a parcel of land for industrial or warehouse usage simply because it lies within a noise impact area. Such an action could be considered "arbitrary, capricious, or unreasonable" and thus be vulnerable in the event of judicial review; zoning plans must clearly demonstrate that there is a reasonable present or future need for such usage. However, if it can be clearly shown that the proposed zoning is being used constructively to increase the value and productivity of land within noise impacted areas, it is the preferred method of controlling land use.

- **Limitations of Zoning.** Zoning has several limitations that must be considered when using it as a compatibility implementation device. These limitations include the following:

  - <u>Zoning is usually not retroactive.</u> That is, changing a zone for the primary purpose of prohibiting a use that already exists is normally not possible. And even if such a change is successful, the existing uses that have been rendered unlawful must remain as "nonconforming" elements until the owner has had ample time to recoup his/her investment.

- Zoning is jurisdiction-limited. Installation impacts often span more than one zoning jurisdiction. In these cases, zoning requires the coordination of all involved jurisdictions in order to be effective. Zoning that implements a compatibility plan will often be composed of existing and new zoning districts within each of the zoning jurisdictions covered by the plan. Further complicating matters, each jurisdiction is likely to have a different base zoning ordinance requiring different actions for implementing the compatibility plan. Also, counties in many states do not have any zoning authority at all, so land use control via zoning in these states stops at the municipal boundary.

- Zoning is **not** permanent. In any jurisdiction, zoning can be changed by the current government body; it is not bound by prior zoning actions. Consequently, even if zoning achieves compatibility, that compatibility is continually pressured by both urban expansion and enterprises that might profit from a favorable zoning change.

- Cumulative zoning can permit incompatible development. Several communities around the country employ "cumulative"-type zoning districts that permit all "higher" uses (such as residential) in "lower" use districts (such as commercial or industrial), thus supporting development that may be incompatible. In these instances, it is necessary to prepare and adopt new or additional zoning districts of the "exclusionary" type (i.e., that clearly specify the uses permitted and exclude all others).

- Zoning Board of Adjustment actions granting variances. Variances to the zoning district of exceptions (e.g., schools or churches) written into the zoning ordinance can also permit development that may be incompatible.

- **Positive Features of Zoning.** The zoning ordinance may be the most attractive land use control to prevent development around installations because it is effective (prohibiting specific development by law) and normally costs the installation nothing.

- **Negative Features of Zoning.** The installation must rely in the municipality's governing body for proper zoning solutions which may entail political struggles beyond the installation's control. Also, the municipality must be wary of "taking land without compensation," which is a citizen's rights issue that is often raised in zoning proceedings.

C.3 OVERLAY DISTRICTS

An overlay district is generally defined as any specially mapped district which is subject to supplementary regulations or requirements for development. Overlay districts, by either adding restrictions to or removing restrictions from the underlying zoning, provide specific provisions designed to address issues unique to a particular geographic area. They are used to curb discordant development in places where a specific resource (cultural, economic, or environmental) is in jeopardy.

The following are some examples of situations that may garner the creation of an overlay district:

- Neighborhood/Historic Area Preservation
- Focused Economic Development – targeted revitalization areas, business parks, etc.
- Natural Resource Protection – watersheds, aquifers, wildlife corridors, etc.
- Infrastructure Protection – airports, military bases, cultural districts, etc.
- Specific Plans – university districts, cultural districts, etc.

The provisions set forth in an overlay district can regulate any number of things from construction materials or styles (to better fit a historical district or provide for noise protection next to an airport), to business types and practices (in order to protect something like a reservoir).

- **Positive Features of Overlay Districts.** Allow great regulatory flexibility to be assigned to a very specific area so that any inconvenience affects the fewest number if people possible. Also, costs the local government and sponsoring party very little to implement.

- **Negative Features of Overlay Districts.** Must be approved by community/city council and is subject to public hearings. Implementation also subject to local political climate and public perception/attitudes.

C.4 EASEMENTS

Easements can be an effective and permanent form of land use control; in many instances, better than zoning when trying to resolve and installations compatibility issues. Easements are permanent (with the title held by the purchaser until sold or released), work equally well within different jurisdictions, are enforceable through civil courts, and may be acquired often at a fraction of the cost of the land value. Another consideration is that the land is left free for full development with noise-compatible uses.

- **Definition.** An easement is the right of another to part of the total benefits of the real property owner. When dealing with the laws of property in this country, ownership of property includes possession of a series of rights to the use of that property. Certain rights to the property are always retained by the state or the general public (e.g., police power, taxation, eminent domain, escheat, etc.), and certain rights are retained by the neighboring property owners (e.g., the flow of water across land). But, the owner controls the rest of the rights to build, log, mine, etc. Usually when property is acquired, all of the rights are purchased (i.e., in fee simple). However, it is possible to buy only the selected rights that are actually needed in the form of easements. The cost of an easement is determined by the value of those rights to the land owner. If the easement will not adversely affect the owner's contemplated usage or sale of the land, the price will be low; if it does, the price will be higher.

There are two basic classes of easements: positive and negative. In positive easements, the right to do something with the property (such as build a road) is acquired. In negative easements, the rights are acquired to prevent the owner of the property from doing something (such as erecting billboards). For issues of noise compatibility, both a positive easement to make noise over the land and the negative easement to prevent the creation of an unprotected noise-sensitive use on the property may need to be acquired to ensure adequate control.

- **Obtaining Easements.** Easements can be obtained in several ways including purchase, condemnation, and dedication. For each easement required, it is wise to include a legal description of the noise that may be created over the property and the classes of uses that may be established or maintained with and without soundproofing.

- **Positive Features of Easements.** Easement purchases are very straightforward transactions and are almost always less expensive than fee-simple purchases. They allow the installation to retain control over adjacent land without the burden of actual ownership, and they are also usable in cases for which development already surrounds the installation.

- **Negative Features of Easements.** There may be difficulty in getting the cooperation necessary to obtain easements, particularly when many land owners are involved. Also, unless otherwise specified, the rights are not automatically transferred upon resale of the land, so future negotiations may be required.

C.5 TRANSFER OF DEVELOPMENT RIGHTS (TDR)

Under the TDR concept, come of the property's developmental rights are transferred to a remote location where they may be used to intensify allowable development. So, for example, lands within an installation's noise-impacted area could be kept in open space or agricultural areas, and their developmental rights for residential uses transferred to more appropriate locations. In this system, land owners are compensated for their rights at market value, and the purchaser either holds the rights or recoups the investment when houses are built and sold using the rights. The TDR approach must be fully coordinated with the community's planning and zoning office, and it may be necessary for the zoning ordinance to be amended so that it permits TRDs. Also, transfers usually must be contained within single zoning jurisdictions.

- **Positive Features of TDRs.** The program itself is inexpensive or cost-free to the installations because it is administered by the local governments, and it may stimulate development in the areas to which the rights are being transferred.

- **Negative Features of TDRs.** One potential problem is record keeping. Because of the complexity of the transactions, it is often difficult to keep track of the principals and the exact number of rights that are sold and bought. Nevertheless, it can be done and this system is currently in place in Harford County, Maryland—the home of Aberdeen Proving Ground—and many others.

C.6 LAND PURCHASES

Fee-simple purchase of noise impacted land is the most positive form of land use control, but it is also the most expensive. It must be kept in mind though while the costs may seem excessive on the surface, the net cost may be reduced substantially with either resale for compatible uses or retention and use for a compatible public purpose. As a preventive measure, purchase should be mostly limited to critical locations and to situations where other solutions are not feasible.

- **Positive Features of Land Purchase.** Allows installation complete control over the use of the land including sale at a later date.

- **Negative Features of Land Purchase.** The biggest problem with this method is that the initial cost of acquiring the land may be too great to justify. Additionally, the cost of maintaining the land in the future must be factored into to any cost projections.

C.7 BUILDING CODES

A building code prescribes the basic requirements that regulate the construction of structures. It is adopted by the local governing body to protect the health, safety, and general welfare of the occupants of these structures through the establishment of a set of minimum requirements for fire resistance, strength, ventilation, plumbing, etc. Although codes are not a technique to actually prevent development, if properly conceived they can effectively restrict it near military installations by requiring structures to be constructed to a particular standard of sound transmission.

- **Positive Features of Building Codes.** If development is imminent, utilizing the building code ensures that at the very least new structures will be constructed with a certain level of inherent sound proofing.

- **Negative Features of Building Codes.** Building codes do not prevent or restrict any type of actual land use around an installation.

C.8 SUBDIVISION REGULATION

Subdivision regulations are a means by which local government can ensure that proper lot layout, design, and improvements are included in new residential or commercial developments. These requirements may be anything from dictating the width of the roads to placement of the water and/or sewer systems. Since most local governments require some type of public dedication of open space when approving development plans, the installation may lobby to have a provision added to the subdivision regulations that requires this open space to be located nearest the installation boundary to create a buffer.

- **Positive Features of Subdivision Regulations.** The regulations can be used to judiciously locate areas of open space to create buffers between noise sources and receivers.

- **Negative Features of Subdivision Regulations.** Subdivision regulations are only a way to diminish the impact of noise emanating from an installation; they alone will not prevent development around an installation. Also, depending on the scope of the development plans, the buffers created may not be large enough to adequately cut the noise levels.

C.9 DISCLOSURE OF NOISE LEVELS

Since noise levels in a community can be measured and recorded, making information about the true noise levels around military installations can sometimes be all it takes to discourage some incompatible uses. These noise levels can be disclosed in several ways including ordinances (or amendments to existing ordinances), including noise levels in the deed, posting noise levels on any sale/lease/rent sign, and initiating voluntary programs among local realtors to provide potential buyers with installation-provided information and noise level/contour maps.

- **Positive Features of Disclosing Noise Levels.** These programs make easily available to the public information that is otherwise difficult to obtain (particularly for those new to the area), making it easier to make an informed choice about where to live.

- **Negative Features of Disclosing Noise Levels.** Simply disclosing noise levels does not ensure that the information will be used, and programs will be required to educate the public and ensure that the information remains current and available. Moreover, these measures could become costly and time-consuming if noise contours were required to be placed on all municipal maps.

C.10 LAND BANKING

Land banking is when a government acquires a substantial fraction of land in a region available for future development for the purpose of implementing a public land use policy. Banking differs from permanent acquisition in that it places the land in a temporary holding status to be turned over for development at a future date.

- **Positive Features of Land Banking.** The two primary arguments in favor of land banking are that it has an anti-inflationary effect in land prices (preventing land speculation), and it will permit more rational patterns of development rather than urban sprawl.

- **Negative Features of Land Banking.** There is not total agreement that land banking is effective. Additionally, beginning a land banking program requires a large expenditure (though this money is recovered when the land is ultimately sold) and there is the possibility that the program can become politically influenced.

C.11 SALES AGREEMENT

An essential ingredient in transferring real estate into a valuable commodity is a legally binding written sales agreement to establish the terms agreed upon by the buyer and seller. An installation, through sales agreements, can restrict the use of surrounding lands if they own or control them.

- **Positive Features of Sales Agreements.** After signing, the sales agreement is a legally binding contract, and either of the parties can seek legal recourse through the legal system if the contract is broken.

- **Negative Features of Sales Agreements.** Unlike the restrictive covenant, the sales agreement pertains only to the prospective buyer, so terms do not carry over to future sales of the property unless so stated in the contract. In addition, certain areas of agreements and contracts are subject to misrepresentation and fraud.

C.12 DEED RESTRICTIONS/COVENANTS

A deed is a document conveying ownership of land from one party to another, and restrictions called *covenants* can be added to the deed to specify restrictions on the use of the land. These covenants are on top of the restrictions already imposed by the current zoning of the property and in many instances may supersede zoning by prohibiting specified uses that would otherwise be allowed. Restrictive covenants "run with the land;" that is, no matter how often the land is resold, these covenants remain in effect until the specified length of the covenant has expired (usually 20-30 years).

In order to utilize this option, the installation must already own or must acquire the property. Then, when reselling the property, the installation specifies which uses are permitted on the land thereby preventing incompatible uses (such as residential housing) for as long as the restrictions remain in effect.

- **Positive Features of Deed Restrictions/Covenants.** This method is attractive because it allows the installation to retain control over surrounding land uses without needing to continue ownership of the land (thus lessening the tax burden). Deed restrictions are legally enforceable no matter how many times the property is sold.

- **Negative Features of Deed Restrictions/Covenants.** This method requires convincing those in charge that it is necessary to purchase more land than is directly needed, even if it is to be resold shortly thereafter. Though rare, there have been cases where courts have declared covenants unreasonably restrictive or impractical and allowed them to be removed by the land owner.

C.13 PURCHASE OF DEVELOPMENT RIGHTS

A title to real property contains several rights, including that of development. Purchasing this single right of development, a military installation can effectively prevent incompatible development by taking away anyone else's chance to build on the land; all at a cost that is considerably less than that of purchasing an entire parcel outright. A program of purchasing development rights works best when the development rights of agricultural lands are the primary focus; the installation protects itself and the land remains productive.

- **Positive Features of Purchasing Development Rights.** While development rights are usually the most expensive rights a parcel of land has, purchasing them is still usually less expensive than purchasing the parcel outright and it may yield the same results. There are no ongoing administrative costs once all of the purchases have been made and the military is not responsible for the upkeep of the land.

- **Negative Features of Purchasing Development Rights.** The money required for such programs is usually front-loaded so obtaining the large lump-sums for purchasing the rights may be difficult. Also, if the best use of the land happens to be something like high density residential, the cost of the rights may not be appreciably less than that of fee-simple ownership.

C.14 PURCHASE OPTION

A purchase option is an agreement whereby the seller agrees to hold the property for a specified time and, in turn, the buyer agrees to pay a sum of money as consideration for that offer. At the time the option is granted, no real property ownership rights pass. Instead, the buyer is purchasing the right to buy at a fixed price within a specified period of time and the seller retains the money paid regardless of whether the option is exercised. This option can be used when funds cannot be immediately acquired to purchase this property outright or if more time is needed to explore possibilities such as rezoning.

- **Positive Features of Purchase Options.** As mentioned above, an option can allow the buyer time to locate and secure the funds necessary to make the final purchase.

- **Negative Features of Purchase Options.** This technique requires the expenditure of funds to purchase the option, and that money is lost if the installation is unable to complete the purchase of the property itself.

APPENDIX D

FICUN GUIDELINES FOR CONSIDERING NOISE IN LAND USE PLANNING

SLUCM No.	LAND USE	NOISE ZONES AND ADNL LEVELS (dBA)						
		Noise Zone I		Noise Zone II		Noise Zone III		
		0-55	55-65	65-70	70-75	75-80	80-85	85+
10	**RESIDENTIAL**							
11	Household Units	yes	yes*	25[1]	30[1]	no	no	no
12	Group Quarters	yes	yes*	25[1]	30[1]	no	no	no
13	Residential Hotels	yes	yes*	25[1]	30[1]	no	no	no
14	Mobile Home Parks or Courts	yes	yes*	no	no	no	no	no
15	Transient Lodgings	yes	yes*	25[1]	30[1]	35[1]	no	no
16	Other Residential	yes	yes*	25[1]	30[1]	no	no	no
20, 30	**MANUFACTURING**							
21	Food & Kindred Products	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
22	Textile Mill Products	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
23	Apparel/Other Finished Products	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
24	Lumber & Wood Products	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
25	Furniture and Fixtures	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
26	Paper & Allied Products	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
27	Printing, Publishing & Allied Industries	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
28	Chemicals & Allied Products	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
29	Petroleum Refining & Related Industries	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
31	Rubber & Misc Plastic Products - Manufacturing	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
32	Stone, Clay & Glass Products - Manufacturing	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
33	Primary Metal Industries	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
34	Fabricated Metal Products - Manufacturing	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
35	Professional, Scientific & Controls	yes	yes	yes	25	30	no	no
39	Miscellaneous Manufacturing	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
40	**TRANSPORTATION, COMMUNICATION & UTILITIES**							
41	Railroad, Rapid Rail Transit & Street Rail	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[4]
42	Motor Vehicle Transportation	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[4]
43	Aircraft Transportation	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[4]
44	Marine Craft Transportation	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[4]
45	Highway & Street Right-of-Way	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[4]
46	Automobile Parking	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
47	Communications	yes	yes	yes	25 [5]	30 [5]	no	no
48	Utilities	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[4]
49	Other Transportation, Communications & Utilities	yes	yes	yes	25 [5]	30 [5]	no	no

SLUCM No.	LAND USE	NOISE ZONES AND ADNL LEVELS (dBA)						
		Noise Zone I		Noise Zone II		Noise Zone III		
		0-55	55-65	65-70	70-75	75-80	80-85	85+
50	**TRADE**							
51	Wholesale Trade	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
52	Retail Building Materials, Hardware/Farm	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
53	Retail - General Merchandise	yes	yes	yes	25	30	no	no
54	Retail - Food	yes	yes	yes	25	30	no	no
55	Retail - Auto, Marine, Aircraft & Parts	yes	yes	yes	25	30	no	no
56	Retail - Apparel & Accessories	yes	yes	yes	25	30	no	no
57	Retail - Furniture Furnishings & Equipment	yes	yes	yes	25	30	no	no
58	Retail - Eating and Drinking Facilities	yes	yes	yes	25	30	no	no
59	Other Retail Trade	yes	yes	yes	25	30	no	no
60	**SERVICES**							
61	Finance, Insurance & Real Estate Services	yes	yes	yes	25	30	no	no
62	Personal Services	yes	yes	yes	25	30	no	no
62.4	Cemeteries [11]	yes	yes	yes	yes[2]	yes[3]	yes[4]	yes[6]
63	Business Services	yes	yes	yes	25	30	no	no
64	Repair Services	yes	yes	yes	yes[2]	yes[3]	yes[4]	no
65	Professional Services	yes	yes	yes	25	30	no	no
65.1	Hospitals, Nursing Homes	yes	yes*	25*	30*	no	no	no
65.1	Other Medical Facilities	yes	yes	yes	25	30	no	no
66	Contract Construction Services	yes	yes	yes	25	30	no	no
67	Government Services	yes	yes*	yes*	25*	30*	no	no
68	Educational Services	yes	yes*	25*	30*	no	no	no
69	Miscellaneous Services	yes	yes	yes	25	30	no	no
70	**CULTURAL, ENTERTAINMENT & RECREATION**							
71	Cultural Activities, Churches	yes	yes*	25*	30*	no	no	no
71.2	Nature Exhibits	yes	yes*	yes*	no	no	no	no
72	Public Assembly	yes	yes	yes	no	no	no	no
72.1	Auditoriums, Concert Halls	yes	yes	25	30	no	no	no
72.11	Outdoor Music Shells, Amphitheaters	yes	yes*	no	no	no	no	no
72.2	Outdoor Sports Arenas, Spectator Sports	yes	yes	yes[7]	yes[7]	no	no	no
73	Amusements	yes	yes	yes	yes	no	no	no
74	Recreational Activities	yes	yes*	yes*	25*	30*	no	no
75	Resorts, Groups & Camps	yes	yes*	yes*	yes*	no	no	no
76	Parks	yes	yes*	yes*	yes*	no	no	no
79	Other Cultural, Entertainment & Recreation	yes	yes*	yes*	yes*	no	no	no

SLUCM No.	LAND USE	NOISE ZONES AND ADNL LEVELS (dBA)						
		Noise Zone I		Noise Zone II		Noise Zone III		
		0-55	55-65	65-70	70-75	75-80	80-85	85+
80	**RESOURCE PRODUCTION & EXTRACTION**							
81	Agriculture (Except Livestock)[11]	yes	yes	yes[8]	yes[9]	yes[10]	yes[10]	yes[10]
81.5 to 81.7	Livestock Farming & Animal Breeding	yes	yes	yes[8]	yes[9]	no	no	no
82	Agriculture Related Activities[11]	yes	yes	yes[8]	yes[9]	yes[10]	yes[10]	yes[10]
83	Forestry Activities & Related Services[11]	yes	yes	yes[8]	yes[9]	yes[10]	yes[10]	yes[10]
84	Fishing Activities & Related Services	yes	yes	yes	yes	yes	yes	yes
85	Mining Activities & Related Services	yes	yes	yes	yes	yes	yes	yes
89	Other Resource Production & Extraction	yes	yes	yes	yes	yes	yes	yes

Legend:

SLUCM	Standard Land Use Coding Manual
Yes	Land use and related structures compatible without restrictions.
No	Land use and related structures are not compatible and should be prohibited.
ADNL	A-weighted day-night sound level
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Yes[x]	"Yes," but with restrictions. See footnotes.
25, 30, 35	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 must be incorporated into the design and construction of the structure.
25*, 30*, 35*	Land use generally compatible with NLR; however, measures to achieve an overall NLR do not necessarily solve noise difficulties and additional evaluation is warranted.

Footnotes:

* The designation of these uses as "compatible" in this zone reflects individual Federal agencies' consideration if general cost and feasibility factors as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

(A) Although local conditions may require residential use, it is discouraged in 65-70 ADNL and strongly discouraged in 70-75 ADNL, The absence of viable alternative development options should be determined and an evaluation indication that a demonstrated community need for residential use would not be met if development were prohibited in these zones should be conducted prior to approval.

(B) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 dB (in 65-70 ADNL areas) and 30 dB (in 70-75 ADNL areas) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, or 15dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels.

(C) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground-level transportation sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.

X^2 Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

X^3 Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

APPENDIX E

AR 200-1, OPERATIONAL NOISE SECTION; DODI

Chapter 14
Operational Noise

14–1. Policy

a. Evaluate and document the impact of noise produced by ongoing and proposed Army actions/activities and minimize annoyance to humans to the extent practicable.

b. Develop installation noise management plans as appropriate.

c. Reduce noise to acceptable levels in on-post noise sensitive locations (for example, medical treatment, education, family housing) through appropriate land use planning and/or architectural and engineering controls.

d. Monitor, record, archive and address operational noise complaints.

e. Develop and procure weapons systems and other military combat equipment (for example, electrical generators, etc.) that produce less noise, when consistent with operational requirements. Measure the noise emitted by all combat equipment and weapons systems to be used in training before deployed to units.

f. Procure commercially manufactured products, or those adapted for general military use that produce less noise, and comply with regulatory noise emissions standards.

g. Acquire property only as a last resort to resolve off-post noise issues.

h. Manage operational noise issues and community relations to maintain sustainable testing and training capabilities and prevent encroachment.

14–2. Legal and other requirements

Property and tort law; Noise Control Act of 1972, Quiet Communities Act of 1978; AR 95–1; AR 210–20; AR 350–19; and applicable State and local laws.

14–3. Major program goals

a. Control operational noise to protect the health and welfare of people, on- and off- post, impacted by all Army-produced noise, including on- and off-post noise sources.

b. Reduce community annoyance from operational noise to the extent feasible, consistent with Army training and materiel testing mission requirements.

c. Actively engage local communities in land use planning in areas subject to high levels of operational noise and a high potential for noise complaints.

14–4. Program requirements

a. Noise descriptors (metrics) appropriate for determination of compatible land use, and assessment procedures will be based on the best available scientific information.

(1) The day-night level (DNL) is the primary descriptor for military noise, except small arms, see table 14–1. The DNL is the time weighted energy average sound level with a 10-decibel (dB) penalty added to the nighttime levels (2200 to 0700 hours). The DNL noise metric may be further defined, as appropriate, by the installation with a specific, designated time period (for example, annual average DNL, average busy month DNL). The typical assessment period over which the noise energy is averaged is 250 days for Active Army installations and 104 days for Army Reserve and National Guard installations. The use of average busy month DNL is appropriate when the OPTEMPO is significantly different during certain peak periods of the year. For future land use planning and encroachment assessment purposes, a reasonable annual growth factor in activity (for example, 10 or 15 percent) may be assumed.

(2) Supplemental metrics, such as single event noise data (for example, Peak, PK 15(met) or CSEL), may be employed where appropriate to provide additional information on the effects of noise from test and training ranges. A-weighted maximum noise levels will be used to assess aviation low level military training routes (MTRs) and/or flight tracks.

(3) The use of average noise levels over a protracted time period generally does not adequately assess the probability of community noise complaints. Assess the risk of noise complaints from large caliber impulsive noise

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resulting from testing and training activities, ex. armor, artillery, mortars and demolition activities, in terms of a single event metric, either peak sound pressure level (PK 15(met)) or C-weighted sound exposure level (CSEL). The metric PK 15(met) accounts for statistical variation in received single event peak noise level that is due to weather. It is the calculated peak noise level, without frequency weighting, expected to be exceeded by 15 percent of all events that might occur. If there are multiple weapon types fired from one location, or multiple firing locations, the single event level used should be the loudest level that occurs at each receiver location.

(4) Assess noise from small arms ranges using a single event metric, either PK 15(met) or A-weighted sound exposure level (ASEL).

(5) Use the land use planning zone (LUPZ) contour to better predict noise impacts when levels of operations at airfields or large caliber weapons ranges are above average.

(6) Use available DOD noise assessment software as the primary means of operational noise assessment.

(7) Prepare noise maps showing noise zones and limits as defined in tables 14–1 and 14–2.

(8) Manage noise-sensitive land uses, such as housing, schools, and medical facilities as being acceptable within the LUPZ and noise zone I, normally not recommended in noise zone II, and not recommended in noise zone III. These noise zones are defined in table 14–1.

(9) Single event noise limits in table 14–2 correspond to areas of low to high risk of noise complaints from large caliber weapons and weapons systems. These should be used to supplement the noise zones defined in table 14–1 for land use decisions. Noise sensitive land uses are discouraged in areas where PK 15(met) is between 115 and 130 dB; medium risk of complaints. Noise sensitive land uses are strongly discouraged in areas equal to or greater than PK 15(met) = 130 dB; high risk of noise complaints. For infrequent noise events, installations should determine if land use compatibility within these areas is necessary for mission protection. In the case of infrequent noise events, such as the detonation of explosives, the installation should communicate with the public.

(10) Transportation and industrial noise will be assessed on a case by case basis using appropriate noise metrics, including U.S. Department of Transportation guidelines.

b. Address issues concerning building vibration and rattle due to weapons blast through the appropriate subject matter experts and legal counsel.

c. Address noise impacts on domestic animals and wildlife, as required, through the study of each species' response or a surrogate response to noise. The noise levels set forth herein apply to humans only and do not apply to domestic animals or wildlife.

Table 14–1
Noise Limits for Noise Zones

Noise zone	Noise limits (dB)	Noise limits (dB)	Noise limits (dB)
	Aviation ADNL	Impulsive CDNL	Small arms — PK 15(met)
LUPZ	60 - 65	57 - 62	N/A
I	< 65	< 62	<87
II	65 - 75	62 - 70	87 - 104
III	>75	>70	>104

Legend for Table 14-1:
dB=decibel
LUPZ=land use planning zone
ADNL=A-weighted day-night levels
CDNL=C-weighted day-night levels
PK 15(met)=Single event peak level exceeded by 15 percent of events
<=less than
>=greater than
N/A=Not Applicable

Table 14–2
Risk of Noise Complaints by Level of Noise

Risk of Noise complaints	Large caliber weapons noise limits (dB) PK 15(met)
Low	< 115
Medium	115 - 130
High	130 - 140
Risk of physiological damage to unprotected human ears and structural damage claims	> 140

Legend for Table 14-2:
dB = decibel
PK 15(met) = Single event peak level exceeded by 15 percent of events

Notes:
[1] Although local conditions regarding the need for housing may require noise-sensitive land uses in Noise Zone II, on or off post, this type of land use is strongly discouraged. The absence of viable alternative development options should be determined and an evaluation should be conducted locally prior to local approvals indicating that a demonstrated community need for the noise-sensitive land use would not be met if development were prohibited in Noise Zone II.
[2] Where the community determines that these uses must be allowed, measures to achieve an outdoor to indoor noise level reduction (NLR) of at least 25 dB to 30 dB in Noise Zone II, from small arms and aviation noise, should be incorporated into building codes and be in individual approvals. The NLR for communities subject to large caliber weapons and weapons system noise is lacking scientific studies to accomplish the recommended NLR. For this reason it is strongly discouraged that noise-sensitive land uses be allowed in Noise Zone II from large caliber weapons.
[3] Normal permanent construction can be expected to provide a NLR of 20 dB, for aircraft and small arms, thus the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation, upgraded Sound Transmission Class (STC) ratings in windows and doors and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels or vibrations.
[4] NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers, can help mitigate outdoor noise exposure NLR particularly from ground level aircraft sources. Barriers are generally not effective in noise reduction for large arms such as artillery and armor, large explosions, or from high-level aircraft sources.

Department of Defense

INSTRUCTION

NUMBER 4715.13
November 15, 2005

USD(AT&L)

SUBJECT: DoD Noise Program

References: (a) DoD Directive 5134.1, "Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L))," December 9, 2005
(b) DoD Directive 5124.2, "Under Secretary of Defense for Personnel and Readiness (USD(P&R))," October 31, 1994
(c) DoD Instruction 4165.57, "Air Installations Compatible Use Zones," November 8, 1977
(d) DoD Directive 5000.1, "The Defense Acquisition System," May 12, 2003
(e) through (g), see enclosure 1

1. PURPOSE

Under the authority of reference (a) and in conformance with reference (b), this Instruction establishes policy and assigns responsibilities for a coordinated DoD noise program. It also provides for establishment of a DoD Noise Working Group (DNWG).

2. APPLICABILITY

This Instruction applies to the Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the Department of Defense (hereafter referred to collectively as the "DoD Components").

3. DEFINITION

Noise. For the purposes of this Instruction, noise is defined as unwanted sound generated from the operation of military weapons or weapons systems (e.g., aircraft, small arms, tank guns, artillery, missiles, bombs, rockets, mortars, and explosives) that affects either people, animals (domestic or wild), or structures on or in areas in proximity of a military installation;

1

occupational noise exposure and underwater sound associated with ship testing and training activities are specifically excluded from this definition.

4. POLICY

The DoD noise program shall:

4.1. Reduce adverse effects from the noise associated with military test and training operations consistent with maintaining military readiness.

4.2. Consider the adverse effects of noise from military weapons or weapons systems on the ability to test, train, and operate weapons systems during the development of Initial Capabilities Documents, Capability Development Documents, Capability Production Documents and Capstone Requirements Documents and throughout the Joint Capabilities Integration and Development System and associated acquisition processes.

4.3. Integrate, without degrading mission capabilities, noise management techniques and principles into installation, operational range, and operating area plans and programs and incorporate into Air Installation Compatible Use Zone and Joint Land Use Study program efforts (reference (c) and DoD Instruction 3030.3 (reference (g)).

4.4. Promote scientific research and the use of sound scientific methods and validated noise data as the basis for and the establishment of noise program guidance.

4.5. Promote the development of initiatives to educate and train DoD military, civilian and contractor personnel, and the public on noise issues.

4.6. Leverage resources to the maximum extent possible by ensuring the coordination of DoD noise program initiatives among the Department of Defense and other Federal Agencies.

4.7. Promote outreach with entities affected by noise generated from the operation of military weapons and weapons systems.

5. RESPONSIBILITIES

5.1. The Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) shall:

5.1.1. Provide policy, guidance, oversight, and representation for the DoD noise program.

5.1.2. Establish noise policy and guidance that fully addresses military readiness considerations and ensures noise impacts are considered in the development, acquisition, and

fielding of weapons and weapons systems, in coordination with the Under Secretary of Defense for Personnel and Readiness and the Director of Operational Test and Evaluation.

5.1.3. Review USD(AT&L) DoD Directives 4165.57 and 5000.1 (references (c) and (d)) and DoD Instruction 4715.9 (reference (e)), and supporting references for consistency, revision, and elimination of duplicative requirements.

5.2. The Deputy Under Secretary of Defense for Installations and Environment (DUSD(I&E)), under the USD(AT&L), shall:

5.2.1. Develop and promulgate goals and objectives for the DoD noise program and establish metrics to evaluate progress toward meeting those goals and objectives.

5.2.2. Develop DoD noise program guidance and establish requirements and priorities for use in DoD Component planning, programming, and budgeting, in consultation with the DoD Components.

5.2.3. Consult with the Military Departments on their various installation compatible land use and noise management programs through the DNWG and the Range Sustainment Working Integrated Product Team process.

5.2.4. Establish, support, and provide guidance to a DNWG that includes representatives from the Military Departments. The DNWG shall:

5.2.4.1. Evaluate and advise the DUSD(I&E) and the DoD Components on noise-related issues that have a bearing on the Department of Defense's ability to carry out its assigned mission requirements.

5.2.4.2. Coordinate and provide recommendations on technical and policy issues concerning noise associated with military testing and training activities and the impacts of such noise.

5.2.4.3. Represent DUSD(I&E) at meetings of the Federal Interagency Committee on Aviation Noise and maintain liaison with other Federal and State Agencies, nongovernmental organizations, professional organizations, educational institutions, and industries having similar interests or responsibilities.

5.3 The Under Secretary of Defense for Personnel and Readiness shall:

5.3.1. Coordinate on all policy and guidance issued by the USD(AT&L) regarding the DoD noise program to ensure the policy and guidance fully address military readiness considerations.

5.3.2. Review DoD Directive 3200.15 (reference (f)) and supporting issuances for consistency, revision, and elimination of duplicative requirements.

5.4 The Director of Operational Test and Evaluation shall coordinate on all policy and guidance issued by USD(AT&L) regarding the DoD noise program to ensure the policy and guidance fully consider impacts on testing and evaluation and the operations of the Major Range and Test Facility Base within the Department.

5.5. The Heads of the DoD Components shall:

5.5.1. Provide management support, resources, and professionally qualified staff sufficient to ensure effective implementation of the DoD noise program at all organizational levels.

5.5.2. Provide representatives to the DNWG.

5.5.3. Analyze current and future test and training needs to support effective planning, programming, budgeting, and execution of DoD noise program requirements.

5.6. The Chairman of the Joint Chiefs of Staff shall ensure the impacts of noise emissions on the ability to train and operate are considered during the Joint Capabilities Integration and Development System process.

6. EFFECTIVE DATE

This Instruction is effective immediately.

NOV 1 5 2005

Kenneth J. Krieg
Under Secretary of Defense
For Acquisition, Technology, and Logistics

Enclosures - 1
E1. References, continued

E1. ENCLOSURE 1

REFERENCES, continued

(e) DoD Instruction 4715.9, "Environmental Planning and Analysis," May 3, 1996
(f) DoD Directive 3200.15, "Sustainment of Ranges and Operating Areas (OPAREAs)," January 10, 2003
(g) DoD Instruction 3030.3, "Joint Land Use Study (JLUS) Program," July 13, 2004

APPENDIX F

SAMPLE DOCUMENTS

SAMPLE NOISE DISCLOSURE AND WAIVER

Parcel _____ County _____

Grantor(s) Name _____

_____

Grantor(s) Address _____

_____

LEGAL DESCRIPTION:

In accordance with section _____ of the Land Use Ordinance for _____ County, State of _____, furnish disclosure to the owners and potential owners of the above described property adjacent as follows:

1. The Grantors, their heirs, successors, and assigns acknowledge this disclosure that the described property is situated in an area that may be subjected to conditions resulting from military training at _____. Such conditions include the firing of small and large caliber weapons, the overflight of both fixed-wing and rotary-wing aircraft, the movement of vehicles, the use of generators, and other accepted and customary military training activities. These activities ordinarily and necessarily produce noise, dust, smoke and other conditions that may conflict with Grantors' use of Grantors' property for residential and other purposes, and Grantors hereby acknowledge the existence of _____ activities.

2. Nothing in this disclosure shall grant a right to _____ for ingress or egress upon or across the described property. Nothing in this disclosure shall prohibit or otherwise restrict the Grantors from enforcing or seeking enforcement of statues of regulations of governmental agencies for activities conducted on adjacent properties.

3. This disclosure is appurtenant to all property adjacent to the above described property and shall bind to the heirs, successors, and assigns of Grantors and shall endure for the benefit of the adjoined _____. _____ is hereby expressly granted the right of third party enforcement of the disclosure.

IN WITNESS WHEREOF, the Grantors have executed this disclosure dated this _____ day of _____, 20_____.

_____
Grantor

_____
Grantor

SAMPLE NOISE EASEMENT

Parcel _____ County _____

Grantor(s) Name _____

_____

Grantor(s) Address _____

_____

LEGAL DESCRIPTION:

In accordance with section _____ of the Land Use Ordinance for _____ County, State of _____, approving a permit for residential development on the above described property, and in consideration do such approval, Grantors grant to the owners of all property adjacent to the above described property, a perpetual nonexclusive easement as follows:

1. The Grantors, their heirs, successors, and assigns acknowledge by the granting of this easement that the residential development is situated in an area that may be subjected to conditions resulting from military training at _____. Such conditions include the firing of small and large caliber weapons, the overflight of both fixed-wing and rotary-wing aircraft, the movement of vehicles, the use of generators, and other accepted and customary military training activities. These activities ordinarily and necessarily produce noise, dust, smoke, and other conditions that may conflict with Grantor's use of Grantor's property for residential purposes. Grantors hereby waive all common law rights to object to normal and necessary military training activities legally conducted on adjacent _____ which may conflict with Grantor's use of Grantor's property for residential and other purposes, and Grantors hereby grant an easement to the adjacent _____ for such activities.

2. Nothing in this easement shall grant a right to _____ for ingress or egress upon or across the described property. Nothing in this easement shall prohibit or otherwise restrict the Grantors from enforcing or seeking enforcement of statues of regulations of governmental agencies for activities conducted on adjacent properties.

3. This easement is appurtenant to all property adjacent to the above described property and shall bind to the heirs, successors, and assigns of Grantors and shall endure for the benefit of the adjoined _____. _____ is hereby expressly granted the right of third party enforcement of the easement.

IN WITNESS WHEREOF, the Grantors have executed this easement dated this _____ day of _____, 20_____.

_____
Grantor

_____
Grantor

APPENDIX G

GLOSSARY OF TERMS, ACRONYMS, AND ABBREVIATIONS

G. 1 GLOSSARY OF TERMS

A-Weighted Sound Level – a sound level (in decibels) that has been weighted to correspond with the non-linear sensitivity of the human ear. A-weighting discriminates against the lower frequencies and is used to measure most common military sounds such as transportation and small-arms fire.

Ambient Noise – the background noise that is usually present at a particular location; anything from cars on a highway, to insects in the woods.

Atmospheric Refraction – the bending and/or focusing of sound waves by the varying layers and densities of the earth's atmosphere.

C-Weighted Sound Level – like A-weighting, this is another sound level weighting technique that is used to normalize the low, impulsive sounds to the range of human hearing. It is used when measuring low frequency sound such as those from large arms, demolitions, and sonic booms.

Community – those individuals, organizations, or special interest groups affected by or interested in decisions affecting towns, cities, or unincorporated areas near or adjoining a military installation, and officials of local, state, and Federal governments, and Native American tribal councils responsible for the decision making and administration of programs affecting those communities.

Community Involvement Program – a carefully designed program that uses a variety of techniques to inform the public of possible decisions and their potential consequences, and provides opportunities for consultation with the public so that their views may be considered before any decisions are made.

Day-Night Average Sound Level (DNL) – the 24-hour average frequency-weighted sound level, in decibels, from midnight to midnight, obtained after the addition of 10 decibel "penalties" to sound levels between midnight and 7 a.m. and 10 p.m. to midnight (0000 to 0700 hours and 2200 to 2400 hours). A-weighting (ADNL) is understood unless otherwise specified, but C-weighting (CDNL) is also common. This average is calculated over a "year," or about 250 training days.

Decibels (dB) – a logarithmic sound pressure unit of measure.

Encroachment – use or development of the land around a military installation that is incompatible with the operations of that installation.

Equivalent Sound Level (LEQ) – the level of a constant sound which, in a given situation and time period, has the same energy as does a time varying sound. For noise sources which are not in continuous operation, the equivalent sound level may be obtained by summing individual sound exposure level (SEL) values and normalizing them over the appropriate time period.

Frequency – the number of complete oscillation cycles per unit of time. The unit of frequency is the Hertz.

Frequency Weighting – the process of factoring in certain frequencies more or less heavily in order to bring the sound measurement more in line with the characteristics of the receiver (and thus make the numbers more meaningful to the task at hand). Example: A- or C-weighting to specifically parallel the sensitivity of the human ear.

Hertz – the unit of frequency equal to once cycle per second.

Impulse (or Impulsive) Noise – noise of short duration (typically less than one second), high intensity, abrupt onset and rapid decay, and often rapidly changing spectral composition. Impulsive noise is characteristically associated with such sources as explosions, impacts, the discharge of forearms, the passage of supersonic aircraft (creating sonic booms), and many industrial processes.

Large Arms – conventional military weapons over 20 millimeters in diameter.

Modularity – the military concept where forces are constructed of highly skilled and relatively standardized units (in training and equipment) in order to maintain the greatest possible combat flexibility and the shortest possible deployment times.

Noise – any sound without value.

Noise Exposure – the cumulative acoustic stimulation reaching the ear of a person over a specified period of time (e.g., a work shift, a day, of a lifetime).

Noise Level Reduction – the difference, in decibels, between the sound level outside a building and the sound level inside a designated room in the building (usually A-weighted). The NLR is dependent upon the transmission loss characteristics of the building surfaces exposed to an exterior noise source, the particular noise characteristics of the exterior noise source, and the acoustic properties if the designated room in the building.

Noise Zone III – the area around a noise source in which the C-weighted day-night sound level (CDNL) is greater than 70 dB, the A-weighted day-night level (ADNL) is greater than 75 dB, or the PK15(met) is greater than 104 dB.

Noise Zone II – the area around a noise source in which the C-weighted day-night level (CDNL) is 62-70 dB, the A-weighted day-night level (ADNL) is 65-75 dB, or the PK15(met) is 87-104 dB.

Noise Zone I – included all areas around a noise source in which the C-weighted day-night sound level (CDNL) is less than 62 dB, the A-weighted day-night level (ADNL) is less than 65 dB, or the PK15(met) is less than 87 dB. This area is usually suited for all types of land use activities.

PK15(Met) – peak sound level, without frequency weighting and accounting for the statistical variation cause by weather, expected to be exceeded by 15% of all events that might occur. A PK15(met) level of greater than 130 dB has a high risk of complaints, 115-130 dB has a moderate risk of complaints, and below 115 dB has a low risk of complaints.

Propagation – the process by which sound travels through space or material; may be affected by such things as weather, terrain, and barriers.

Small Arms – conventional military weapons less than 20 millimeters in diameter.

Sound Exposure Level (SEL) – the total energy of a sound event normalized to a specific amount of time (e.g., one second) so that sounds of different durations may be compared directly.

Sound Level Meter – an instrument consisting of an amplifier, microphone, and a graduated readout that provides a direct reading of the sound pressure level at a particular location. Sound may be measured in a variety of metrics (e.g., ADNL, CDNL, Peak, etc.) and they must satisfy the requirements of the American National Standards Institute (ANSI) Standard for Sound Level Meters (S1.4-1983).

Unweighted Peak Sound Level – the peak, single event sound level without weighting, without taking into account berms or other attenuation, and without any particular certainty.

G. 2 GLOSSARY OF ACRONYMS AND ABBREVIATIONS

A

AASF	Army Aviation Support Facility
ACUB	Army Compatible Use Buffer
ADNL	A-Weighted Day-Night Average Sound Level
AGD	Adjutant General's Department
AGL	Above Ground Level
AGR	Active Guard and Reserve
ANSI	American National Standards Institute
AR	Army Regulation
ARNG	Army National Guard

B

NONE

C

CA	Combat Arms
CERL	Construction Engineering Research Laboratory
CDNL	C-Weighted Day-Night Average Sound Level
CHABA	National Academy of Sciences Committee on Hearing, Bioacoustics, and Biomechanics
CP/MPQC	Combat Pistol/Military Police Qualification Course
CPQC	Combat Pistol Qualification Course
CS	Combat Support
CSS	Combat Service Support

D

DA	Department of the Army
dB	Decibel(s)
dBA	Decibels, A-Weighted
dBC	Decibels, C-Weighted
dBP	Decibels, Unweighted Peak
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DODI	Department of Defense Instruction

E

EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
ERG	Explosives Research Group

F

FAA	Federal Aviation Administration
FICUN	Federal Interagency Committee on Urban Noise

G

GIS	Geographic Information System

H

HE	High Explosive
HQ	Headquarters
Hz	Hertz

I

INRMP	Integrated Natural Resource Management Plan
IONMP	Installation Operational Noise Management Plan
IPBC	Infantry Platoon Battle Course
ISBC	Infantry Squad Battle Course

J

JLUS	Joint Land Use Study

K

NONE

L

LEQ	Equivalent Sound Level
LUPZ	Land Use Planning Zone

M

MG	Machine Gun
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPMG	Multi-Purpose Machine Gun
MRF	Modified Record Fire
MSA	Metropolitan Statistical Area
MSL	Mean Sea Level

N

NAS	Naval Air Station
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NLR	Noise Level Reduction
NOE	Nap of the Earth
NVG	Night Vision Goggles

O

OEA	Office of Economic Adjustment
ONMP	Operational Noise Management Program
OPTEMPO	Operations Tempo

P

PAO	Public Affairs Office
PL	Public Law
POC	Point of Contact

Q

None

R

ROTC	Reserve Officers Training Corps
RW	Rotary-wing Aircraft (i. e. , a helicopter)

S

SAB	Separate Armored Brigade
SARNAM	Small Arms Range Noise Assessment Model
SEL	Sound Exposure Level
SIB	Separate Infantry Brigade
SONMP	Statewide Operational Noise Management Plan
SRTR	Short Range Training Rounds
STC	Sound Transmission Class

T

TA	Training Area
TAG	The Adjutant General
TDR	Transfer of Development Rights
TNT	Trinitrotoluene
TP	Training Practice

U

UAC	Urban Assault Course
USACERL	U. S. Army Construction Engineering Research Laboratories
USACHPPM	U. S. Army Center for Health Promotion and Preventive Medicine
USAF	U. S. Air Force
USAPHC	U. S. Army Public Health Command
USAR	U. S. Army Reserve
USC	U. S. Code

V, W, X, Y, Z

None

APPENDIX H

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APPENDIX I

NOISE COMPLAINT MANAGEMENT

At the time of publication, the Public Affairs Office (PAO) was in the process of updating the VTARNG Standard Operating Procedure (SOP). Appendix J is blank and is provided to document the Noise Complaint Management Program, including the SOP and Noise Complaint reporting forms. When the updated SOP and aircraft Noise Complaint forms are completed extract this page add a copy of the SOP and Noise Complaint Forms.

APPENDIX J

PROPOSED ACTIVITY NOISE ASSESSMENT