

# STATE OF THE RESERVATION REPORT

TRAINING YEAR 2020 • CAMP EDWARDS  
FINAL





Final Annual State of the Reservation Report, Camp Edwards, Training Year 2020  
March 2021



Prepared by:  
The Massachusetts National Guard  
Environmental & Readiness Center  
Bldg. 3468 Beaman Street  
Camp Edwards, MA 02542  
Phone: 339-202-9342  
[Massnationalguard.org/ERC/index.htm](http://Massnationalguard.org/ERC/index.htm)

# PREFACE

The *Annual State of the Reservation Report* (the Annual Report), established by the Massachusetts Environmental Policy Act process and required by state law (Chapter 47 of the Acts of 2002), is the result of many years of environmental reviews and submissions by the Massachusetts Army National Guard.

The Annual Report describes the nature and extent of military training and other activities taking place in the Camp Edwards Training Area/Upper Cape Water Supply Reserve. In addition, it describes the status of the Massachusetts Army National Guard's compliance with environmental laws, regulations and the Environmental Performance Standards, a set of 19 standards established in Chapter 47 of the Acts of 2002 guiding military and civilian usage of the Camp Edwards Training Area/Upper Cape Water Supply Reserve (Training Area/Reserve). The Annual Report illustrates that military training can occur in the Camp Edwards Training Area/Upper Cape Water Supply Reserve in a manner that is compatible with the natural resources purposes of water supply and wildlife habitat protection.

The *Annual State of the Reservation Report* covers the Massachusetts National Guard's Training Year 2020, which ran from October 1, 2019 to September 30, 2020; therefore, information provided in this report generally encompasses an individual training year rather than calendar year. The report's primary focus is the review of the Massachusetts Army National Guard's environmental programs relative to compliance with applicable local, state, and federal regulations. Each year, the report provides information on military training levels, range area usage, resource management activities, environmental indicators for training activities, and coordination among other activities and projects, such as the regional water supply and the remediation program activities. Cape Cod Air Force Station and the US Coast Guard Communications Station are both located within the boundary of the Upper Cape Water Supply Reserve; however, they are not subject to Chapter 47 of the Acts of 2002 and the Environmental Performance Standards (Chapter 47 of the Acts of 2002, Section 15).

The report also provides information on environmental reviews for proposed Massachusetts National Guard and other projects within the Upper Cape Water Supply Reserve.

The Annual Report is structured as follows:

Section 1, Introduction, discusses the structure of Joint Base Cape Cod and the environmental management structure pertaining to activities in the northern training areas of Camp Edwards.

Section 2, Small Arms Ranges and Military Training Activities, provides an update on the return to live fire at the Small Arms Ranges at Camp Edwards and associated activities. This section also provides information on military training that occurred in the Training Area/Reserve during Training Year 2020. Data is provided on the levels of training in the various training areas in the Training Area/Reserve and range usage, as well as at the various training support area facilities in the Cantonment Area on Camp Edwards.

Section 3, Environmental Program Management, focuses on environmental management programs operated by the Massachusetts Army National Guard in the Training Area/Reserve and program compliance with the Environmental Performance Standards for the Training Area/Reserve for the training year.

Section 4, Remediation Program Activities, provides a summary of remediation activities undertaken in the Training Area/Reserve during the training year by the Installation Restoration Program and the Impact Area Groundwater Study Program.

Section 5, Miscellaneous Military and Civilian Activities and Environmental Program Priorities, provides information on major activities undertaken during Training Year 2020 that may not be directly related to a



Massachusetts Army National Guard environmental management program, actions in the Training Area/Reserve, or specific Environmental Performance Standards for the Training Area/Reserve.

The Annual Report is the culmination of a year-long effort by the military and civilian employees of the Massachusetts Army National Guard, Training Site Camp Edwards, the Environmental & Readiness Center, the Natural Resource Program, and the Environmental Management Commission to provide valuable information on the state of the Training Area/Reserve to interested stakeholders and the community at large. In good faith, the Annual Report is provided to the Environmental Management Commission's Environmental Officer, and the Commission's Science Advisory Council and Community Advisory Council for their input.

## Annual State of the Reservation Report Key Terms

### Upper Cape Water Supply Reserve

The Upper Cape Water Supply Reserve was established by Chapter 47 of the Acts of 2002 as public conservation land dedicated to three primary purposes: water supply and wildlife habitat protection; the development and construction of public water supply systems, and the use and training of the military forces of the commonwealth; provided that, such military use and training is compatible with the natural resource purposes of water supply and wildlife habitat protection. It comprises—and for the purposes of this report, may be synonymous with—Camp Edwards' 14,886-acre northern training area. Cape Cod Air Force Station and US Coast Guard Communications Station Boston are both located within the boundary of the Upper Cape Water Supply Reserve; however, they are not subject to the Environmental Performance Standards.

### Camp Edwards Training Area

The Massachusetts Army National Guard Camp Edwards Training Site (Camp Edwards Training Area) is the major training area for Army National Guard soldiers in the Northeast. It is approximately 14,886 acres located on the northern portion of Joint Base Cape Cod. At Camp Edwards, soldiers practice maneuvering exercises, bivouacking, and use the small arms ranges. The Upper Cape Water Supply Reserve also is located on the 14,886 acres of Camp Edwards. It comprises—and for the purposes of this report, may be synonymous with—Camp Edwards' 14,886-acre northern training area.

### Environmental Performance Standards

The Environmental Performance Standards (Appendix A) are a list of requirements, or standards for performance, that guide both military and other users in the protection of Camp Edwards' natural and cultural resources and the groundwater beneath the Training Area/Reserve. The Environmental Performance Standards are based in large part on existing federal, state, and Department of Defense regulations. In some cases, the protections offered by the performance standards are more stringent than those offered by other regulations. These standards apply to the Upper Cape Water Supply Reserve within the Camp Edwards Training Area. Although Cape Cod Air Force Station and the US Coast Guard Communications Station are located within the boundary of the Upper Cape Water Supply Reserve, the Environmental Performance Standards do not apply to them as they were excluded by Chapter 47 of the Acts of 2002.

### Training Year

A training year runs from October 1 to September 30 and is based on the federal fiscal year. Information found in the annual *State of the Reservation Report* is compiled by training year. This *Annual State of the Reservation Report* is for Training Year 2020 (October 1, 2019 – September 30, 2020).

## Training Support Area

There are separate facilities and equipment that can simulate live military training; these are grouped under the Training Support Area. The majority of the training activities associated with these facilities are conducted in the Cantonment Area of Camp Edwards. Training Support Areas include Kelley Tactical Training Base, the Calero Mobile Military Operations on Urban Terrain Site, the Engagement Skills Trainer, and the Virtual Convoy Operations Trainer.

## Small Arms Ranges

Small arms ranges allow live-fire qualification training with weapons of a small caliber, i.e., pistols, rifles and semi-automatic and automatic rifles. Small arms training is designed to train a soldier to be “qualified” in the use and maintenance of his or her assigned weapon. There are four active small arms ranges on Camp Edwards, which the Massachusetts Army National Guard uses for weapons familiarization, weapons zeroing (essentially customizing it to give the soldier a more accurate shot) and qualification.

## Impact Area

The 2,200-acre Impact Area is located in the center of the Upper Cape Water Supply Reserve/Camp Edwards Training Site. The small arms ranges are situated around the perimeter of the Impact Area, with range firing toward the Impact Area. The 330-acre Central Impact Area is located within the Impact Area; it was the primary target area for artillery, mortar, and other firing activities from the early 1900s until firing ceased in 1997.

## Cantonment Area

The southern 7,200-acre developed area of Joint Base Cape Cod with roads, utilities, office and classroom buildings, training support areas, and housing. There are numerous federal, state and county entities located there.

## Referenced Documents

The Annual *State of the Reservation* report encompasses a large amount of information and makes reference to many letters, reports and other documents that were developed over the course of Training Year 2020. Many of these are available on-line and any letter, document or report referenced in the *Annual State of the Reservation Report* is available by contacting Emily Kelly, Community Involvement Specialist, Massachusetts National Guard Environmental & Readiness Center, 339-202-9341, emily.d.kelly2.nfg@mail.mil.

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# ACRONYMS

AFCEC	Air Force Civil Engineer Center
AFS	Air Force Station
ANGB	Air National Guard Base
AR	Army Regulation
ATV	All Terrain Vehicle
BMP	Best Management Practice
BP	Battle Position
CAA	Clean Air Act
CAC	Community Advisory Council
CAX	Combined Arms Exercise
CER	Camp Edwards Regulation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CIA	Central Impact Area
CMP	Conservation and Management Plan
CMR	Code of Massachusetts Regulations
CPMPP	Construction Period Monitoring and Protection Plan
CPQC	Combat Pistol Qualification Course
CRREL	Cold Regions Research and Engineering Laboratory
CS	Chemical Spill
CSE	Comprehensive Site Evaluation
DBH	Diameter at Breast Height
DCR	Department of Conservation and Recreation
DFG	Department of Fish and Game
DFW	Division of Fisheries and Wildlife
DNA	Deoxyribonucleic acid
DoD	Department of Defense
E&RC	Environmental & Readiness Center
EMC	Environmental Management Commission
EPA	Environmental Protection Agency
EPS	Environmental Performance Standard
FAA	Federal Aviation Administration
FS	Fuel Spill
GLU	Cantonment Grasslands
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IAGWSP	Impact Area Groundwater Study Program
IED	Improvised Explosive Device
IMT	Individual Movement Techniques



**Acronyms, continued**

INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
ISWM	Integrated Solid Waste Management Site
ITAM	Integrated Training Area Management
JBCC	Joint Base Cape Cod
JLUS	Joint Land Use Study
LQG	Large Quantity Generator
MANG	Massachusetts National Guard
MAANG	Massachusetts Air National Guard
MAARNG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MA SHPO	Massachusetts State Historic Preservation Office
MCP	Massachusetts Contingency Plan
MEC	Munitions and Explosives of Concern
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
MGL	Massachusetts General Law
MIPAG	Massachusetts Invasive Plants Advisory Group
mm	millimeter
MMCL	Massachusetts Maximum Contaminant Level
MMR	Massachusetts Military Reservation
MMRP	Military Munitions Response Program
MPMG	Multipurpose Machine Gun Range
NBC	Nuclear-Biological-Chemical
NEPA	National Environmental Policy Act
NHESP	Natural Heritage and Endangered Species Program
NLEB	Northern Long-eared Bat
OB/OD	Open Burning/Open Detonation
OEA	Office of Economic Adjustment
OMMP	Operation, Maintenance and Monitoring Plan
P2	Pollution Prevention
PAVE PAWS	Precision Acquisition Vehicle Entry – Phased Array Warning System
PAI	Pounds of active ingredient
ppb	parts per billion
ppm	parts per million
PAN	Percussion Actuated Neutralizer
PFAS	Per- and polyfluoroalkyl substances
RDX	Royal Demolition Explosive

**Acronyms, continued**

REC	Record of Environmental Consideration
RI/FS	Remedial Investigation/Feasibility Study
ROA	Record of Action
ROTC	Reserve Officers Training Corps
RTI	Regional Training Institute
SAC	Science Advisory Council
SEMSS RRF	Southeastern Massachusetts Resource Recovery Facility
SGCN	Species of Greatest Conservation Need
SPVS	Solar Photovoltaic System
SR/ES	Source Registration/Emissions Statement
SVL	Soldier Validation Lane
TA	Training Area
TSA	Training Support Area
TTB	Tactical Training Base
TY	Training Year
UAS	Unmanned Aerial System
URI	University of Rhode Island
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTES	Unit Training and Equipment Site
UTM	Ultimate Training Munition
WFPC	Wildland Fire Program Coordinator
WPA	Wetlands Protection Act
WWTP	Waste Water Treatment Plant
XRF	X-Ray Fluorescence

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# SECTION 1

## INTRODUCTION

### 1.0 INTRODUCTION

This section of the Annual *State of the Reservation Report* (Annual Report) provides information on Joint Base Cape Cod (JBCC) and the environmental management structure overseeing activities in the approximately 14,886-acre Camp Edwards Training Area/Upper Cape Water Supply Reserve (Training Area/Reserve). The Upper Cape Water Supply Reserve is located on, and is contiguous with, the 14,886 acres of the Camp Edwards Training Area. Excluded from the Upper Cape Water Supply Reserve are areas outside of the operational control of the Massachusetts National Guard (See Section 1.1 and Figure 1-1).

### 1.1 JOINT BASE CAPE COD STRUCTURE

Joint Base Cape Cod is a multi-service military installation and is home to the Massachusetts Army National Guard's (MAARNG) Camp Edwards, the Massachusetts Air National Guard's (MAANG) Otis Air National Guard Base (ANGB), the United States Coast Guard's (USCG) Base Cape Cod, the U.S. Air Force's Cape Cod Air Force Station (AFS), and the Department of Veterans Affairs Cemetery. Joint Base Cape Cod is located in the upper western portion of Cape Cod, immediately south of the Cape Cod Canal in Barnstable County, Massachusetts. It includes parts of the towns of Bourne, Mashpee and Sandwich, and abuts the Town of Falmouth. Joint Base Cape Cod covers nearly 21,000 acres – approximately 30 square miles (Figure 1-1).

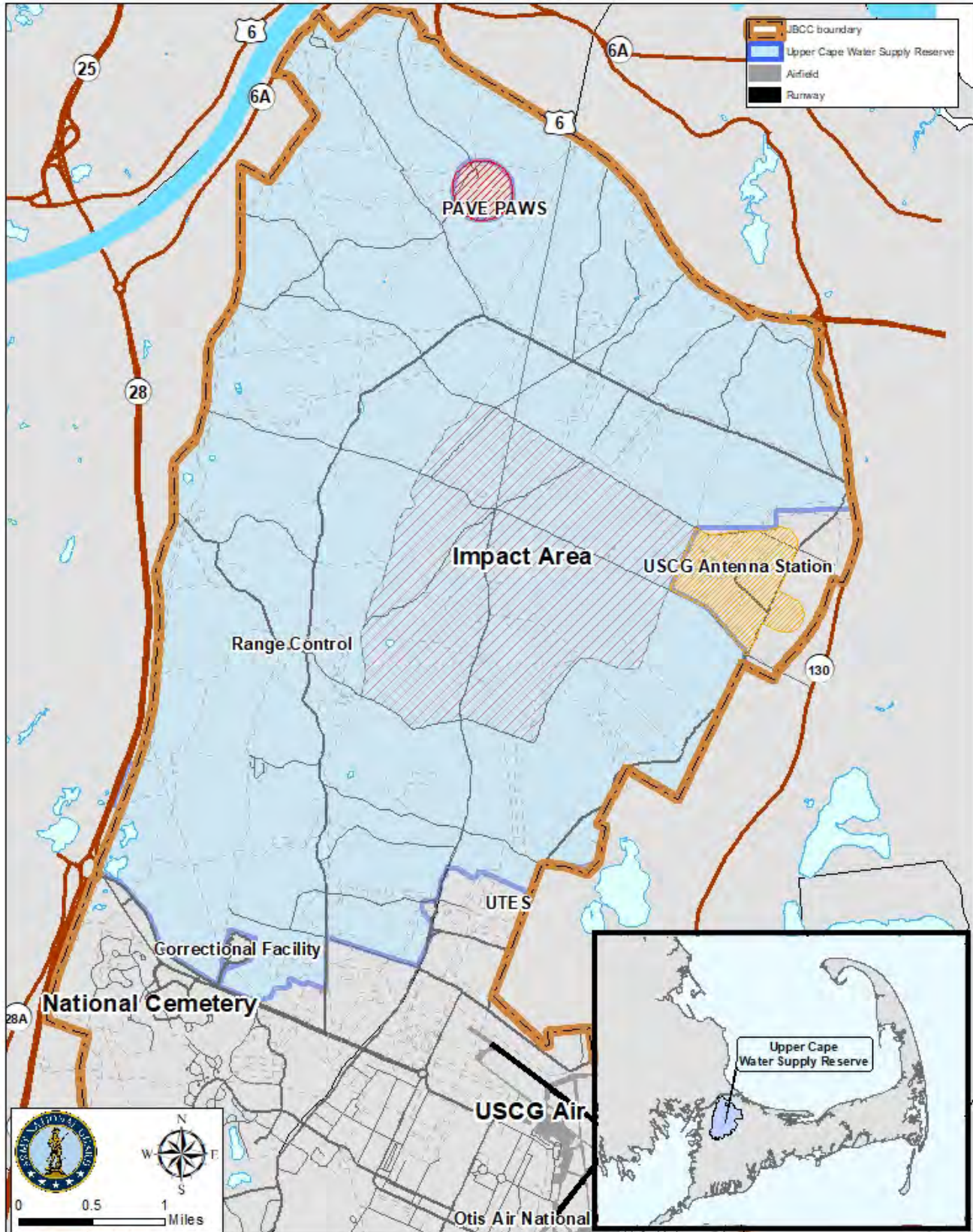
The Camp Edwards Training Area comprises 14,886 acres of the northern portion of JBCC. The remaining Camp Edwards military-controlled area of JBCC lies in the southern portion, or Cantonment Area. The Commonwealth of Massachusetts owns the land comprising Camp Edwards and leases the property to the Department of the Army, who in turn licenses the land to MAARNG for training.

The MAARNG and MAANG are part of the Commonwealth of Massachusetts Military Division. However, federal law largely dictates their activities, make-up, training, and functions. For example, most of the day-to-day activities conducted at JBCC by the National Guard, including annual and weekend training, are federal military activities funded by the federal government. In conducting federal military activities, the National Guard is required by federal law to follow Department of Defense (DoD) regulations, Army regulations, Air Force instructions, and applicable federal and state laws and regulations.

There are three major facilities in the northern portion of JBCC that are not on land under the operational control of the Massachusetts National Guard. Cape Cod AFS, which includes the PAVE PAWS ballistic missile early warning radar system, is located on an 87-acre parcel of land on the northwest corner of the Training Area/Reserve. The USCG's Communications Station is located on a 542-acre parcel along the northeastern side of the Training Area/Reserve. A Barnstable County Correctional Facility that opened in 2004 is located on a 29-acre parcel of land just north of Connery Avenue, just outside the southern edge of the Training Area/Reserve. The locations of these facilities are shown in Figure 1-1. Because these facilities are located on land not under the control of the Massachusetts National Guard, and because the Environmental Performance Standards (EPSs) (see Appendix A) established through Chapter 47 of the Acts of 2002 do not apply to these organizations and facilities, detailed information concerning activities at these facilities is not included in the Annual Report. Questions pertaining to activities at Cape Cod AFS, the Coast Guard Communications Station, and the Barnstable County Correctional Facility should be addressed to the persons listed in Appendix B of this report.



Figure 1-1 Map of Joint Base Cape Cod



The Commonwealth of Massachusetts has issued three utility easements on its state-owned property in the Training Area/Reserve: an electrical power line easement (Eversource), a natural gas pipeline easement (National Grid), and a natural gas pipeline easement (Algonquin - that partially overlays the National Grid easement). Additionally, there are easements issued to the Upper Cape Regional Water Supply Cooperative and to the Bourne Water District. The locations of the utilities and facilities are shown in Figure 1-2.

## 1.2 ENVIRONMENTAL MANAGEMENT STRUCTURE

### 1.2.1 Environmental Management Commission

Chapter 47 of the Acts of 2002 established the Environmental Management Commission (EMC), consisting of the Commissioner of the Department of Fish and Game (DFG), the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP), and the Commissioner of the Department of Conservation and Recreation (DCR). The EMC oversees compliance with and enforcement of the EPSs in the Training Area/Reserve, coordinates the actions of environmental agencies of the Commonwealth in the enforcement of environmental laws and regulations in the Training Area/Reserve, as appropriate, and facilitates an open and public review of all activities in the Training Area/Reserve. The legislation also states that the environmental agencies on the EMC retain all their respective, independent enforcement authority.

Chapter 47 of the Acts of 2002 also directed that the EMC be assisted by two advisory councils, appointed by the Governor of Massachusetts. The Community Advisory Council (CAC), consisting of 15 members, assists the EMC by providing advice on issues related to the protection of the water supply and wildlife habitat within the Training Area/Reserve. The Science Advisory Council (SAC), consisting of up to nine members, assists the EMC by providing scientific and technical advice relating to the protection of the drinking water supply and wildlife habitat within the Training Area/Reserve.

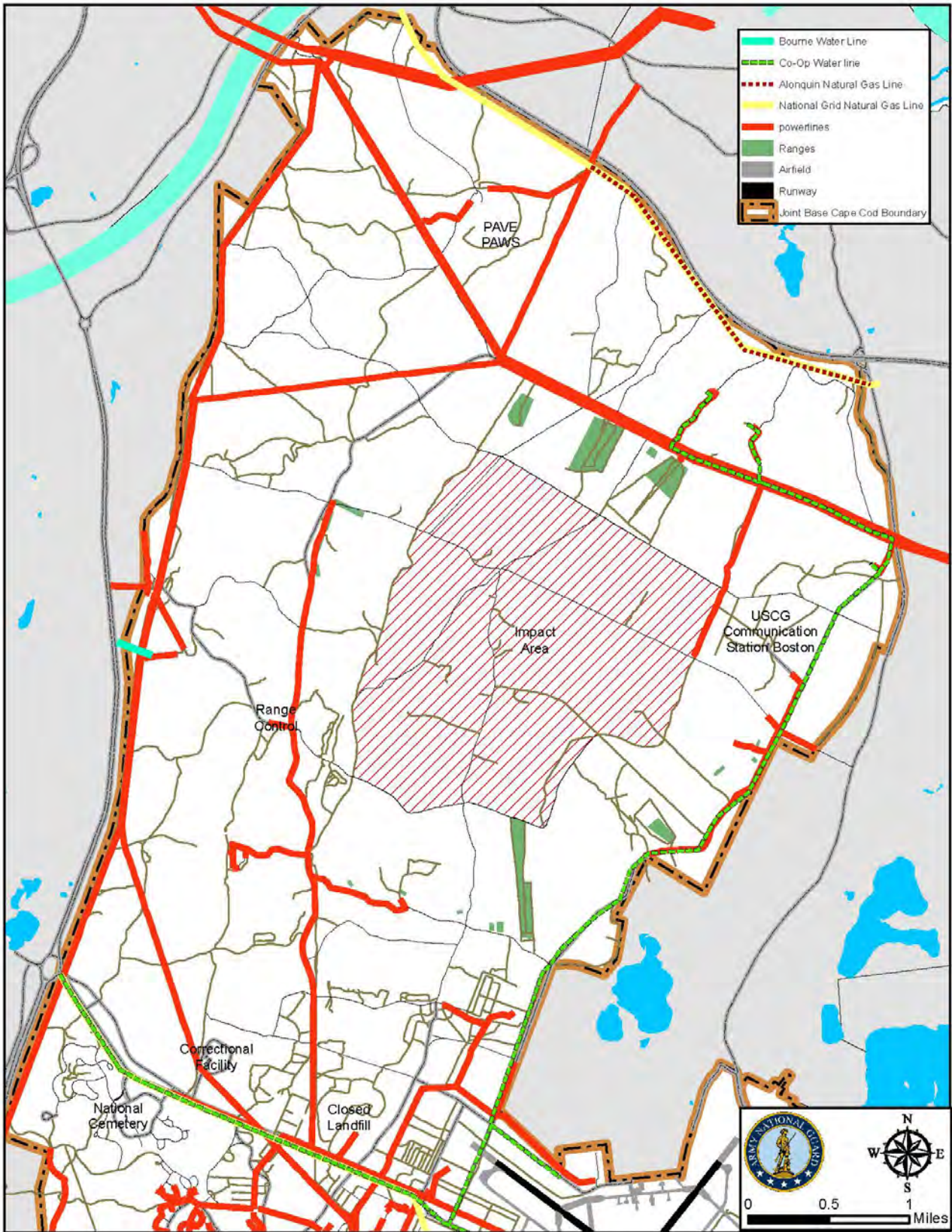
Chapter 47 of the Acts of 2002 also established an Environmental Officer for the Training Area/Reserve. Mr. Leonard Pinaud of MassDEP is the Environmental Officer. In this capacity, he provides monitoring of military and civilian activities on and uses of the Training Area/Reserve and the impact of those activities and uses on the water supply and wildlife habitat. Working directly for the EMC, the Environmental Officer has unrestricted access to all data and information from the various environmental and management programs in the Training Area/Reserve. He has full access to all points in the Training Area/Reserve and conducts inspections at any time in order to monitor, oversee, evaluate, and report to the EMC on the environmental impact of military training and other activities. His on-site monitoring occurs prior to, during, and immediately following training and other activities. The Environmental Officer's monitoring activities include but are not limited to: training sites, pollution prevention and habitat protection activities for both military and military contractors in the Training Area/Reserve, as well as coordinating with and consulting with the Massachusetts National Guard Environmental & Readiness Center (E&RC) on various projects, initiatives and issues.

The Environmental Officer acts as a liaison between the EMC, SAC, CAC, military, general public, and various state agencies. He identifies and monitors ongoing issues regarding training procedures and the environment in the Training Area/Reserve and keeps the EMC, SAC and CAC apprised of the progress of these issues in addition to bringing issues to the E&RC for resolution. He also participates in community outreach activities with the E&RC and facilitates the EMC, SAC and CAC public meetings under the legislation.

The EMC, SAC and CAC met a total of three times during Training Year (TY) 2020. The groups discussed a number of topics, all of which are covered in this report. In November 2017, an Ad Hoc Committee to the Science Advisory Council was established. Please see Section 2.3 for further discussion. Minutes from the meetings may be found at [https://www.massnationalguard.org/ERC/advisory\\_groups\\_minutes.htm#emc](https://www.massnationalguard.org/ERC/advisory_groups_minutes.htm#emc)



Figure 1-2 Utility Easements and Leases



### 1.3 COVID IMPACTS AT CAMP EDWARDS

As in the rest of the world, the impacts of the Covid-19 pandemic were felt on Camp Edwards during TY 2020. Many Massachusetts Army National Guard Units originally scheduled for annual training at Camp Edwards were instead deployed to help with the Covid-19 nursing home testing effort. Currently many are still deployed providing trained expertise to give vaccines to soldiers, nursing home residents, and others. Other units, when their out-of-state training was canceled, were redirected to train at Camp Edwards leading to an increase in training at the Camp.

The pandemic not only affected soldier training but also had impacts on environmental monitoring and management. Most environmental management and monitoring took place as usual although some activities, such as prescribed fire, had to be reduced or canceled due to the necessity of instituting safe Covid practices. The table below summarizes those impacts as noted in the Annual Report.

Antimony Speciation: Lab closure	Section 2.3
Training: Title 32 orders for Covid response	Section 2.9
Training: Increase in pyrotechnic use due to out-of-state training being redirected to Camp Edwards	Section 2.11
Monitoring: Reduced frequency of snake surveys	Section 3.3
Monitoring: Surveys performed by a single observer	Section 3.3.8
Management: In-house herbicide treatment not performed in TY 2020	Section 3.5.2
Management: No prescribed burn operations conducted in TY 2020	Section 3.6.1
Wildland Fire Training: No fire training Spring 2020/no Fall Fire Academy	Section 3.6.2
Hunting: Hunts will proceed if Massachusetts is in Phase 3, but not in lower phases.	Section 3.5.4
Hunting: The wild turkey hunt was canceled in TY 2020.	Section 3.5.5
Monitoring: Personnel support reduced for a joint research project.	Section 3.3.8



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# SECTION 2

## SMALL ARMS RANGES AND MILITARY TRAINING ACTIVITIES

### 2.0 INTRODUCTION

Section 2 of the Annual Report provides an update on actions associated with active small arms ranges in the Training Area/Reserve including range maintenance, environmental sampling, and levels of military and civilian use of the ranges.

This section also provides information on the use of Training Areas, Training Support Areas (TSA) in the Cantonment Area of Camp Edwards, information on simulated munitions, the Soldier Validation Lane (SVL), and off-site training during TY 2020.

The Massachusetts National Guard (MANG) reports on some Cantonment Area training activities to provide context for why soldiers then move into the Training Area/Reserve to conduct the most realistic training possible to provide for trained and ready soldiers. In the words of the MAARNG trainers, soldiers are provided training in a “crawl, walk, run” scenario. The crawl phase is in the classroom where they learn theory and the basics of the training they are about to undertake; the walk phase is where soldiers can literally walk through the training event in a classroom setting, use simulators, or go into the field and walk through a scenario. Finally, the run phase is where the crawl and the walk phase are put into the most realistic field setting possible in the Training Area/Reserve.

### 2.1 CAMP EDWARDS TRAINING AREA/UPPER CAPE WATER SUPPLY RESERVE

#### 2.1.1 Military and Civilian Use

The MAARNG has approximately 5,621 soldiers who train on average one weekend per month and one two-week cycle during a training year. The Training Area/Reserve is also utilized by other Department of Defense (DoD) and law enforcement agencies (i.e.: Marines, US Coast Guard, Barnstable County Sheriff's Department, and local police departments). Units start planning their training several years in advance of the year in which they actually conduct their training. The unit leadership assesses the strengths and limitations of its personnel and begins to schedule training sites and resources to best support the training their units require. During the year prior (TY 2019) to the year of execution (TY 2020) units confirm geographical areas and training sites within the Training Area/Reserve.

Military training activities in the Training Area/Reserve are tracked by Range Control based on individual training area use and the number of personnel participating in this use. This method records the number of times each training area is utilized and the number of personnel and vehicles utilizing the areas for each event. Figure 2-1 shows the locations of the major training areas and small arms ranges in the Training Area/Reserve.

Camp Edwards Range Control manages and tracks training area use. For example, Table 2-1 shows the overall utilization of the ranges, training areas and training support areas during TY 2020, while Table 2-2 shows their utilization for each of the past ten training years. For specific training area use for TY 2020 see Table 2-3 and for the ten year totals for training area use see Table 2-4. Range Control is operational 24 hours per day when units are training and, during the course of a training day, personnel from Range Control will observe units at various locations to ensure that they are following range, safety and environmental regulations.

Military training activities in the Training Area/Reserve are tracked by the number of times each training area is utilized per day and by the number of personnel and vehicles utilizing the areas for each use. In many cases personnel and vehicles utilize more than one training area per day. Figure 2-2 shows color-coded personnel use by training area for TY 2020. Figure 2-3 shows a color-coded personnel use by training area for each of the past ten training years. Figure 2-4 provides a color-coded ten year personnel use by training for the past ten training years. Figure 2-5 shows color-coded daily usage by training area for TY 2020. Figure 2-6 shows a color-coded daily usage by training area for each of the past ten training years with Figure 2-7 providing a color-coded ten year daily usage by training area for the past ten training years. For example, as seen in Figure 2-7, training areas B-8 and B-9 were not used, and area B-11 shows a dramatic increase in use; this is a result of the closing and opening of these training areas due to the proximity to the Monument Beach Sportsman’s Club’s (Club) firing range. These training areas are within the Surface Danger Zone (SDZ) for the rifle range and therefor are closed when the club’s range is operational. An SDZ is a notional, undisturbed safety area extending out from a small arms range where there is a one-in-a-million chance that a bullet may land. The MAARNG and the Club coordinate schedules to ensure safety of Soldiers and Club members.

Graph 2-1 shows personnel use by training area for TY 2020 and the average personnel use by training area for TY 2011 to TY 2020; Graph 2-2 shows days used by training area for TY 2020 and the average days used by training area for TY 2011 to TY 2020. Use of specific training areas is dependent upon its capacity to hold Soldiers, its terrain to support a given training exercise, and restoration of training venues through the cleanup and the ITAM programs. Over the last several years training has focused on collective exercises where training areas that can support these training events are used.

As units become aware that the ranges and other training venues at Camp Edwards meet qualification standards, the use of the areas where these venues are located will increase. Fluctuations in training usage is also largely influenced by deployment cycles and changes to training doctrine and directives. In addition, over the past two decades, legacy contamination cleanup activities (managed by Air Force Civil Engineer Center/Impact Area Groundwater Study Program [See Section 4.0]) in the Training Area/Reserve have resulted in small arms ranges and other training venues being unavailable for use. However, as clean-up activities have been completed these training venues are again available for compatible military use. So, with new ranges, training venues, and eventual completion of the cleanup program, Training Area use and numbers will fluctuate accordingly.

In the Table 2-1 and Table 2-2, civilian use includes use of the ranges and training areas in the Training Area/Reserve and the Training Support Areas (TSA) in the Cantonment Area; civilian use ranges from unmanned aircraft systems ground operations and flight testing, to practicing land navigation, to training in the Calero Mobile Military Operations on Urban Terrain Site, to use of classrooms and other facilities. In addition, there were also public deer and turkey hunting seasons during TY 2020. Information on these activities is provided in Sections 3.5.4 and 3.5.5 of this report. Fluctuations in training days and event numbers from year to year is a result of differing unit training requirements, combined training needs, and deployment cycles.

**TABLE 2-1 OVERVIEW OF TRAINING USE - TY 2020**

Area	Training Days/Events	PERSONNEL	
		Military Personnel	Civilian Personnel
Ranges	192	5,314	701
Training Areas	918	61,574	294
Training Support Areas	1,931	71,586	5,833
<b>TOTAL</b>	<b>3,041</b>	<b>138,474</b>	<b>6,828</b>

Figure 2-1 Camp Edwards Training Area and Ranges

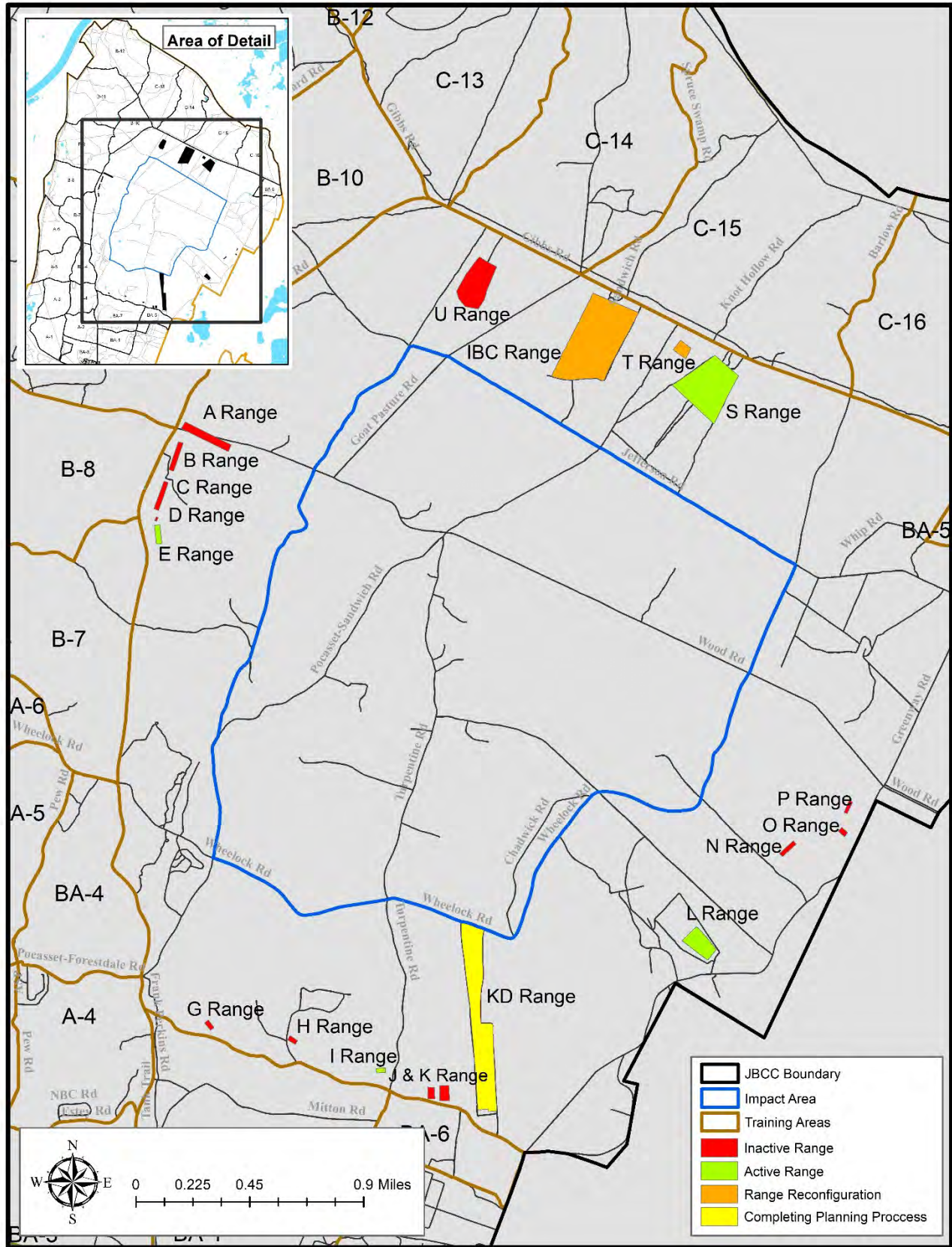




Figure 2-2 Personnel Usage by Training Area in the Training Area/Reserve, TY 2020

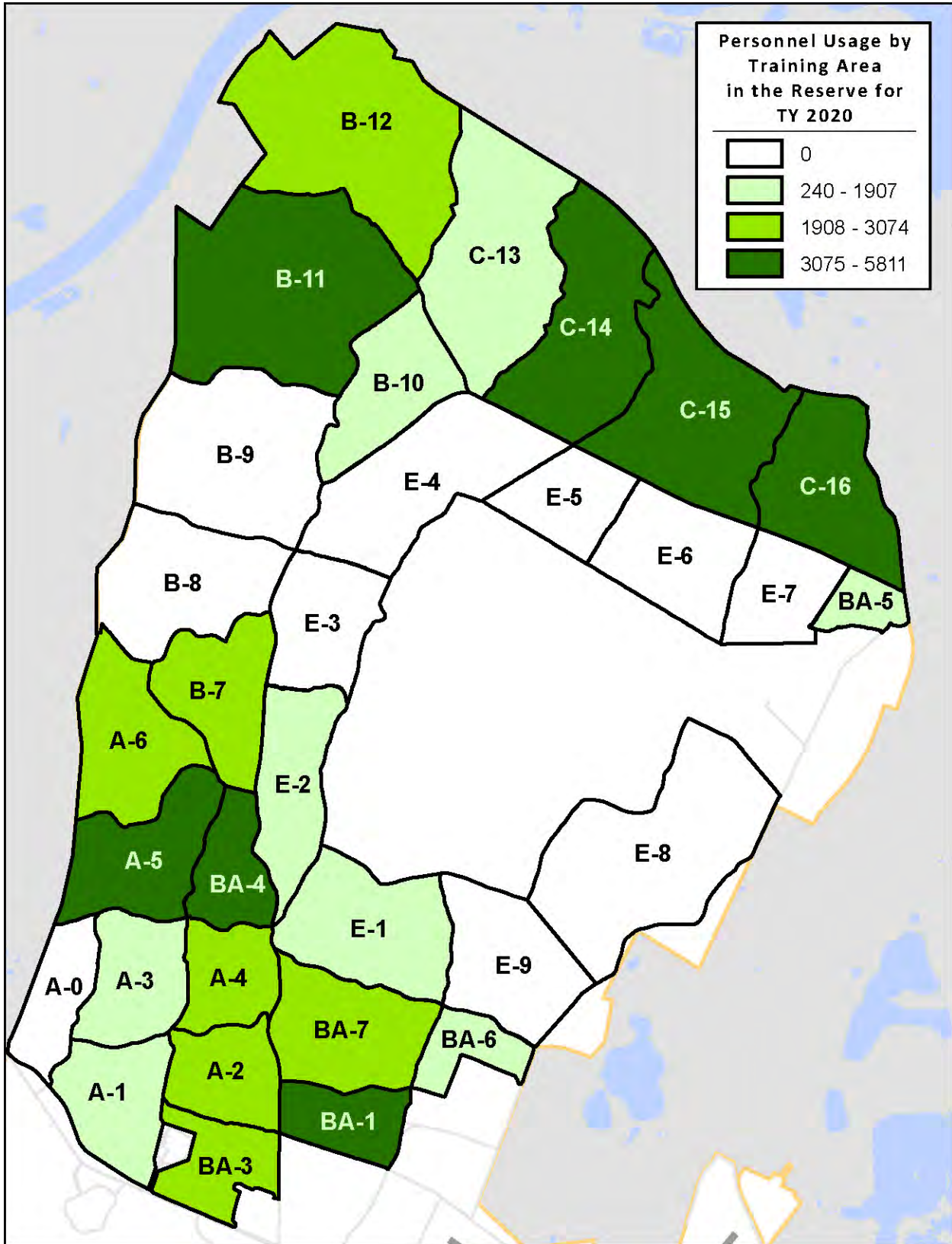
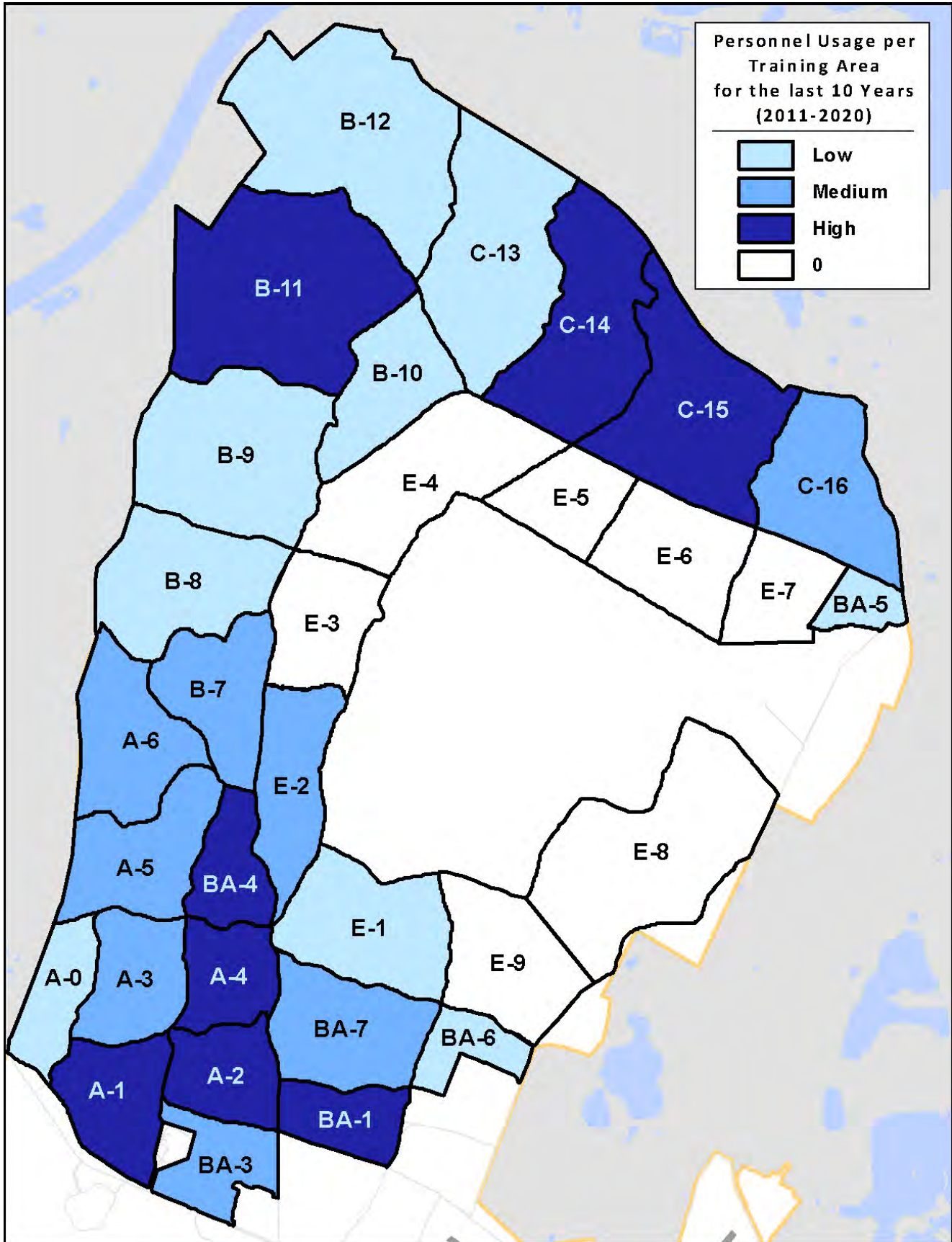


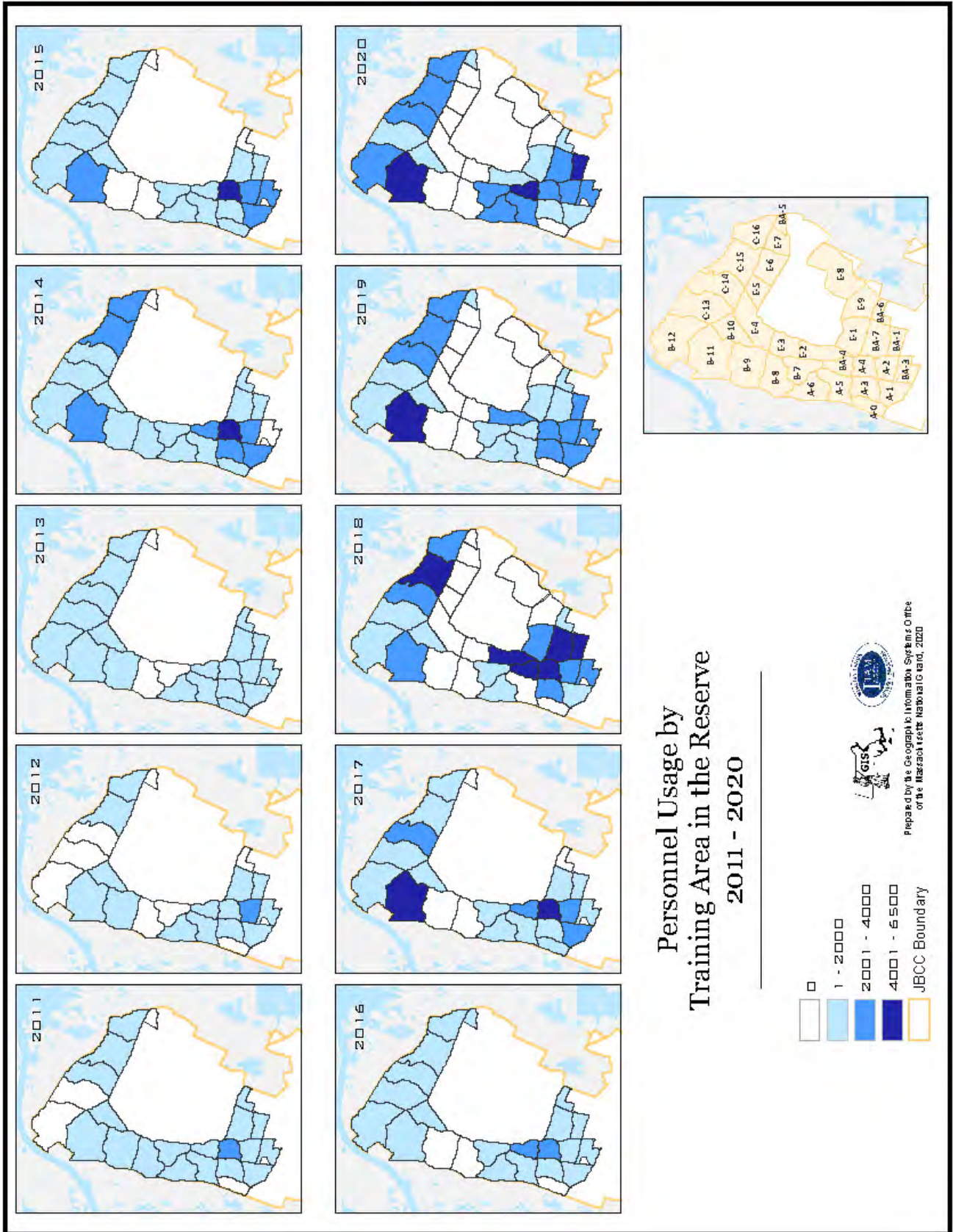
Figure 2-3 Personnel Usage by Training Area in the Training Area/Reserve, TY 2011 – TY 2020



Low=263-6,550 personnel; Medium=6,551-16,342 personnel; High=16,343-34,542



Figure 2-4 Ten Year Personnel Use by Training Area in the Training Area/Reserve, TY 2011 – TY 2020



Note: Prior to 2018, the E training areas were not available for use and are not delineated in the 2011 to 2017 graphics.

Figure 2-5 Daily Usage per Training Area in the Training Area/Reserve, TY 2020

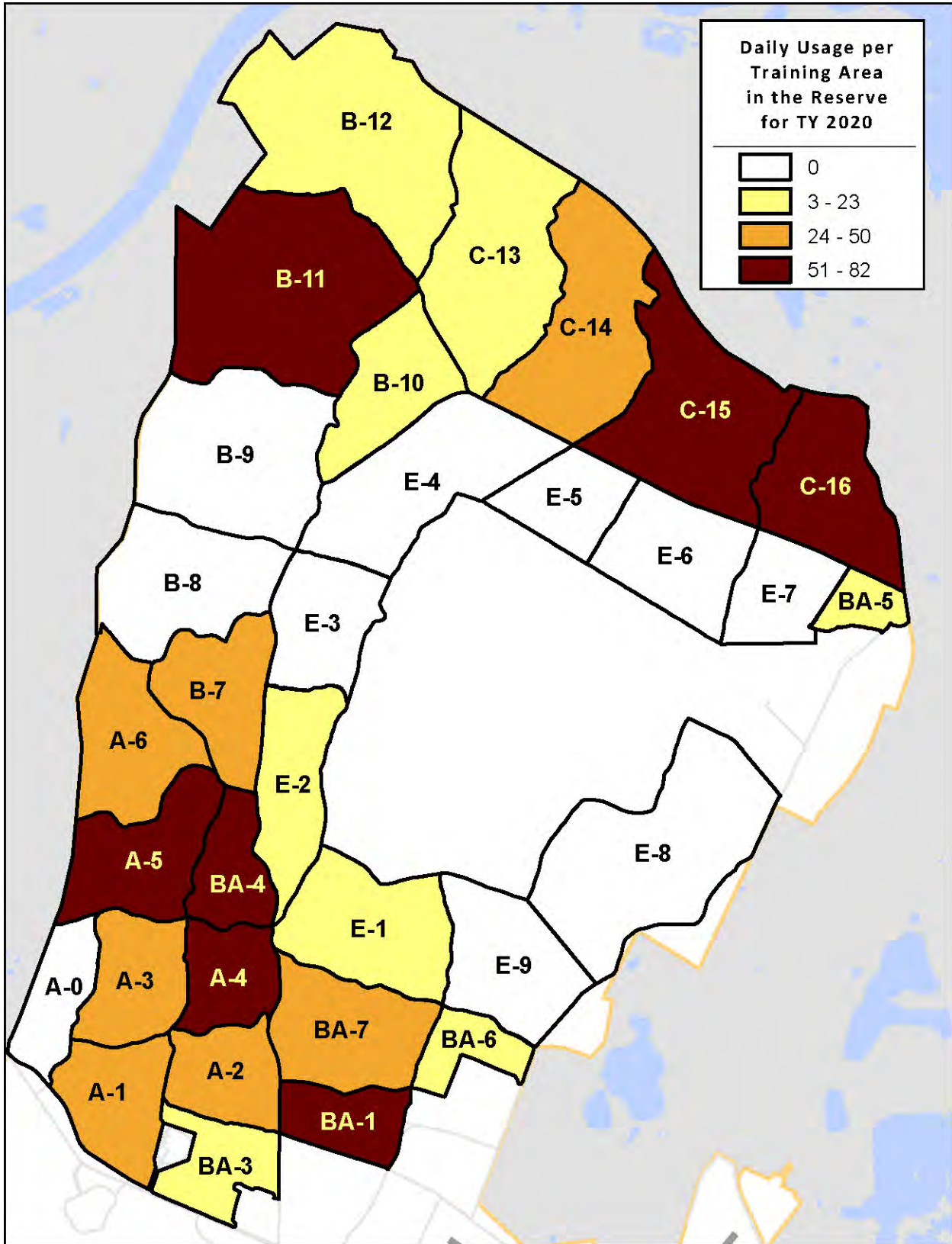
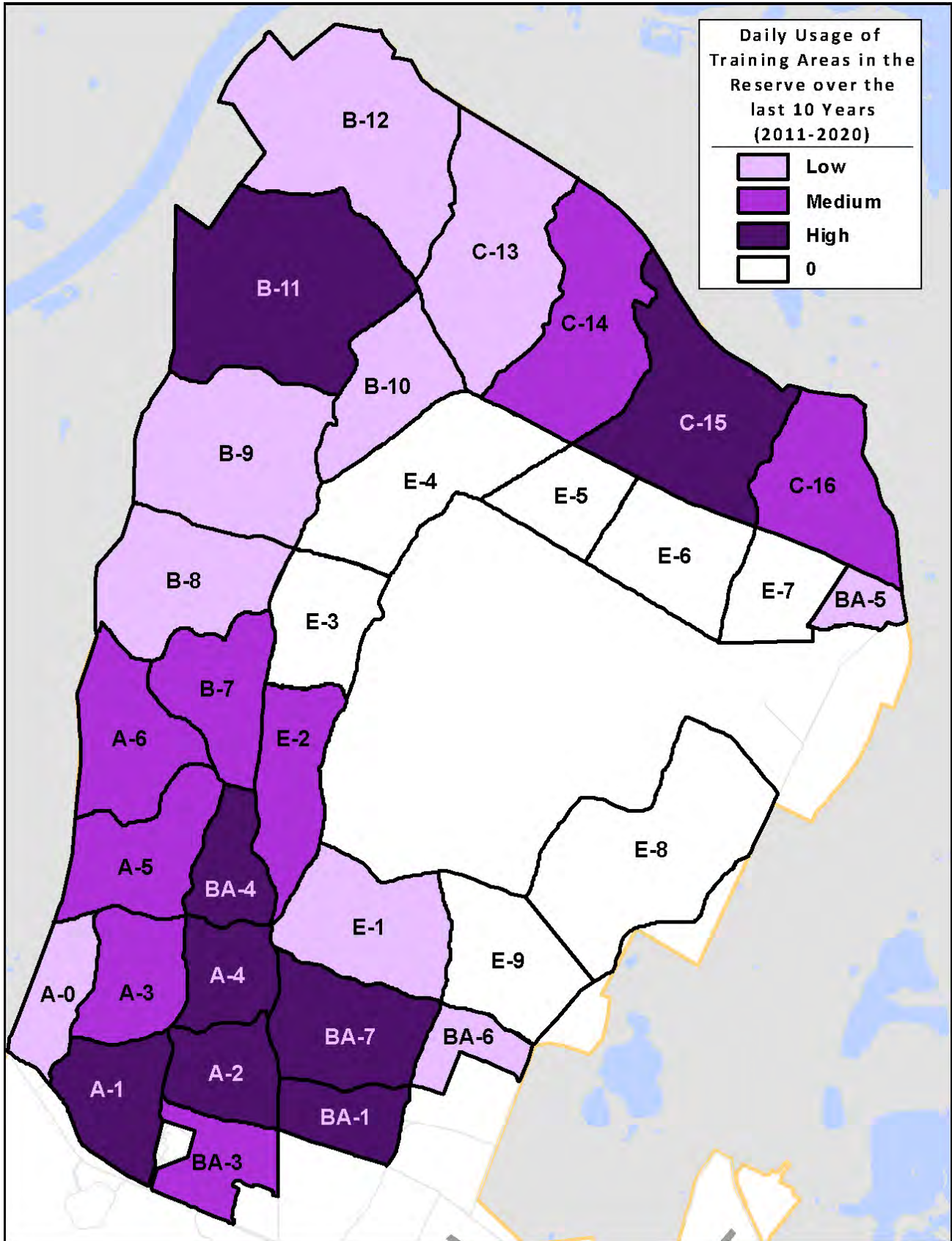


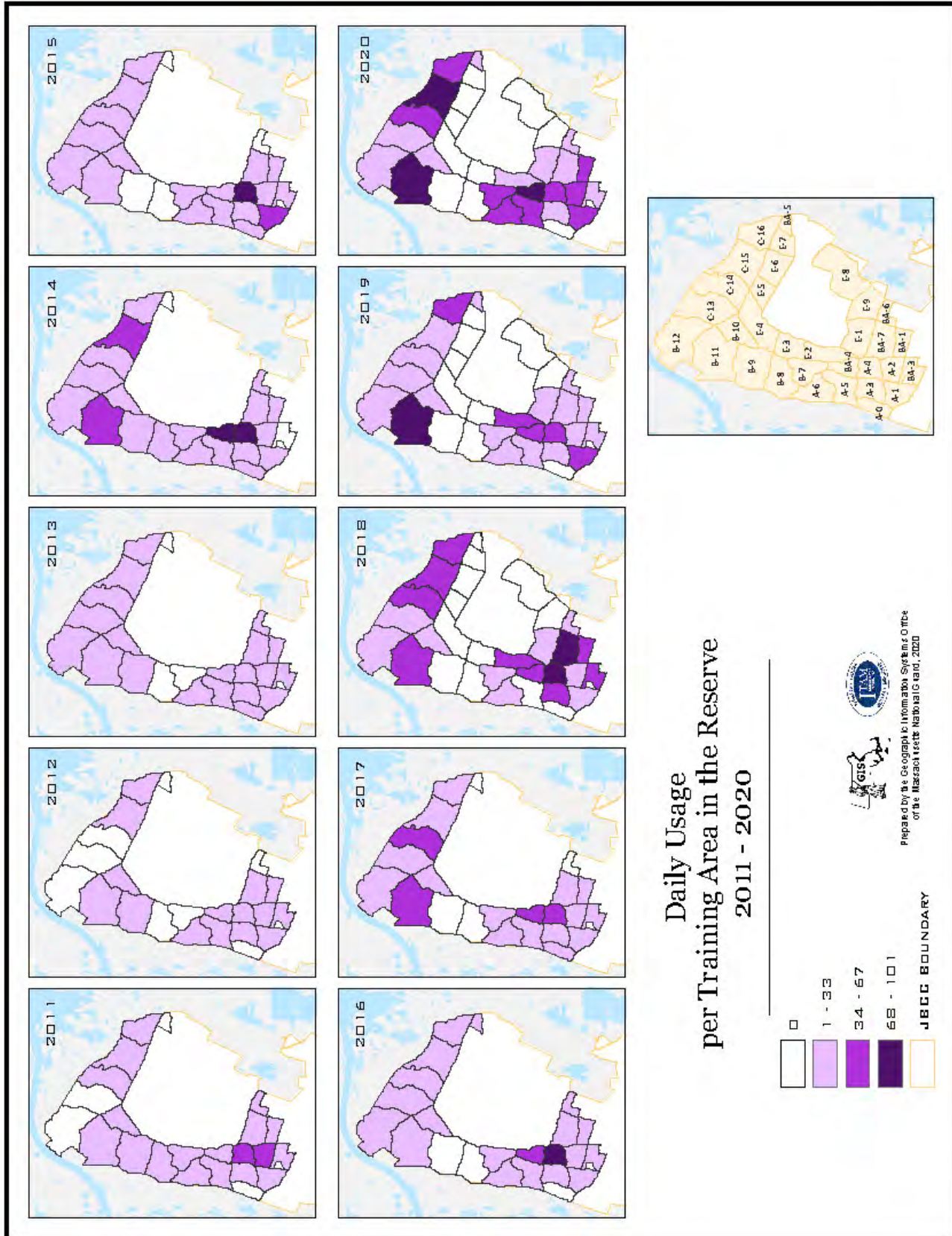


Figure 2-6 Daily Usage per Training Area in the Training Area/Reserve, TY 2011 – TY 2020



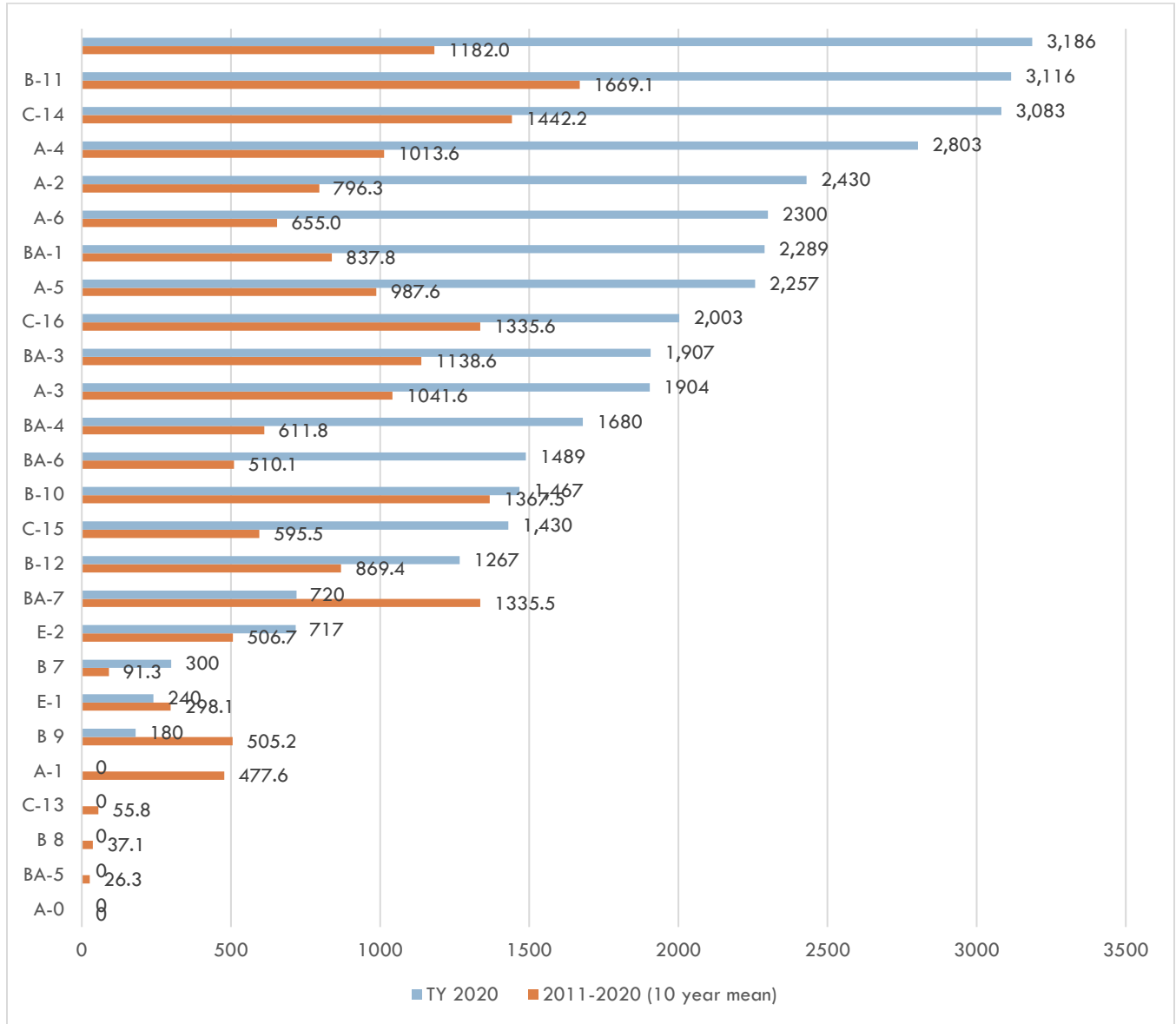
Low=5-80 days; Medium=81-239 days; High=240-543 days

Figure 2-7 Ten Year Daily Usage by Training Area in the Training Area/Reserve, TY 2011 – TY 2020



Note: Prior to 2018, the E training areas were not available for use and are not delineated in the 2011 to 2017 graphics.

Graph 2-1 Personnel Use by Training Area



Graph 2-2 Days Used by Training Area

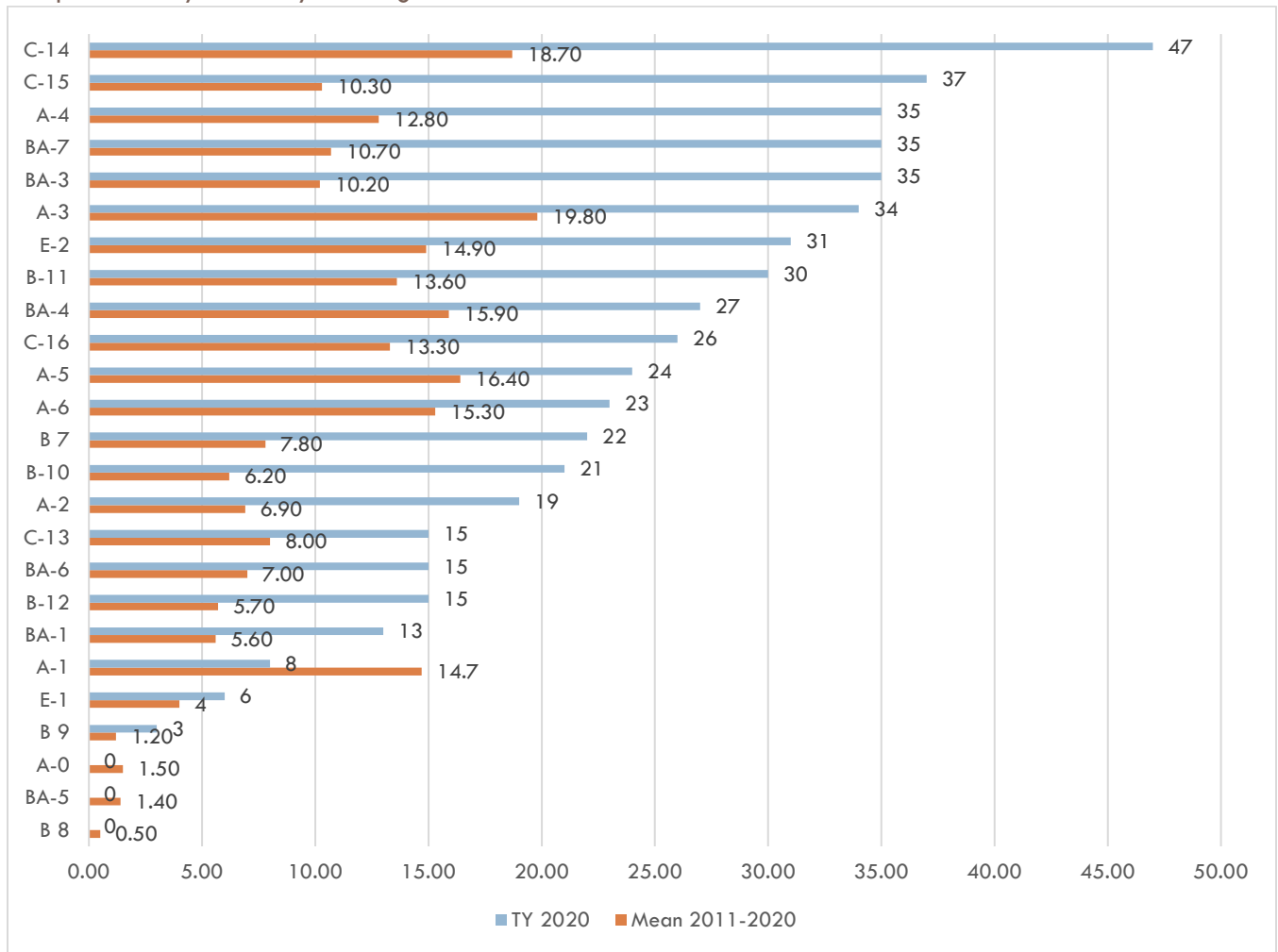




TABLE 2-2 TRAINING USE HISTORY

Training Year	Training Days/Events	Military Personnel	Civilian Personnel
TY 2020	3,041	138,474	6,828
TY 2019	2,481	94,974	12,424
TY 2018	2,118	103,864	1,673
TY 2017	2,268	144,671	3,450
TY 2016	2,065	92,083	2,271
TY 2015	2,105	122,645	2,691
TY 2014	1,845	121,740	2,050
TY 2013	1,052	46,361	1,650
TY 2012	1,117	78,745	866
TY 2011	1,232	71,707	819
<b>TOTAL</b>	<b>19,324</b>	<b>1,015,264</b>	<b>34,722</b>

In the table above, civilian usage numbers in TY 2019 and TY 2020 are higher than in past training years; this is due in part to the Cape Cod Police Academy's use of Camp Edwards facilities over the past two years as well as a Federal Emergency Management Agency training that took place in TY 2019.

## 2.2 RANGE UPDATE

The current active small arms ranges on Camp Edwards are Sierra, India, Lima, and Echo ranges. Juliet and Kilo ranges are currently inactive as their STAPP™ systems have been dismantled (see Section 2.4.2). The ISBC, KD and Tango ranges are undergoing rehabilitation. The locations of these ranges are shown in Figure 2-1.

## 2.3 SCIENCE ADVISORY AD HOC COMMITTEE

On November 2, 2017, the EMC formed an Ad Hoc Committee to the SAC to review the current small arms range environmental monitoring process and aide in developing the most appropriate monitoring processes for those ranges. Committee members are SAC members Phil Gschwend and Jack Duggan, both geochemists, SAC member Denis LeBlanc, US Geological Survey, and Jay Clausen from the US Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL), who is a metals mobility expert. The committee had a sunset clause of two years, however based on the effectiveness of the body and emerging issues, such as pyrotechnics, the EMC voted to allow the Ad Hoc committee to continue.

The committee met on August 19, 2020 and discussed the continuing work to research the movement of antimony in soil, which is being conducted by CRREL. The work, when complete, will help determine the type, or species, of antimony present in the soil, which can then lead to what the source of antimony may be on the ranges and if any management actions are needed. At the time of the SAC ad hoc meeting, the California lab that was to do the speciation was closed due to the ongoing Covid pandemic.

During the TY 2019 SAC Ad Hoc meeting, it was recommended that the MAARNG conduct two seasonal baseline samplings at the Small Arms Ranges and after the baseline is established, move to sampling every three years. Those baseline samples were collected in October 2019 and April 2020. See section 2.4 for further sampling information and Appendix C for sampling results. The samples were for metals and those constituents that may make metals mobile in soil. The Ad Hoc committee discussed the baseline sampling data and how they may impact antimony. The Ad Hoc committee determined that it required more time to digest the information presented before determining whether to change range sampling frequency to every three years.

## 2.4 TANGO, JULIET AND KILO RANGES

Live fire with lead ammunition resumed at Tango Range in August 2007, Kilo Range in March 2009, and Juliet Range in August 2009. STAPP™ systems were installed on these ranges to capture and contain lead ammunition. The system is a multi-layer rubber sandwich framed by synthetic lumber, which consists of a bottom rubber membrane, a matrix of rubber granules, and a cover that permits bullets to pass through but minimizes precipitation getting into the system.

The Tango Range STAPP™ system was dismantled in November 2017 and is currently being reconfigured for use as a copper ammunition only zeroing range in support of weapons qualification at Sierra Range. The Juliet Range and Kilo Range STAPP™ systems were dismantled in Fall 2020 (see Section 2.4.2). The Department of Defense has been moving away from lead ammunition for approximately 10 years. As such, lead rifle ammunition is no longer authorized for most MAARNG Units and it is not authorized for use at Camp Edwards. For this reason, Juliet and Kilo Ranges with their associated STAPP™ systems were no longer required. The ranges' STAPP™ systems were subsequently dismantled.

These ranges are currently in inactive status.

### 2.4.1 Range Maintenance and Sampling

Camp Edwards personnel conducted inspections of Juliet and Kilo ranges during TY 2020 in accordance with the provisions of the Operations, Maintenance and Monitoring Plan (OMMP).

Maintenance activities conducted at Juliet and Kilo ranges during TY 2020 included: securing the tarp cover over the STAPP™ system after severe weather, disposing of water from the internal reservoir, and repairing the top cover.

A list of Range Control's inspection and maintenance activities at these ranges in TY 2020 is included in Appendix C.

In October 2019 and again in April 2020, surface soil, porewater, and groundwater samples were collected from the ranges per the OMMP and guidance from the SAC Ad Hoc Committee. The samples were analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH, alkalinity, specific conductance, dissolved organic carbon and oxygen where appropriate for the media being sampled. Results (see Appendix C) of the surface soil and groundwater analyses continue to show no trends or significant concentrations when compared to the Action Levels specified in the OMMPs and as compared to background levels. Porewater results indicate an exceedance of the action level (6 parts per billion [ppb]) for antimony in several lysimeters on these ranges. Figures showing lysimeter locations, data and graphs are in Appendix C. Antimony is in lead alloy bullets and in bullet primers.

There are two likely causes of increased antimony in porewater:

- legacy range soils, where lead-antimony bullets were fired, were used for berm and range construction at Juliet, Kilo, and Tango ranges;
- phosphates added to range soils (1998-1999) to immobilize lead in legacy soils

To address the issue of antimony and other metals movements through soils, the MAARNG, along with members of the SAC Ad Hoc Committee (see Section 2.3) added the sampling of substances that can cause metals to be mobile in soil (see above paragraph). The first round of this amended sampling was completed in October 2019 and the second round is scheduled for April 2020.

Another finding of the Ad Hoc Committee through lab studies at CRREL in New Hampshire is that antimony is not threatening the groundwater. It has been determined that antimony mobility is influenced by pH and soil

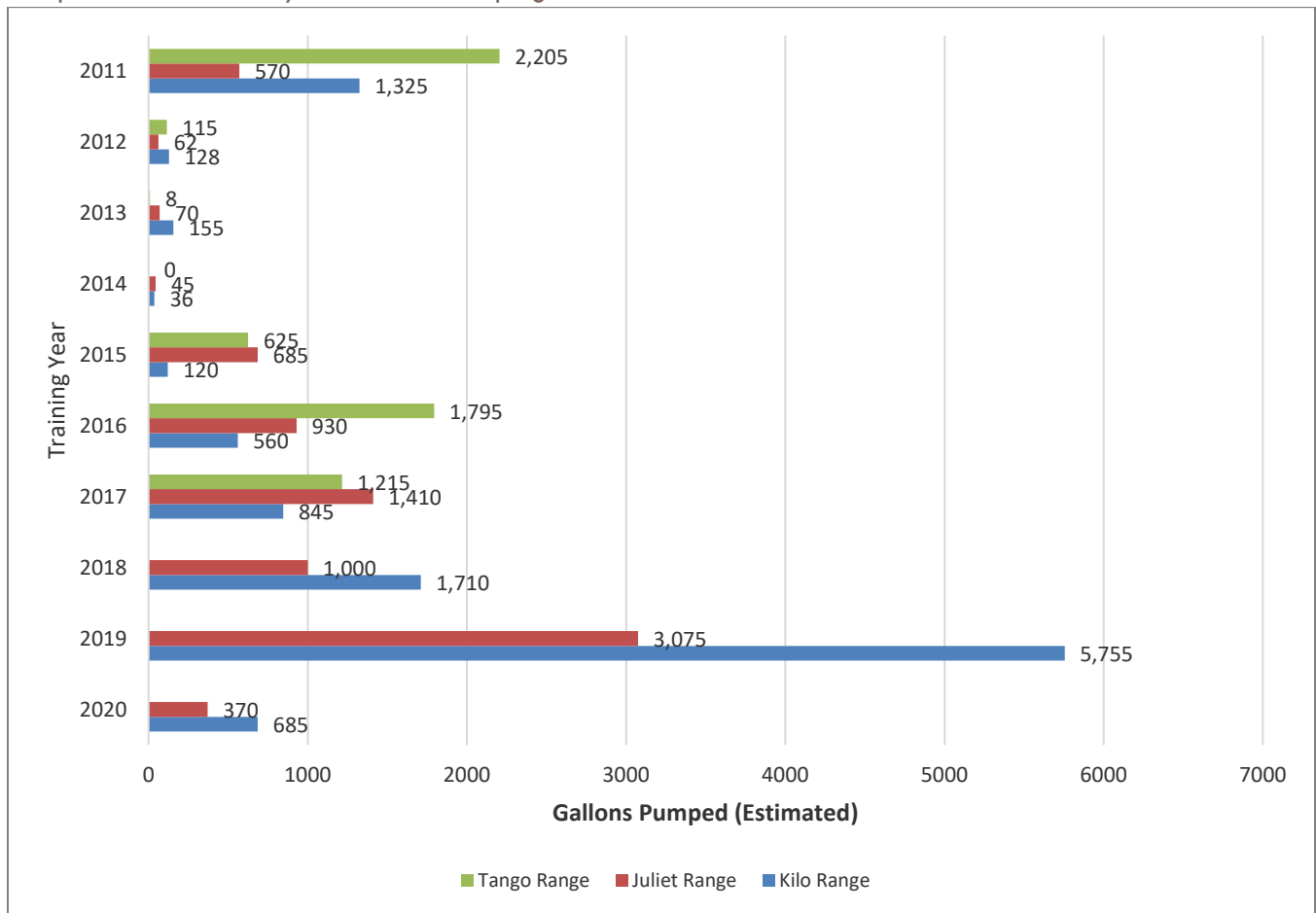
amendments. Soil amendments were halted several years ago at the direction of the SAC Ad Hoc committee until such time it could be determined what the effects of these amendments had on antimony mobility. It has also been determined through soil sampling that antimony mobility is limited to surface soils where amendments were applied. The Tango, Juliet and Kilo Ranges sampling results for TY 2020 are available in Appendix C.

As of October 2020, the STAPP™ systems on Juliet and Kilo Ranges have been removed from the ranges with the ranges now placed in inactive status.

An estimated 1,055 gallons of water were pumped from the STAPP™ systems on Juliet and Kilo ranges during TY 2020: 370 gallons at Juliet and 685 gallons at Kilo. The water pumped is the result of incidental seepage of rainwater, as well as condensation within the systems. This water has been tested at various times since the systems were installed for constituents that would reasonably be expected to be found on active ranges, particularly antimony, copper, and lead. Water collected from the STAPP™ collection system never enters the environment and is managed as a non-hazardous wastewater and disposed of accordingly.

Graph 2-3 reflects the amount of water pumped from the STAPP™ systems from TY 2011 to TY 2020. Gallons pumped are estimated figures based on measurements of water in containment areas by dip stick as water pumped from multiple systems can be accumulated in the same disposal drum. The graph below shows an increase in water pumped from the systems in TY 2019, which was due to large-scale rain events where the tarps covering the STAPP™ systems were blown off by wind, allowing more rainwater to enter the systems.

Graph 2-3 STAPP™ System Water Pumping



## 2.4.2 Tango, Juliet and Kilo Ranges Dismantling

Camp Edwards decommissioned and removed the STAPP™ system from Tango Range in November 2017. The range will be converted to a 32-lane zeroing range for copper ammunition. Soldiers will be able to zero their weapons at Tango Range and then move to the adjacent Sierra Range to conduct weapons qualification. To safely use Tango Range, the target and firing lines will be moved 25 meters north to move them out of the SDZ of the adjoining Sierra Range, such that both ranges can be used simultaneously. Construction began on Tango Range in Fall 2020 and is planned to be complete in March 2021.

Work to dismantle the STAPP™ systems on Juliet and Kilo ranges began on October 13, 2020 and was completed by November 3, 2020. Photographs 2-1 to 2-5 below show the cleanout and removal of the regrind material from the Juliet Range STAPP™ system prior to it being dismantled. Approximately 4,192 lbs. of lead were removed from the Juliet and Kilo STAPP™ systems during the cleanout.



Photograph 2-1 The Juliet Range STAPP™ system.



Photograph 2-2 The Juliet Range STAPP™ system showing the regrind material.





Photograph 2-3 The Juliet STAPP™ system showing the projectile layer.



Photograph 2-4 The Juliet Range STAPP™ system cleaned out. The bottom liner is visible.



Photograph 2-5 Shows the vacuum and tight tanks for regrind removal.

## 2.5 SIERRA AND INDIA RANGES

Sierra Range is an automated 300-meter pop-up modified record of fire range using copper ammunition only and is used to qualify soldiers in marksmanship proficiency. The firing line is 200 meters long with 10 firing positions. There are nine stationary, pop-up targets in each firing lane. The targets are located at 50, 100, 150, 200, 250, and 300 meters, with two targets at the 50-meter distance and one each at the other distances. Sierra Range returned to live fire with copper ammunition in June 2012. The following weapons are authorized for use on Sierra and India Ranges: the M16 and M4 rifles, the M249 machine gun with 5.56mm ammunition, and the M240 machine guns (India Range only) using 7.62mm ammunition.

India Range is a 25-meter small arms range using copper ammunition to train soldiers on the skills necessary to align the sights on their weapons and practice basic marksmanship techniques against stationary targets. It has 20 firing positions with one target in each firing lane. The range is also used for short-range marksmanship training and qualification. India Range returned to live fire with copper ammunition in September 2013.

### 2.5.1 Range Maintenance and Sampling

In TY 2020, the MAARNG found that an experiment that began in TY 2019 using an alternative bullet-pocket management practice was not successful. The Camp Edwards Range Control staff utilized multiple bullet capturing blocks (Dura-Bloc™) to fill two bullet pockets on India Range. One pocket had the blocks placed in a stepped fashion and the other had the blocks placed in a flush fashion. The experiment did not prove successful as there would be increased maintenance and potential hazardous waste.

Maintenance activities during TY 2020 at Sierra Range included filling bullet pockets with screened loam. At India Range, maintenance activities included flattening the firing line and repairing and filling bullet pockets.

A list of Range Control's inspection and maintenance activities at Sierra and India ranges in TY 2020 is included in Appendix C.

In October 2019 and again in April 2020, groundwater, porewater, and surface soil samples were collected from Sierra Range and India Range as prescribed in the OMMP. The samples were analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH, alkalinity, specific conductance, dissolved organic carbon and oxygen where appropriate for the media being sampled. Results of the soil and

groundwater analyses continue to show no exceedance of the Action Levels specified in the OMMP. The Sierra and India Range sampling results for TY 2020 are available in Appendix C.

## 2.6 LIMA RANGE

In 2012, the Environmental Protection Agency (EPA) Region 1 and the EMC approved returning to live firing on Lima Range using the M781 40mm Training Round.

The M781 is a practice grenade that is fired as a projectile composed of a hollow plastic “windshield” filled with Day-Glo-Orange marking powder. The Day-Glo-Orange marking powder is considered to be non-toxic. The initial firing of the M781 40mm Training Round occurred in 2013.

Lima Range is used to train and test individual soldiers on the skills necessary to engage and defeat stationary target emplacements with the 40mm grenade launcher. The range has four self-contained stations and is 30-meters wide by 400-meters long. The stations consist of firing positions and targets of various types and distances, ranging from 100 to 350 meters.

### 2.6.1 Range Maintenance and Sampling

In October 2019 and again in April 2020, porewater and surface soil samples were collected from Lima Range and analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH, alkalinity, specific conductance, dissolved organic carbon and oxygen, where appropriate for the media being sampled. There were no Action Level exceedances. The Lima Range sampling results for TY 2020 are in Appendix C.

Maintenance activities included making repairs to the netting at the back of the range.

A list of Range Control’s inspection and maintenance activities Lima Range in TY 2020 is included in Appendix C.

## 2.7 ECHO RANGE

Echo Range, a dual-purpose range, is a Combat Pistol/Military Police Qualification Course, consisting of 15 firing lanes with seven pop-up targets per lane offset along the firing lanes at varying distances with one fixed Military Police target at the end of the lane. Shooters shift their pistol firing position to engage the targets at the varying distances. 9 mm pistol ammunition is fired at pop-up targets, passes through, and strikes the backstop berm. The two courses of fire, on the same range, are referred to as an automated combat pistol/military police firearms qualification course.

The backstop berm is utilized as the primary projectile capture area. Single Individual Target frontal berms are the capture location for extreme low shot projectiles. The backstop berm was constructed on core material (native), landscape fabric as a demarcation line, a projectile capture medium that is 1/8th minus (road sand) and capped with topsoil that slows projectiles and allows for vegetation and slope stabilization.

Echo Range became operational in September 2019.

### 2.7.1 Range Maintenance and Sampling

In October 2019 and again in April 2020, groundwater and surface soil samples were collected from Echo Range and analyzed for antimony, copper, lead, chloride, sulfate, calcium, magnesium, phosphate, potassium, sodium, pH, alkalinity, specific conductance, dissolved organic carbon and oxygen, where appropriate for the media being sampled. There were no Action Level exceedances when samples were analyzed from Echo Range during the sampling efforts.

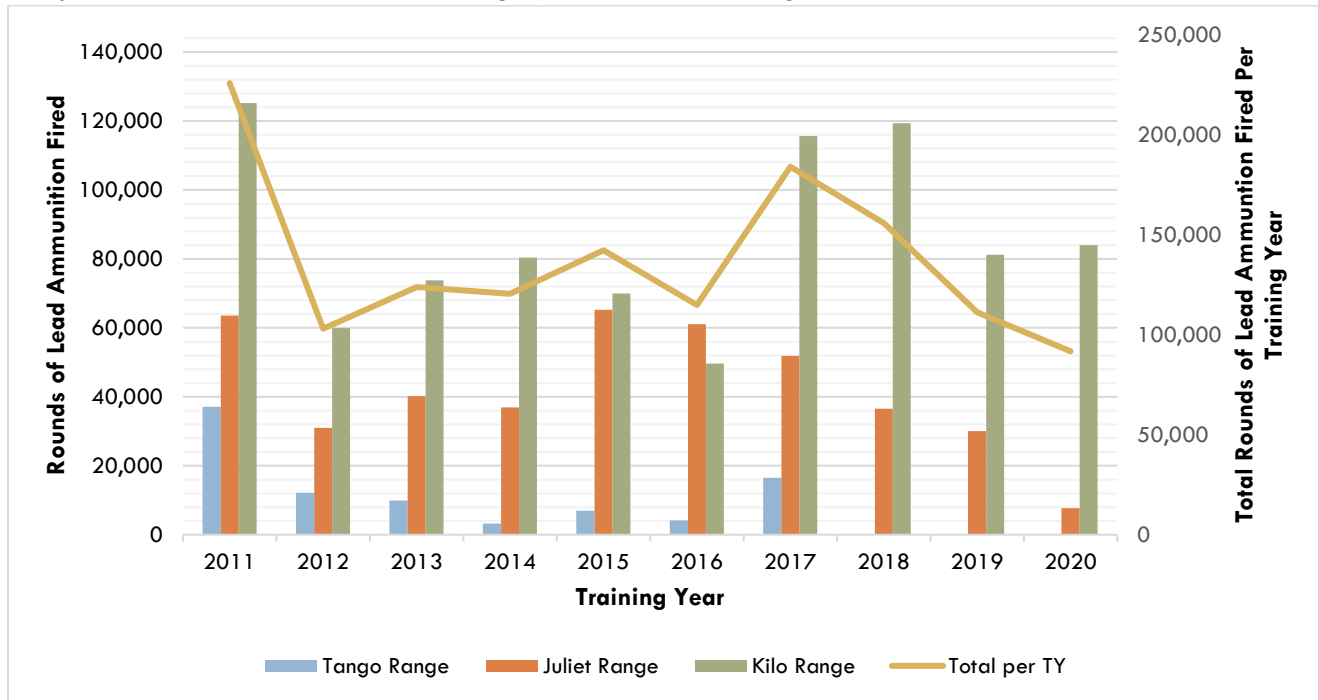
Maintenance activities included excavating a firing lane for electrical work and then backfilling it when the electrical work was complete.

A list of Range Control’s inspection and maintenance activities at Echo Range in TY 2020 is included in Appendix C.

## 2.8 RANGE USAGE DATA

A total of 1,768,071 rounds of lead ammunition have been fired at Tango, Juliet and Kilo ranges since STAPP™ systems were installed (at Tango Range in 2006; and Juliet and Kilo ranges in 2008) and their use approved: 474,910 at Juliet Range and 949,135 at Kilo Range. As of November 2017, the Tango Range STAPP™ system was dismantled; there is currently no firing on Tango Range. Graph 2-4 provides a summary of lead ammunition rounds fired at Tango, Juliet and Kilo from TY 2011 to TY 2020. The graph shows a declining trend in usage of lead ammunition; lead is being phased out of the Department of Defense inventory. Information on lead ammunition fired from TY 2007 through TY 2020, including amounts and types, is provided in Appendix C.

Graph 2-4 Lead Ammunition Use – Tango\*, Juliet and Kilo Ranges

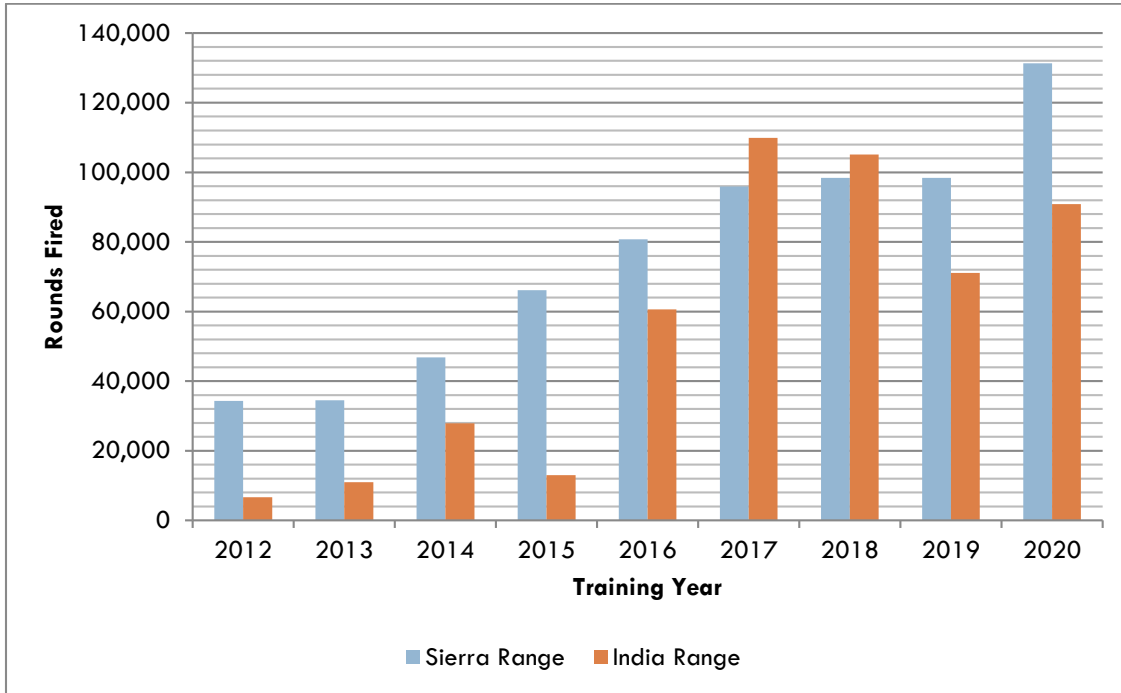


\*The Tango Range STAPP system was dismantled in November 2017. There is currently no firing on Tango Range.

A total of 1,182,378 rounds of copper ammunition have been fired at Sierra and India ranges since its use was approved: 686,487 at Sierra Range and 491,098 at India Range. Graph 2-5 provides a summary of copper ammunition fired at Sierra and India ranges since use of copper ammunition was approved at them. The graph shows an upward trend in copper ammunition use. During TY 2020, the MAARNG has transitioned to all copper-based rifle ammunition. Information on the number of copper ammunition fired on Sierra and India ranges each training year from 2012 through 2020 is provided in Appendix C.

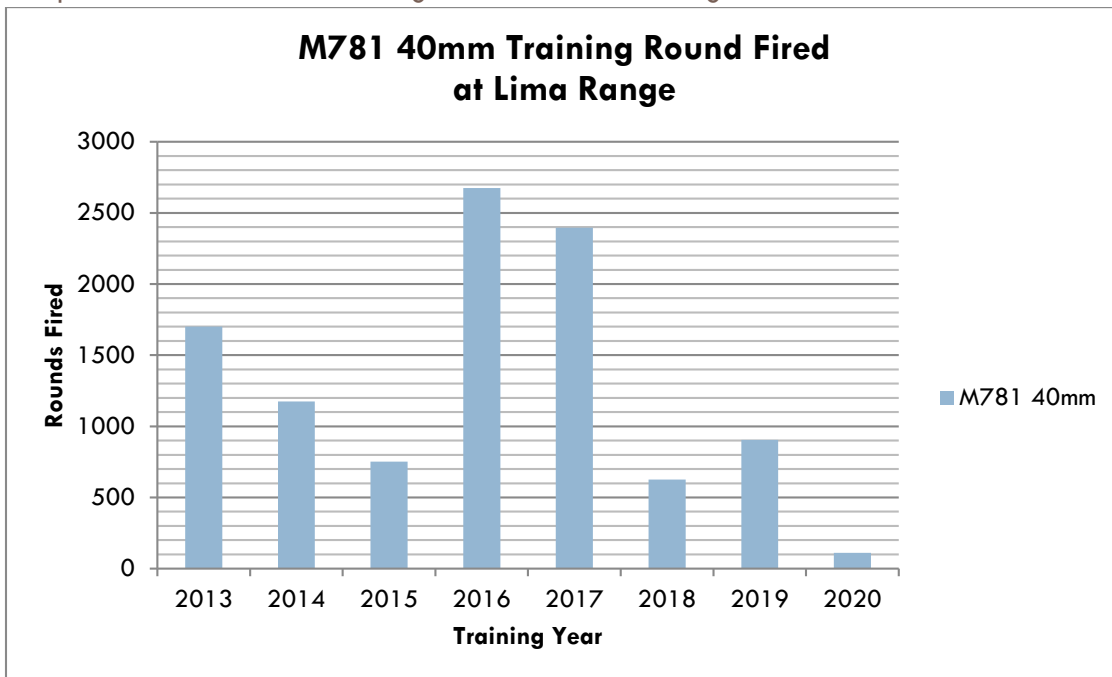


Graph 2-5 Copper Ammunition Use – Sierra and India Ranges



A total of 10,337 M781 40mm Training Rounds have been fired at Lima Range since its use was approved. In TY 2020, 14 M576 40mm rounds were fired by the US Coast Guard through a non-standard training request approved by the EMC’s Environmental Officer. The M576 40mm is an all-steel buckshot round. Graph 2-6 provides information on the number of M781 40mm Training Rounds fired at Lima Range. The graph reflects the cyclic requirement for qualification for grenadiers. Units that have grenadiers only have one to two soldiers with that requirement in the unit; not every soldier uses this weapon.

Graph 2-6 M781 40MM Training Round Use – Lima Range



A total of 19,105 rounds of 9mm lead ammunition has been fired at Echo Range since it became operational during TY 2019. Information on lead ammunition fired from TY 2007 through TY 2020, including amounts and types, is provided in Appendix C.

The only civilian use of the small arms ranges during TY 2020 was by the Massachusetts State Police and the Cape Cod Police Academy. The Massachusetts State Police fired 1,500 .45 cal. rounds on Kilo Range. The Cape Cod Police Academy fired 48,400 9mm rounds of ammunition and 10,300 5.56mm rounds of ammunition on Kilo Range.

During TY 2020, some type of weapons firing was conducted on at least one of the ranges on 71 calendar days.

In accordance with the OMMP for each range, the MANG is required to capture, contain, and recover bullets/projectiles to the greatest extent practical. Recovery of projectiles is based on usage, time, and projectile density. The OMMPs define when this is required for each range.

### 2.8.1 Training Areas

Camp Edwards has numerous areas that support military training: training areas, battle positions, observation posts, training roads, etc. The training areas also support a variety of training activities including land navigation, bivouacs, Soldier Validation Lanes, meteorological data collection, engineer/infantry/artillery skills training, drivers (day and night) training, and Reserve Officer Training Corps (ROTC) training.

Information on utilization of the training areas and major locations within them during TY 2020 is provided in Table 2-3. The total overall utilization of the training areas for the past 10 training years is included in Table 2-4. The variations over the years in training days and personnel numbers is a result of differing unit training requirements, combined training needs, and deployment cycles. During TY 2020, some type of training was conducted in at least one of the training areas on 207 calendar days. The numbers in Tables 2-3 and 2-4 do not include employees and vehicles from the remediation programs and private contracting firms. Also, hunters using the Training Area/Reserve during the deer and turkey seasons are not tracked as they move through the various training areas. During TY 2020, hunter days in the Training Area/Reserve accounted for around 1.14 percent of the usage, and around 75% of the Training Area/Reserve was available to hunters during the deer hunting season. Please see Sections 3.5.4 and 3.5.5 for information about the deer and turkey hunting seasons.

Other military users of the training areas during TY 2020 included the US Army, the US Army Reserve, the US Coast Guard, the US Coast Guard Reserve, the US Navy, the Massachusetts Air National Guard, the Vermont ARNG, New Hampshire ARNG, Rhode Island ARNG, and the New York ARNG, and the Princess Louise Fusiliers (Canadian Armed Forces).

Civilian organizations using the training areas during TY 2020 included the Cape Cod Police Academy, the Massachusetts Environmental Police, the Massachusetts State Police, the Massachusetts Institute of Technology-Lincoln Lab, Systems & Technology Research, the Department of Defense’s Defense Innovation Unit, and environmental remediation and restoration contractors.

TABLE 2-3 TRAINING AREA USE - TY 2020					
Location	Training Days	Personnel		Vehicles (Wheeled) #	Vehicles (Tracked) #
		Military	Civilian		
SVL-OBJ 1	32	1,481	20	0	0
SVL-OBJ 2	26	1,539	20	0	0
SVL-OBJ 3	9	974	0	0	0

TABLE 2-3 TRAINING AREA USE - TY 2020, cont'd

Location	Training Days	Personnel Military	Personnel Civilian	Vehicles (Wheeled) #	Vehicles (Tracked) #
SVL-OBJ 4	2	188	0	0	0
BP 2	24	455	15	22	0
BP 7	3	180	0	0	0
BP 14	20	225	0	0	0
BP 16	23	255	0	0	0
BP 24	3	180	0	0	0
BP 27	6	240	0	0	0
BP 28	8	720	0	0	0
NBC 1	4	106	0	0	0
Training Roads	52	4,812	0	0	0
A 1	13	717	0	0	0
A 2	22	1,267	0	0	0
A 3	31	1,907	0	0	0
A 4	24	1,467	0	0	0
A 5	35	2,289	62	0	0
A 6	37	2,430	0	0	0
B 7	35	2,690	62	0	0
B 10	15	1,680	0	0	0
B 11	30	3,186	0	0	0
B 12	21	2,300	0	0	0
BA 1	15	1,430	0	0	0
BA 3	23	2,003	0	0	0
BA 4	26	2,257	0	0	0
BA 5	3	300	0	0	0
BA 6	19	1,489	0	0	0
BA 7	27	1,904	0	0	0
C 13	15	1,680	0	0	0
C 14	34	3,116	0	0	0
C 15	47	3,083	0	0	0
C 16	35	2,803	0	0	0
Wheelock Hill	6	322	0	8	0
Land Nav 1	28	937	0	8	0
Land Nav 2	15	591	0	0	0
Land Nav 3	22	1,077	0	0	0
Land Nav 4 Alpha	11	263	0	0	0
Land Nav 4 Bravo	10	374	0	0	0
Land Nav 4 Charlie	19	580	0	0	0
Dig Site 3	43	4,381	0	72	0
Landing Zones	25	116	115	0	0
<b>Total</b>	<b>898</b>	<b>59,994</b>	<b>294</b>	<b>110</b>	<b>0</b>

TABLE 2-4 TRAINING AREA USE HISTORY

Training Year	Training Days/Events	Personnel		Vehicles (Wheeled)	Vehicles (Tracked)
		Military	Civilian		
TY 2020	898	59,994	294	110	0
TY 2019	702	49,716	1,920	618	0
TY 2018	893	69,652	238	530	12
TY 2017	688	42,478	1,344	1,244	12
TY 2016	551	24,344	1,858	2,805	0
TY 2015	681	33,219	1,909	2,198	0
TY 2014	642	39,137	370	4,129	0
TY 2013	247	11,164	181	1,484	7
TY 2012	232	13,532	122	2,037	5
TY 2011	298	16,591	132	2,232	2
<b>TOTAL</b>	<b>5,832</b>	<b>359,827</b>	<b>8,368</b>	<b>17,387</b>	<b>38</b>

### 2.8.2 Vehicle Use, Fueling and Maintenance

Vehicle use in the training areas during TY 2020 was 110 wheeled vehicles. No tracked vehicles were used. These numbers do not include vehicles from the Impact Area Groundwater Study Program (IAGWSP) program and contractors. Pumping fuel in the Training Area/Reserve has been prohibited by the EPSs since 2002, however the MAARNG has proposed to modify the EPSs to allow refueling in the Training Area/Reserve under certain conditions. Please see Section 2.14 for further discussion. Currently, the fuel point and the secondary containment pads in the Tactical Training Base (TTB) area represent the designated location for units to refuel and park and store tanker trucks at Camp Edwards.

The military does not conduct scheduled vehicle maintenance in the training areas. Personnel in the field are authorized only to check fluid levels, add small amounts, and repair flat tires or track sections that separate during training. Major repairs and other maintenance activities and training occur at the Unit Training Equipment Site (UTES) facility located in the Cantonment Area of Camp Edwards. The UTES facility is a vehicle and motor pool area; the Massachusetts National Guard has also designated the area as a Satellite Accumulation Point to store hazardous waste.

### 2.8.3 Training Support Areas (Simulators, Cantonment Area)

There are separate facilities and equipment that can simulate live military training; these are grouped under the Training Support Area (TSA). The majority of the training activities associated with these facilities are conducted in the Cantonment Area of Camp Edwards.

Table 2-5 presents the total number of training days/events and personnel that used each TSA during TY 2020. Overall historical use of the TSA for the past 10 training years is included in Table 2-6. Figure 2-8 shows TSA locations in the Cantonment Area. Because unit commanders maximize training time by rotating personnel through several different events or exercises in a given training cycle, this again presents an inflated figure for training days compared to calendar days. For example, the Cape Cod Police Academy Cadets and Cadre are counted as using the facility and areas on a daily basis.

Civilian organizations using the TSA in the Cantonment Area of Camp Edwards during TY 2020 included Allied Universal Security, Barnstable County Sheriff's Department, the Boy Scouts of America, Cape Cod Healthcare, Cape Cod Police Academy, Falmouth Police Department, FBI Boston, the Massachusetts Environmental Police, Massachusetts Maritime Academy, the Massachusetts State Police, the Massachusetts Bay Transit Authority



Police, the Massachusetts Emergency Management Agency-Region 2, the Sea Cadets, the United States Geological Survey and the Massachusetts National Guard Family Support Group.

TABLE 2-5 TRAINING SUPPORT AREA USE - TY 2020

Training Support Area	Training Days/Events	Personnel	
		Military	Civilian
1100 Training Area (Drivers Training)	16	870	0
1300 Training Area	5	380	0
APFT Running Track	35	4,082	0
Asymmetric Threat Classroom	6	172	0
Battle Simulation Ctr - Bldg 1206	91	9,595	650
Battle Simulation Ctr - Rear Offices	158	4,428	0
Battle Simulation - Bldg 1213, 1st Floor	45	3,064	450
Battle Simulation - Bldg 1213, 2nd Floor	53	4,487	450
Battle Simulation - TOC Pads	19	5,135	0
Call for Fire Trainer	55	2,571	192
VBS3 Classroom - Bldg 3494	28	1,600	140
Connery Field	30	4,407	0
Counter IED Visual Indicator Lane	1	23	0
Engagement Skill Trainer 2000 - A	96	1,118	0
Engagement Skill Trainer 2000 - B	120	4,082	0
Engagement Skill Trainer 2000 - C	90	2,432	192
HEAT 1123	16	490	0
HEAT 1132	12	330	0
HEAT 1215	33	1,340	0
1243-High Risk Entry Facility-Control	22	345	335
1244-High Risk Entry Facility	22	345	335
Lee Field	23	3,450	120
MRAP	57	2,707	0
ODS - Operator Driving System	1	2	0
Shaw Field	36	5,855	0
Unstabilized Gunnery	42	1,751	0
Vault 1 - TSC	202	566	69
Vault 2 - TSC	256	846	0
Vault 3 - TSC	168	572	0
Virtual Convoy Opns Trainer #43 (VCOT - TSC)	9	30	0
Virtual Convoy Opns Trainer #98 (VCOT - TSC)	39	1,435	0
Weapons Cleaning - Bldg 3498	20	866	0
Welcome Center	116	1,850	2700
YD Memorial Park	9	360	200
<b>TY 2020 Total</b>	<b>1,931</b>	<b>71,586</b>	<b>5,833</b>

TABLE 2-6 TRAINING SUPPORT AREA USE HISTORY

Training Year	Training Days/Events	Personnel		
		Military	Civilian	Total
TY 2020	1,931	71,586	5,833	77,419
TY 2019	1,554	39,888	10,223	51,665
TY 2018	1,061	39,619	4,285	43,904
TY 2017	1,299	96,783	1,150	97,933
TY 2016	1,224	50,463	282	50,745
TY 2015	1,313	73,678	627	75,618
TY 2014	1,132	77,516	1,541	79,057
TY 2013	742	42,654	1,404	44,058
TY 2012	824	63,210	691	63,901
TY 2011	852	52,225	574	52,799
<b>TOTAL</b>	<b>11,932</b>	<b>607,622</b>	<b>26,610</b>	<b>637,099</b>

## 2.9 OFF-SITE TRAINING

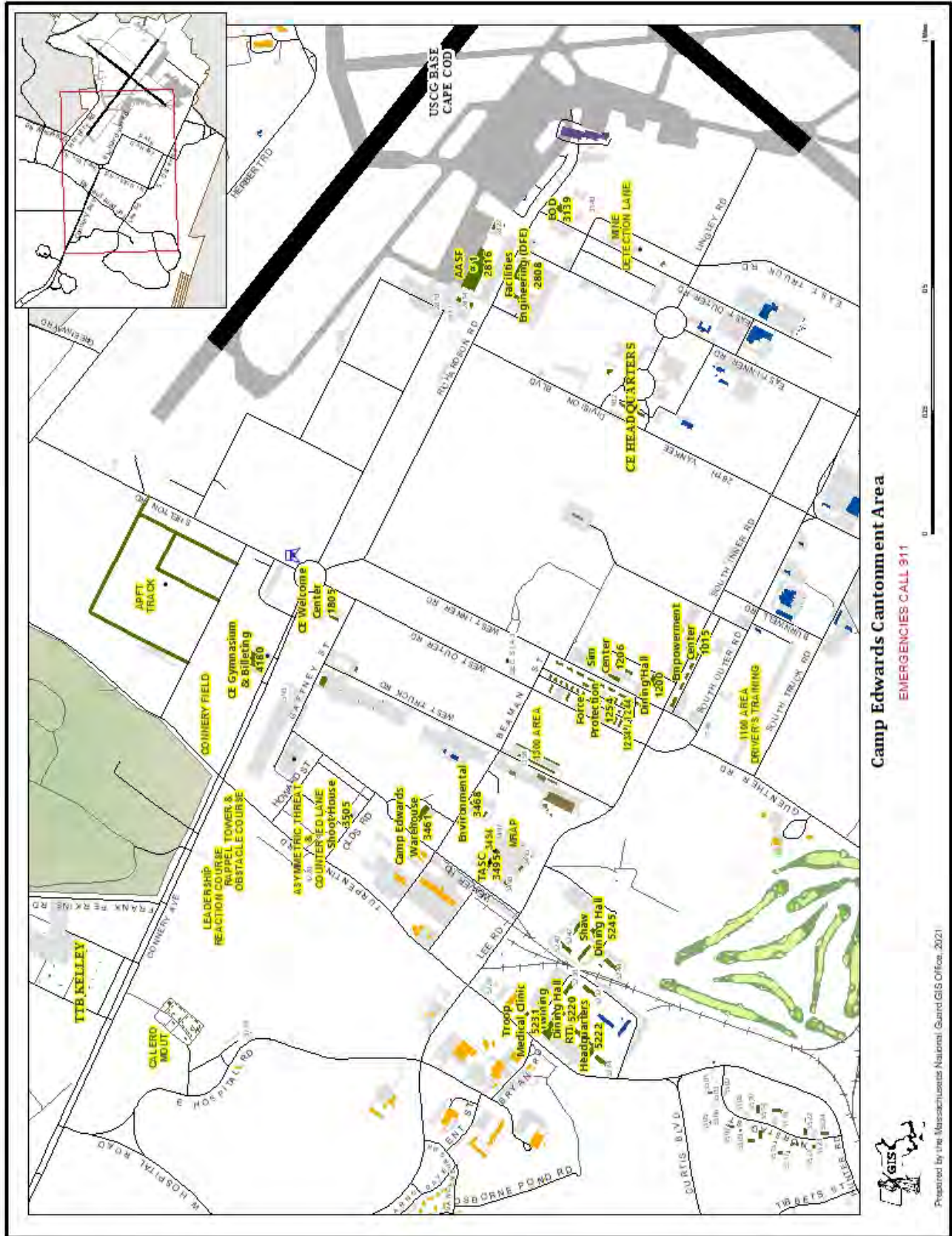
During TY 2020, the MAARNG had 89 units conduct their annual two-week training cycle. Of these, 81 units trained in Massachusetts, 55 of which trained solely at Camp Edwards (approximately 2,246 soldiers). Eight units trained in four different states; one in New Hampshire, one in Iowa, two in Washington and four in New York. Four units were mobilized and deployed in support of contingency operations; one unit deployed overseas, and three units deployed to the continental United States.

The total number of Massachusetts Soldiers trained during annual training for TY 2020 was 3,683 out of 5,621. Eighteen units conducted year-round annual training consisting of 580 soldiers, while 863 served on Title 32 orders for the Covid-19 response in lieu of annual training. The number of MAARNG soldiers that completed a two-week annual training cycle by general geographical locations is: 3,026 in Massachusetts and 657 in other states.

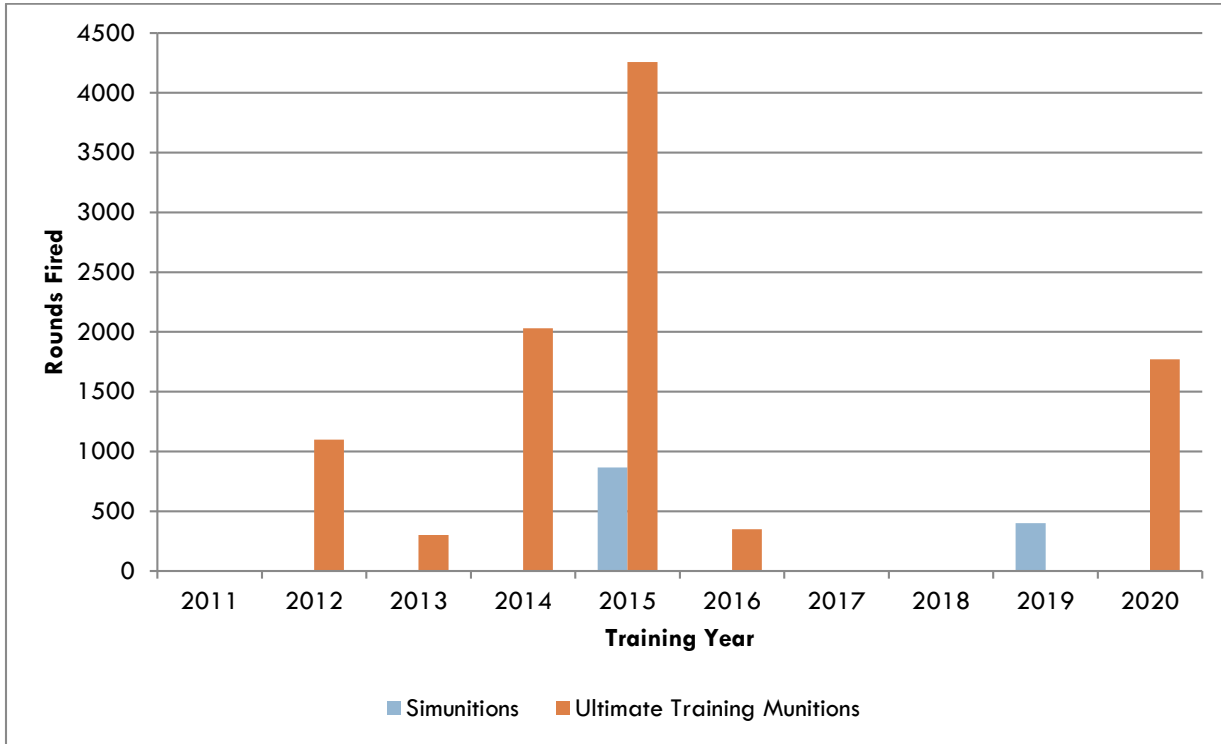
## 2.10 SIMULATED MUNITIONS

The MAARNG uses two types of simulated munitions at Camp Edwards: an Ultimate Training Munitions (UTM) Man Marker Round and a Simunitions FX Marking Round. The EMC required that the Annual Report include steps taken by the National Guard and progress associated with converting to the use of lead-free primer in simulated munitions. The Massachusetts National Guard monitors the activities of the U.S. Army Environmental Command in its efforts working with private industry development of alternate munitions; currently no new information has been provided. Simulated munitions are best used in concert with other simulators to be effective for most units; therefore, their effective training use is currently limited. Graph 2-7 provides the number of UTM and Simunitions FX Marking Rounds fired in the Training Area/Reserve since 2011.

Figure 2-8 Training Support Areas



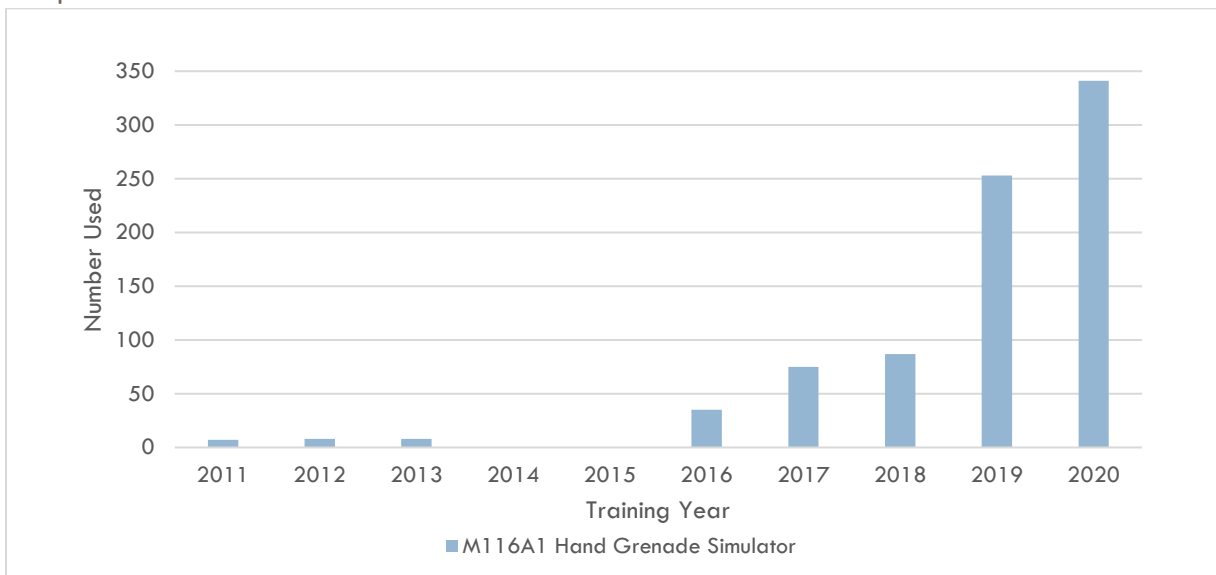
Graph 2-7 Simulated Munitions Use



## 2.11 PYROTECHNICS

The M116A1 Hand Grenade Simulator was approved for use at Camp Edwards in March 2010. Three hundred-forty-one were used in the Training Area/Reserve during TY 2020. Graph 2-8 shows the number used each training year since TY 2011. M116A1 hand grenade simulator use increased because the MAARNG has been conducting more collective training versus individual unit training. The M116A1 is used primarily during collective unit training and is used to simulate battlefield conditions during training events. A result of the Covid-19 pandemic was the cancellation of out-of-state training that was redirected to Camp Edwards, which contributed to the increase in usage of pyrotechnics at Camp Edwards during TY 2020.

Graph 2-8 M116A1 Hand Grenade Simulator Use



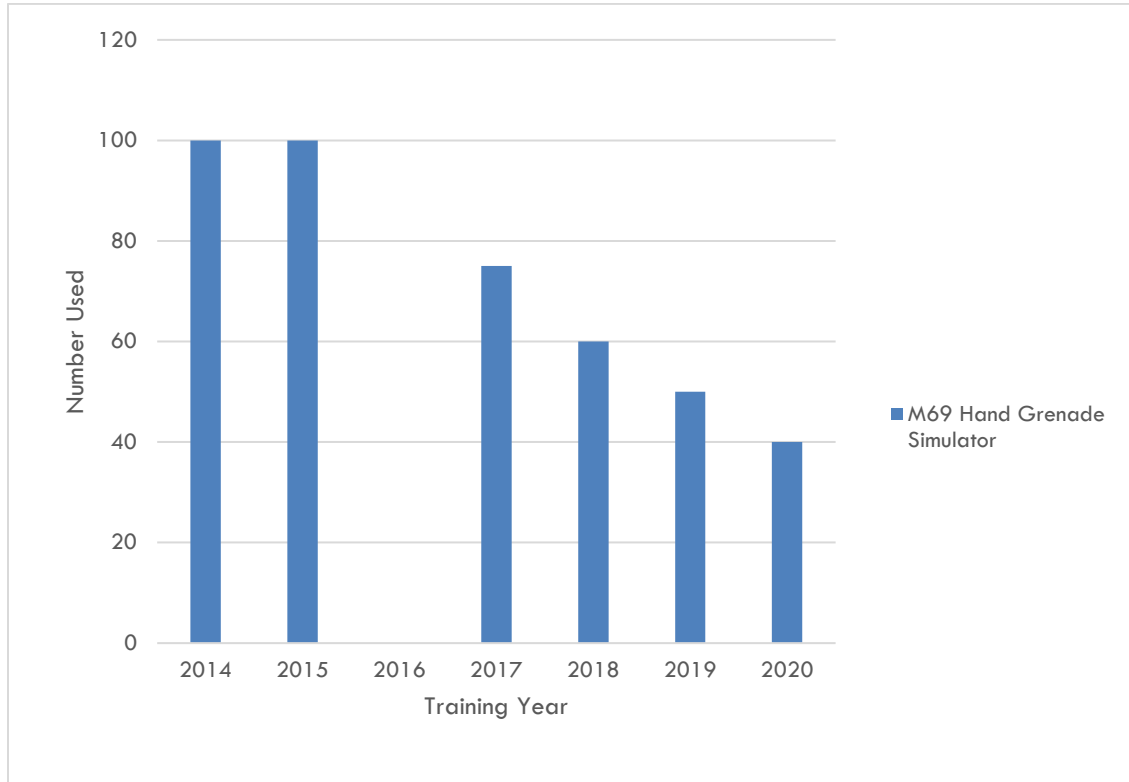
## 2.12 M69 HAND GRENADE SIMULATOR

In 2013, EPA Region 1 and the EMC approved the use of the M69 Hand Grenade Simulator on Camp Edwards.

The M69 provides realistic training and familiarizes soldiers with the functioning of a fragmentation hand grenade. The average Soldier can throw the M69 approximately 40 meters (131 feet). After a delay of four to five seconds, the M69 emits a small puff of white smoke and makes a popping noise. The grenade bodies are reused repeatedly by replacing the fuse assembly.

Camp Edwards developed a Standard Operating Procedure and Course Management Plan for the M69 Hand Grenade Simulator, approved by the EMC in 2014. The plan allows for maximum effective use of the M69 Hand Grenade Simulator with the M288 Fuse in the Camp Edwards training areas and on the Hand Grenade Qualification Course while abiding by training and environmental guidelines. Use of the M69 Hand Grenade Simulator began in September 2014. Forty were used in the Training Area/Reserve in TY 2020. Graph 2-9 shows the number of M69 Hand Grenade Simulators used since TY 2014. M69 Hand Grenade Simulator use shows a declining trend because the MAARNG has been conducting more collective training versus individual unit training. The M69 is used primarily during individual unit training for hand grenade use and familiarization.

Graph 2-9 M69 Hand Grenade Simulator Use



## 2.13 SOLDIER VALIDATION LANE

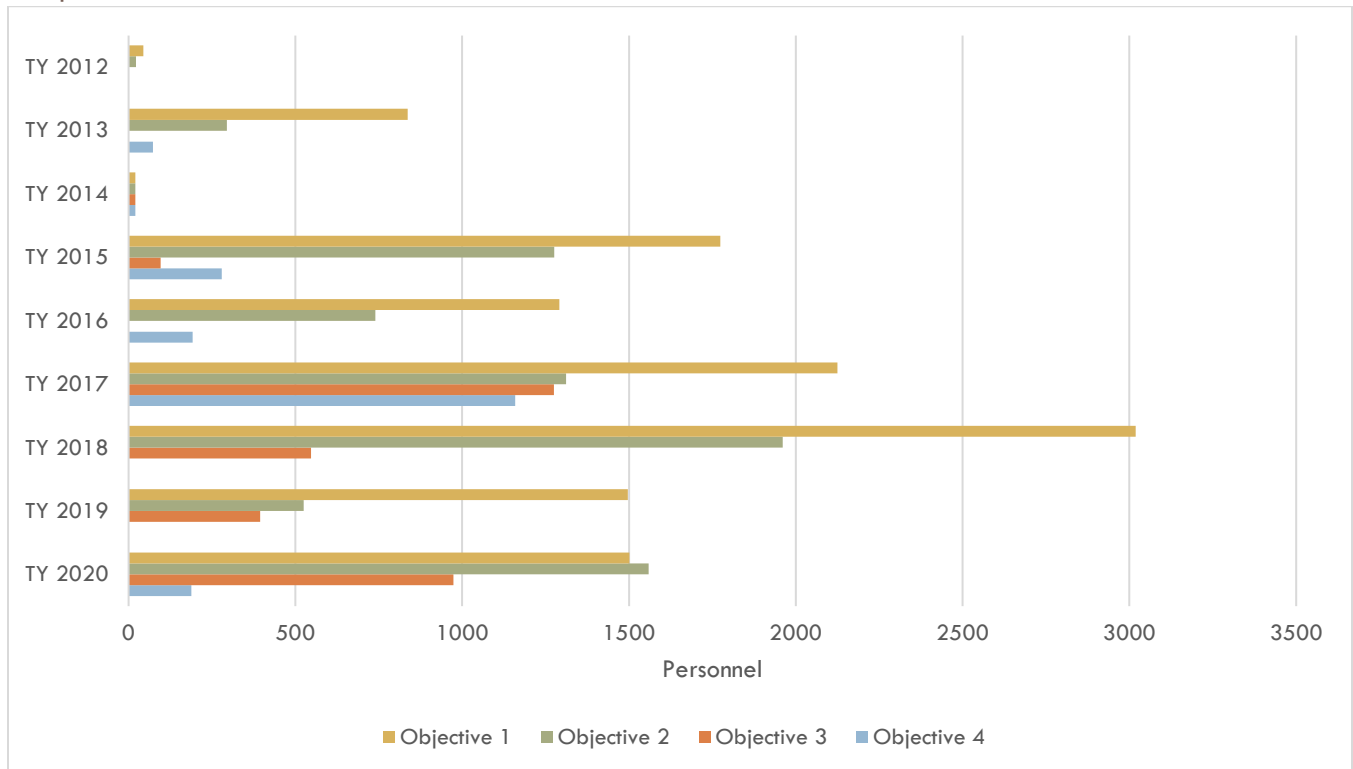
The SVL uses conex-like shipping containers as training aids, which can be reconfigured to mimic small villages and used for Improvised Explosive Device (IED) training. The containers are located in open or previously cleared, historically used training areas including training and bivouac sites within the Training Area. The ability to periodically reconfigure the portable training aids within the Training Area will critically enhance the ability to adapt scenarios to the most current combat situations, ultimately helping to save the lives of soldiers on the battlefield.



Four SVL locations (called objectives) were used during TY 2020 to meet military training needs: Objective 1 in Training Area A-4; Objective 2 in Training Area BA 4; Objective 3 in Training Area B 11, and Objective 4 in Training Area C-14. Graph 2-10 shows the use of all four SVL Objectives since TY 2012. The locations of the SVL Objectives are shown in Figure 2-9.

The Natural Heritage and Endangered Species Program (NHESP) requires a yearly monitoring report be submitted documenting the locations and numbers of containers and the approximate dates of placement within these locations, as well as documenting any cutting of trees or leveling of sites that were required for container placement. The Soldier Validation Lane Annual Monitoring Report for TY 2020 is available in Appendix C.

Graph 2-10 Soldier Validation Lane Use

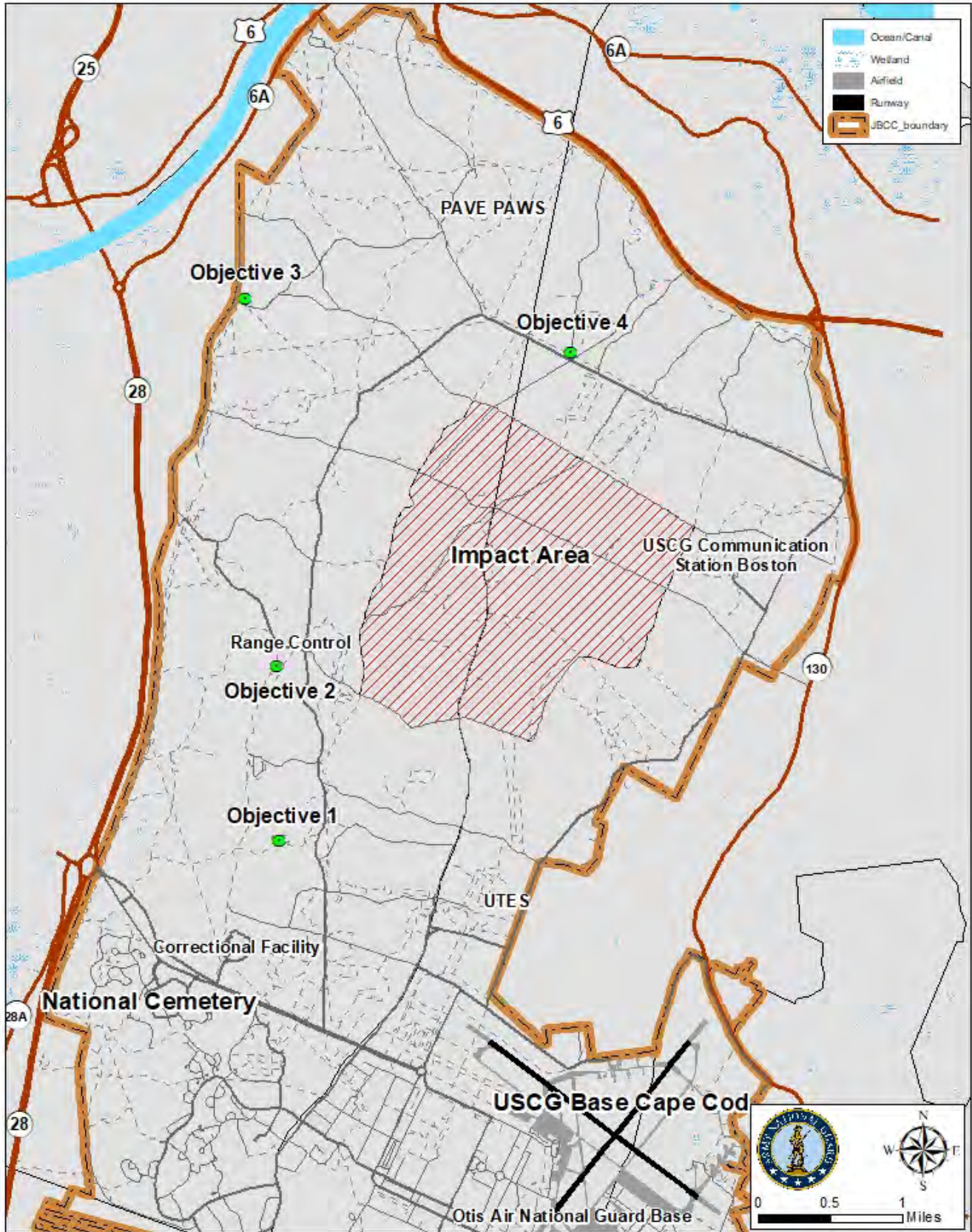


### 2.14 EPS 15.3.3 FIELD REFUELING

The MAARNG is proposing to modify EPS 15.3.3, Fuel Management, which states: “No storage or movement of fuels for supporting field activities, other than in vehicle fuel tanks, will be permitted except in approved containers no greater than five gallons in capacity.” The MAARNG is making a request of the EMC that vehicle refueling in the Training Area/Reserve be allowed under certain conditions. Currently, exceptions to the standard are granted so that the MAARNG can complete critical remediation, construction and training area and habitat management in the most cost effective and efficient manner. In addition to the MAARNG’s need to refuel vehicles for remediation, range construction and training area and habitat management, there is a required need for MAARNG soldiers to be able to train effectively with refueling in a tactical, field training environment. The proposed adjustment is reflective of the many years of EPS implementation and continual improvement of training and environmental practices that allow for compatible military training at Camp Edwards.

In TY 2017, the MAARNG conducted its first Proof of Concept outside of the Training Area/Reserve, within TTB Kelley, to illustrate that field refueling can be conducted in a safe and environmentally protective manner. During the Proof of Concept, MAARNG soldiers refueled a Blackhawk helicopter in a tactical environment, demonstrating their standard Best Management Practices (BMPs), which are protective of the environment.

Figure 2-9 SVL Objective Locations



BMPs included large-capacity secondary containment under the fueler and secondary containment at connections in the fuel line. A second Proof of Concept was conducted during TY 2018 at Battle Position 2 that consisted of refueling HUMVEEs. BMPs include secondary containment under the fueler and a drip pan on the ground under the nozzle.

In addition to the proofs of concept, several exceptions to the standard have been granted to the MAARNG by the EMC Environmental Officer to include the Combined Arms Exercise in TY 2019. Refueling in the Training Area/Reserve during that exercise was executed successfully. During TY 2020, exemptions to the standard were granted by the EMC Environmental Officer in TY 2020 in support of the Tango Range reconstruction and removal of the STAPP™ systems on Juliet and Kilo ranges.

As requested by the EMC through guidance of the SAC and CAC, the MAARNG has drafted a Standard Operating Procedure for fueling in the Training Area/Reserve along with a map that denotes areas for fueling vehicles and off-limits areas. The Standard Operating Procedure covers topics ranging from how Soldiers fuel to criteria for closing and opening a newly requested fueling site. The MAARNG has also developed language for the proposed EPS change. At the September 2019 SAC meeting, it was determined that more information would be needed to review and provide input to the EMC to decide if this standard needs to be adjusted. Information requested included site descriptions, distance to sensitive receptors, depth to groundwater, site screening criteria, etc. The MAARNG plans to return to the both the SAC and CAC with the additional information prior to requesting the EPS change from the EMC during TY 2021.

## 2.15 MULTI-PURPOSE MACHINE GUN RANGE

During TY 2015, the MAARNG's MILCON (Military Construction) project submission to construct a Multi-Purpose Machine Gun Range (MPMG) in 2020 on Camp Edwards at the current KD Range was approved by Congress. An MPMG is where soldiers train and qualify with automatic weapons. KD Range is a 600-yard Known Distance Range that is currently divided into two subparts with two distinct firing line/target configurations and training uses.

The approximately \$11.5 million project consists of \$9.7 for range construction and \$1.8 million for targetry. Environmental contracting and review of the project began in May 2018 and includes review under both the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA).

As part of the preliminary planning process, Camp Edwards conducted a test fire at KD Range on August 14, 2015, to simulate noise from the proposed MPMG range. The results of the test fire showed noise levels did not exceed MassDEP levels for nuisance noise and met the Army's criteria for considering a range in this area. Other surveys included an Archeological Survey in 2016 (no "finds" reported); Flora/Fauna Planning/Impact Assessment Surveys; Federal species: Bats surveyed in 2015 and 2016 (project area); Frosted elfin surveyed in 2017, and the Rusty-patched bumble bee, which was surveyed in 2017; State species: Eastern Whip-poor-will surveyed annually, including adjacent to project area; updated base-wide Moth survey, and then under the Migratory Bird Treaty Act, base-wide annual bird monitoring including in and near the project area.

Over the past five years, the MAARNG has coordinated with multiple state and Federal agencies including DFW's NHESP to ensure that adverse impacts to natural resources (including state-listed rare species) were avoided or mitigated (see Section 3.19).

For the MEPA process, a Notice of Project Change was filed in February 2020 with a 30-day public comment period. The Secretary of the Executive Office of Energy and Environmental Affairs determined that a Supplemental Environmental Impact Report (SEIR) should be completed. The MAARNG submitted the SEIR on June 11, 2020, with a 30-day comment period. The MAARNG received a certificate signed by the Secretary on

July 17, 2020, which determined the SEIR submitted for the project adequately and properly complies with MEPA and its implementing regulations.

For the NEPA process, the Environmental Assessment was completed in August 2020 and a 30-day public comment period was held from August 8, 2020 to September 7, 2020. Approximately 367 comment letters were received from state and local agencies, environmental groups, and members of the public. As of December 2020, the MAARNG is completing the responses to comments. Once that is complete, the public comments and responses will be placed on the E&RC's website. National Guard Bureau will determine whether the Environmental Assessment meets the "Finding of No Significant Impact" or if the project requires further environmental consideration.

In addition to environmental review under MEPA and NEPA, the MAARNG must receive the EMC's approval for both the MPMG range design and its OMMP.



## SECTION 3

# ENVIRONMENTAL PROGRAM MANAGEMENT

### 3.0 INTRODUCTION

Chapter 47 of the Acts of 2002 requires the Annual Report to contain information describing the range of resource management activities conducted by the MAARNG in the Training Area/Reserve and to report on activities associated with the EPSs for the Training Area/Reserve. Sections 3.1 through 3.16 include information for each EPS where there were associated activities. Section 3.17 provides similar information for the generic Cultural Resources EPS that also applies to MAARNG activities in the Training Area/Reserve. In addition to meeting this requirement, Section 3 provides information on required mitigation measures undertaken by the MAARNG and information on any noncompliance with the EPSs or other laws and/or regulations.

Chapter 47 of the Acts of 2002 also requires the Annual Report to describe long-term trends in the major areas of resource management and activities. Data is provided in this report back through TY 2011, when available, or longer when appropriate to illustrate long-term trends. Additional information on environmental management activities performed in the Training Area/Reserve can be found on the Publications page of the E&RC web site at: <https://www.massnationalguard.org/ERC/>.

During TY 2020, six Records of Environmental Consideration (RECs) were reviewed for natural and cultural resources for proposed actions in the Training Area/Reserve. RECs are an internal environmental review document based on NEPA. The RECs reviewed were for the paving of Turpentine Road, renovations completed at the former Otis Road and Gun Club, small road repair, repaving Pocasset-Forestdale Road, and removal of the firing position culverts at B and C ranges.

Appendix D identifies the relevant federal, state, DoD, and U.S. Army environmental regulations governing MAARNG activities in the Training Area/Reserve.

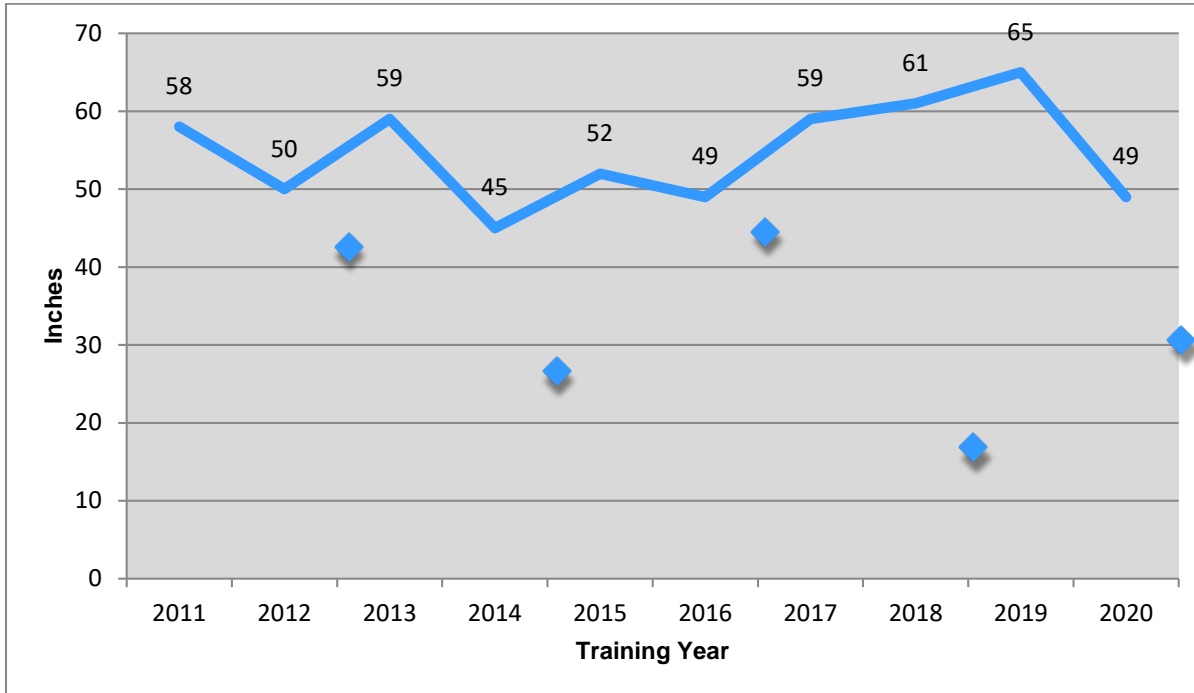
### 3.1 GROUNDWATER RESOURCES MANAGEMENT

The MAARNG complied with the Groundwater Environmental Performance Standard during TY 2020. Travel in Zone 1 Wellhead Protection Areas was limited to foot travel or to vehicles required for construction, operation, or maintenance of wells. The Upper Cape Water Supply Cooperative continues to have fencing around its three water supply wells and appropriate signage around the wells' 400-foot radius in the Training Area/Reserve. Both the Upper Cape Water Supply Cooperative and the 102<sup>nd</sup> Intelligence Wing operated within the water withdrawal limits of their respective MassDEP issued permit or registration. The Bourne Water District has a well in the Training Area/Reserve that became operational in TY 2014 as part of its overall water supply system. The JBCC Groundwater Protection Policy is available on the Publications page of the E&RC website at: <https://www.massnationalguard.org/ERC/>.

#### 3.1.1 Precipitation

Precipitation information included in the Annual Report is obtained from the Northeast Regional Climate Center at Cornell University in Ithaca, New York, based on recordings from a station in East Sandwich, Massachusetts. That station reported a total of 49.23 inches of precipitation for TY 2020 (Graph 3-1). Barnstable County experienced drought conditions in 2020.

Graph 3-1 Precipitation Recorded



### 3.1.2 Groundwater Level

In TY 2005, the U.S. Geological Survey (USGS) installed a monitoring well (USGS number MA-SDW 537-0107) on Camp Edwards to record the altitude of the water table in the Cape Cod aquifer. The well became operational in January 2005. The well is located west of Greenway Road on the J-1 Range of the Training Area/Reserve and is about 107 feet deep. A recording device in the well electronically transmits a continuous record of the water level near the top of the water-table mound that forms the Sagamore groundwater-flow system on western Cape Cod. The well’s location is shown in Figure 3-1.

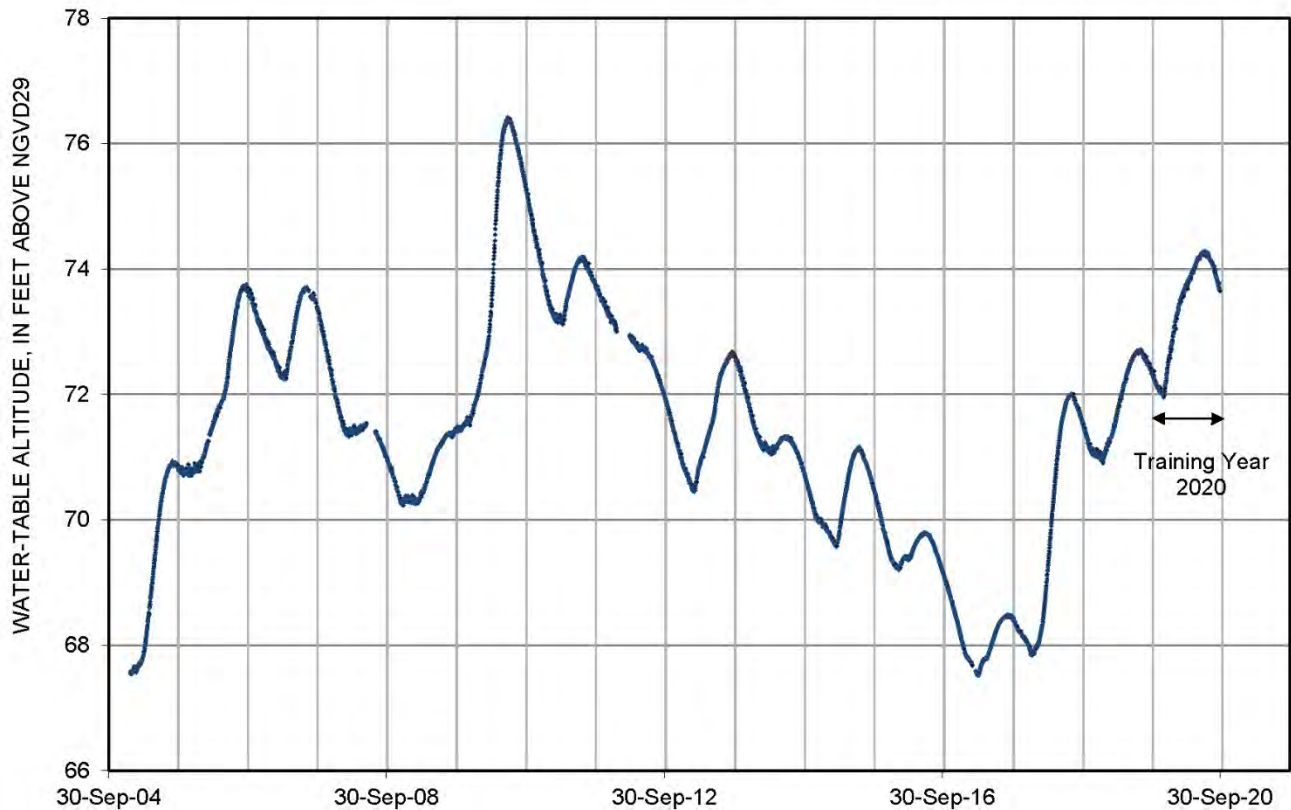
The pattern of water-level changes observed at the monitoring well is caused by natural seasonal and year-to-year variations in recharge from precipitation. Graph 3-2 shows the trend in the water-table altitude at the USGS monitoring well for the 2005-2020 training years. During TY 2020 the water-table altitude declined about 0.5 feet during October to early December, rose about 2.3 feet during the next 7 months, and then declined about 0.6 feet, ending the training year about 2.2 feet higher than the average water-table altitude for TY 2005-2020.

The IAGWSP of the Army National Guard provides part of the funding for the operation of the monitoring well because the water-level data are used in that program. Information about the well and the observed groundwater levels is publicly available on the following USGS website:

<http://groundwaterwatch.usgs.gov/AWLSites.asp?S=414159070310501&ncd=>

Graph 3-2 U.S. Geological Survey Monitoring Well

U.S. GEOLOGICAL SURVEY MONITORING WELL  
MA-SDW 537-0107



### 3.1.3 Water Supply Systems

#### Upper Cape Regional Water Supply Cooperative

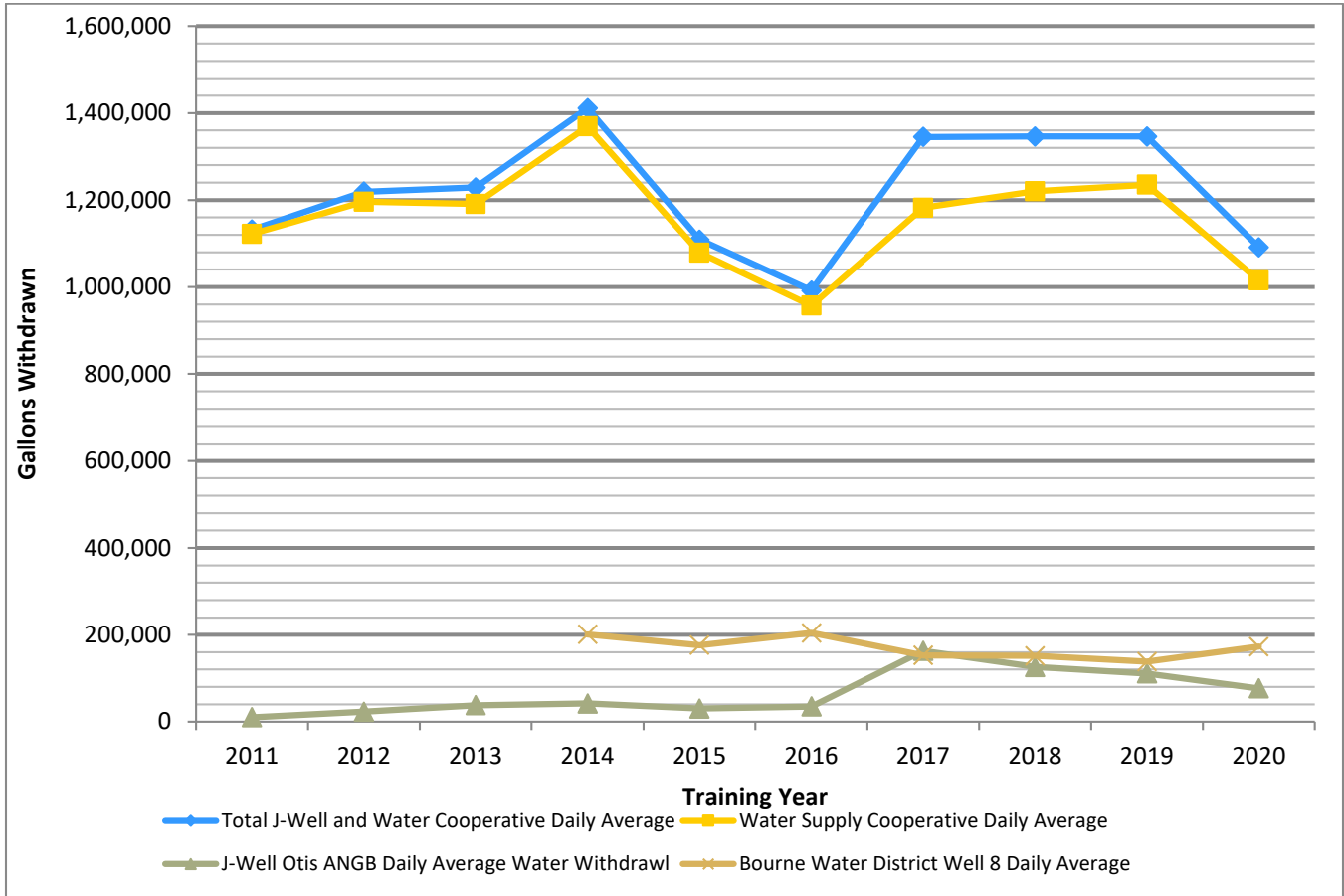
The Upper Cape Regional Water Supply Cooperative provided 370,647,000 gallons of water (a daily average of 1,015,471) from its three wells to the six public water supply systems it services during TY 2020: Bourne Water District, Mashpee Water District, Sandwich Water District, the Town of Falmouth water system, the Barnstable County Correctional Facility, and the Otis ANGB water supply system. The Cooperative is authorized to withdraw up to 3.0 million gallons per day. Graph 3-3 shows the daily average pumping rate of the Cooperative since TY 2011. The locations of the Cooperative’s three water supply wells (WS-1, WS-2, WS-3) and its seven sentry monitoring wells (C-1 through C-7) are shown in Figure 1 in Appendix E. No samples were taken for the Cooperative’s long-term monitoring well last year. The Cooperative’s 2020 Consumer Confidence Report is available in Appendix E.

#### Otis ANGB Public Water Supply System

The Otis ANGB system pumped an average of 76,460 gallons of water per day and a total of 27,908,000 gallons of water from its well, known as J-Well (located in the Cantonment Area), during TY 2020. It also received 40,188,000 gallons from the Cooperative during TY 2020; a daily average of 110,104 gallons. Graph 3-3 shows the daily average pumping rate of the Otis system since TY 2011.

A copy of the calendar year 2019 Consumer Confidence Report published by the 102nd Intelligence Wing in May 2020 is provided in Appendix E.

Graph 3-3 Daily Water Withdrawal, J-Well and Water Cooperative



Note: Bourne Water District Well 8 began production on May 30, 2014.

### Bourne Water District Water Supply Well

Bourne Water District Well 8 became operational in May 2014. During TY 2020 a total of 63,054,700 gallons were pumped, with a daily average of 172,752 gallons pumped. Graph 3-3 shows the daily average pumping rate of Well 8 for TY 2014 through TY 2020. The well’s location is shown in Figure 3-1. A copy of the calendar year 2019 Bourne Water District’s Water Quality Report is provided in Appendix E.

### Other Water Wells

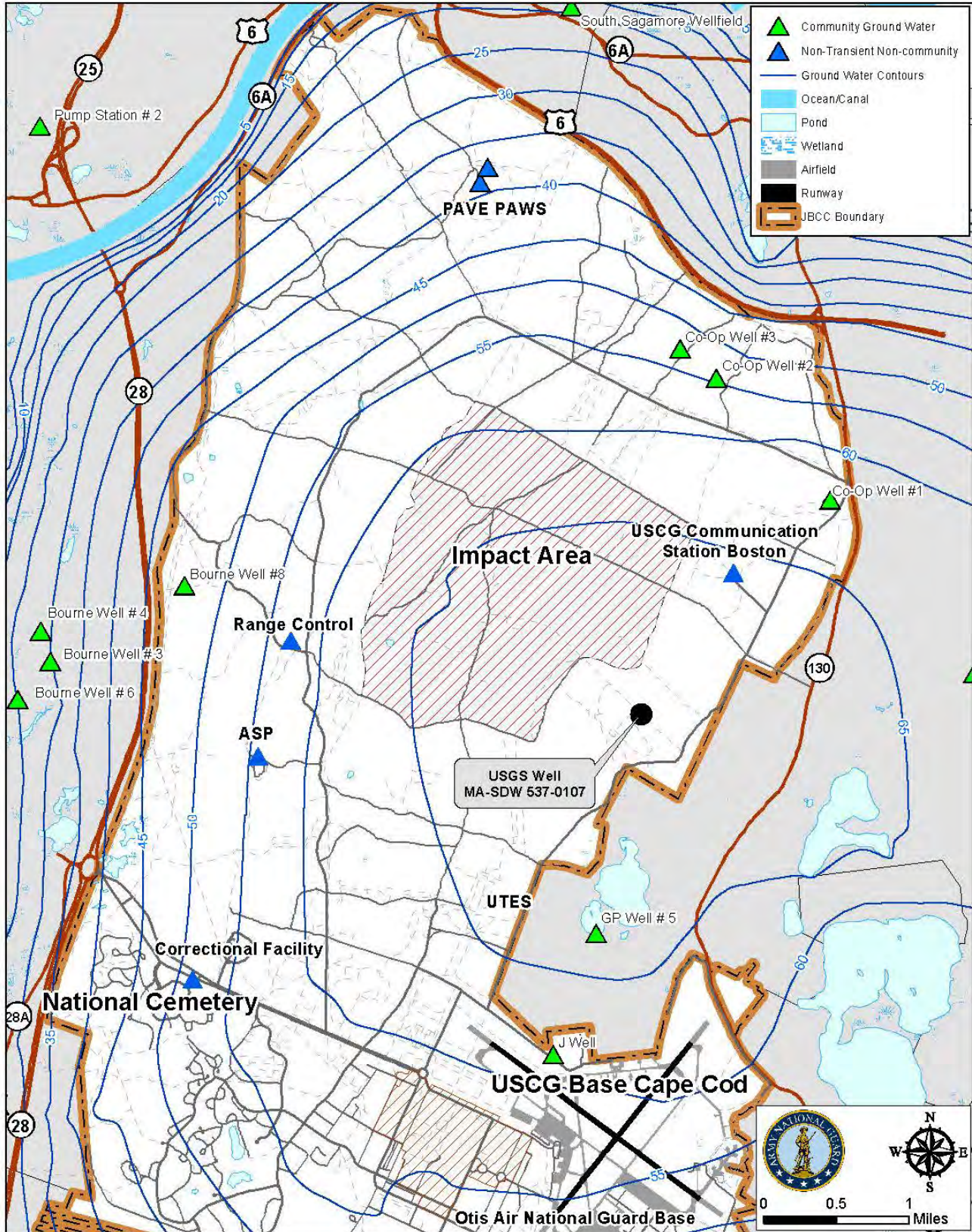
There are two water supply wells located within the boundary of the Training Area/Reserve, which are not subject to Chapter 47 of the Acts of 2002 and the EPSs. These are located at Cape Cod AFS (PWS# 4036008) and the USCG Communications Station. Further information on water supply wells is available on MassDEP’s website: <https://www.mass.gov/service-details/well-database>.

## 3.2 WETLANDS AND SURFACE WATER MANAGEMENT

The MAARNG did not take any actions during TY 2020 that resulted in the loss of any wetland resources or their 100-foot buffer areas. No new bivouac areas were created in the Training Area/Reserve during the year within 500 feet of any wetland and no land alteration activities were conducted by the MAARNG within 100 feet of a certified vernal pool during the year. Representatives of the E&RC routinely attended numerous coordination meetings held by various parties (e.g., Camp Edwards, IAGWSP) to stay abreast of the activities in the Training Area/Reserve and to ensure appropriate coordination occurred and impacts were avoided or permitted. No wetland associated projects were implemented or reviewed within the Training Area/Reserve during TY 2020.



Figure 3-1 Well Locations



In TY 2020, work was completed to comply with the Conservation and Management Plan (CMP) for Agassiz's Clam Shrimp (*Eulimnadia agassizii*), a state listed endangered species, occurring in roadway puddles. Details on this mitigation and monitoring are in Section 3.3.4. In TY 2018, the Bourne Conservation Commission reviewed this project and made a negative determination, as reported in the TY 2018 annual report.

In TY 2020, two significant efforts were made to help further wetlands priorities on base. First, Conservation Agents from the towns of Bourne and Sandwich both participated in a Stakeholder Task Force meeting for the development of the Integrated Natural Resource Management Plan (INRMP) Update. This allowed for input from the town's wetland specialists on priorities for conservation projects on the base going forward. The INRMP was sent out for signatures in December 2020. The document is now final, with the final signature received on February 8, 2021. In addition, in TY 2020, the Natural Resources Office hired a Conservation Biologist to focus on wetlands and vegetation priorities.

### 3.2.1 Vernal Pools

In TY 2020, the Natural Resources Office only monitored vernal pools and puddles for the existence of clam shrimp. No vernal pools or puddles were monitored specifically for amphibian activity. Monitoring of puddles followed the guidance agreed upon in the Conservation and Management Permit (CMP) for Agassiz's Clam Shrimp. The clam shrimp monitoring results are presented in Section 3.3.4.

## 3.3 RARE SPECIES MANAGEMENT

The Natural Resources Office and their contractors observed and reported on floral and faunal species listed under the Massachusetts Endangered Species Act (MESA) on Camp Edwards in TY 2020. The office observed 16 species and is reporting the sightings to NHESP in early TY 2021 (Table 3-1). One field technician hired for TY 2020 was primarily involved in observing and reporting these rare floral and faunal species in the Training Area/Reserve with supplementary observations from others. The Natural Resources Office is also reporting observations of "Tracking List" species to NHESP as a standard condition of scientific collection permits for reptiles and amphibians.

The Natural Resources Office formally and informally reviewed proposed military and civilian activities in the Training Area/Reserve to ensure that adverse impacts to natural resources (including state-listed endangered species) were avoided or mitigated. Multiple state and federal coordination processes were initiated or completed during TY 2020 for rare species. MESA coordination continued, culminating in a CMP, for future development of a MPMG range (Project #18-37434) and establishment of a "master planning" mitigation bank at JBCC for state-listed species potentially impacted by other projects within the Training Area/Reserve and Priority Habitat. The final CMP was signed on September 30, 2020. Informal consultation was also conducted with the US Fish and Wildlife Service (USFWS) New England Field Office for the MPMG Range project, evaluating the potential for impacting federally listed species including the Northern Long-eared Bat and two plants not currently known to occur at JBCC (sandplain gerardia [*Agalinis acuta*] and American chaffseed [*Schwalbea americana*]). The USFWS concurred with the MAARNG determination that the MPMG construction, maintenance, use, and mitigation actions may affect, but are unlikely to negatively affect, the Northern Long-eared Bat and American chaffseed on July 7, 2020. Additional review, coordination, survey, and permitting under this project and CMP included the Tango Range redevelopment and Eversource switching station soil stockpile with MESA approval and turtle protection for both projects. Additional details on these projects and associated actions is described in the Mitigation Section (3.19).

Multiple contracts were developed or continued in TY 2020 for surveying and managing rare species. Tetra Tech, a contractor for the MAARNG, manually vetted bat acoustic data from TY 2018 and TY 2019. Tetra Tech also completed a report interpreting MAARNG bat call vetting results from 2016 and 2017. Tetra Tech is currently



working to manually vet bat acoustic data from TY 2020, upload past data into the MAARNG bat acoustic database, and create a scope of work to analyze trends in bat data on base over the last 7 years.

See Section 3.3.6 for information on TY 2020 contracts and other in-house work regarding Eastern Box Turtles.

See Section 3.3.1 for details on a contract regarding the state-listed plant *Triosteum perfoliatum*.

In Training Year 2020, MAARNG Natural Resources continued opportunistic coverboard surveys aimed at studying snake species distributions in the Training Area/Reserve. Surveys were less frequent than in past years due to Covid-19 pandemic-related issues. In TY 2020 Natural Resources and ITAM staff worked with Camp Edwards Headquarters and Facilities Engineering to remove and fill the old, unused concrete firing positions at Ranges B and C. Past discoveries of snakes in these pits identified them as potential sources of mortality for snake species. Regular checks by Natural Resources technicians attempted to prevent/minimize any mortality events while coordination and work occurred to fill and or remove the pits.

### 3.3.1 Rare Species Reporting

Table 3-1 identifies the rare species sightings reported to NHESP for the past five years (See Appendix F for sightings reported for the past 10 years). The fluctuation in numbers reported is attributed to a variety of factors, including but not limited to: the time and length of surveys, locations where surveys are conducted (the same locations are not necessarily visited each year), intensity of the surveys, the number and experience of summer field crew personnel, weather conditions during the times available for surveys, locations where soldiers may train during the training year, familiarity of individual soldiers and others utilizing the various training areas and training support areas on Camp Edwards with rare species, etc. With these limitations and the varied associated counting procedures and efforts, the numbers contained in Table 3-1 do not reflect changes or trends in populations. These are raw number counts that are reported to NHESP based on sightings.

Efforts are ongoing to collect rare species and management data in a way that allows for trends analysis that will better inform management decisions and meet the intent of Chapter 47 of the Acts of 2002. The data currently reported in the table are gross observations only and not interpretable for trends. State-listed species such as the Whip-poor-will lend themselves to data collection for trends analysis (annual point-count transects) and cooperation with statewide or national efforts (Section 3.3.8). Likewise, grassland bird monitoring standardization will allow for long-term trends analysis and better integration with broader conservation initiatives. The Natural Resources Program staff are working with statewide and regional efforts to coordinate monitoring, including participating in the annual Northeastern Nightjar Survey.

In TY 2020, three species that occur on Camp Edwards were added to the Massachusetts Endangered Species list. The Eastern Hog-nosed Snake (*Heterodon platirhinos*), a species frequently found on base, was added as a Species of Special Concern. Habitat management activities that occur on base, including prescribed fire, forestry, and vegetation management, are thought to benefit the species. The Eastern Meadowlark (*Sturnella magna*) was



Photograph 3-1 The caterpillar of the Slender Clearwing Sphinx (*Hemaris gracilis*), one of the species reported to NHESP during TY 2020.

TABLE 3-1 LIST OF RARE SPECIES REPORTED TO NHESP

Quantities shown are not resulting of standardized surveys and should not be interpreted as population trends

Common/Scientific Names	Individuals Reported						
	Fed Status <sup>14</sup>	State Status	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
<b>BIRDS</b>							
Grasshopper Sparrow <sup>13</sup> ( <i>Ammodramus savannarum</i> )	-	T	16	15	16	20	34
Northern Harrier <sup>1</sup> ( <i>Circus cyaneus</i> )	-	T	Wintering	Wintering	Wintering	Wintering	Wintering
Upland Sandpiper <sup>13</sup> ( <i>Bartramia longicauda</i> )	-	E	9	8	7	12	6
Eastern Meadowlark <sup>13,16</sup> ( <i>Sturnella magna</i> )	-	SC	8	3	2	7	14
Whip-poor-will <sup>2</sup> ( <i>Antrostomus vociferous</i> )	-	SC	87	52	110	53	99
<b>REPTILES and AMPHIBIANS</b>							
Eastern Box Turtle ( <i>Terrapene carolina carolina</i> )	-	SC	38	42	43	58	45
Eastern Hog-nosed Snake <sup>16</sup> ( <i>Heterodon platirhinos</i> )	-	SC	2	3	8	9	1
<b>PLANTS</b>							
Adder's Tongue Fern <sup>4,6</sup> ( <i>Ophioglossum pusillum</i> )	-	T	98	247	0	25	646
Broad Tinker's Weed <sup>5,6</sup> ( <i>Triosteum perfoliatum</i> )	-	E	113	127	0	200	TBD
American Arborvitae <sup>9</sup> ( <i>Thuja occidentalis</i> )	-	E	4	N/A	N/A	N/A	N/A
<b>BEEES</b>							
Walsh's Anthophora <sup>15,16</sup> ( <i>Anthophora walshii</i> )	-	E	0	5 (1)	0	32 (9)	4
<b>BUTTERFLIES and MOTHS<sup>11</sup></b>							
Buck Moth ( <i>Hemileuca maia</i> )	-	SC	90	95	0	4	2
Pine Barrens Speranza ( <i>Speranza exonerata</i> )	-	SC	44	13	0	0	0
Sandplain Euchlaena ( <i>Euchlaena madusaria</i> )	-	SC	3	7	0	0	1
Heath Metarranthis ( <i>Metarranthis pilosaria</i> )	-	SC	1	1	0	0	0



TABLE 3-1 LIST OF RARE SPECIES REPORTED TO NHESP, cont'd

Quantities shown are not resulting of standardized surveys and should not be interpreted as population trends

Common/Scientific Names	Individuals Reported						
	Fed Status <sup>14</sup>	State Status	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
Melsheimer's Sack Bearer ( <i>Cicinnus melsheimeri</i> )	-	T	2	0	0	0	7
Gerhard's Underwing ( <i>Catocala herodias</i> )	-	SC	33	10	0	0	2
Pine Barrens Zale ( <i>Zale lunifera</i> )	-	SC	13	8	0	0	0
Barrens Dagger Moth ( <i>Acronicta albarufa</i> )	-	T	1	0	0	0	0
Chain-dotted Geometer ( <i>Cingilia catenaria</i> )	-	SC	0	0	0	1	0
Drunk Apamea ( <i>Apamea inebriata</i> )	-	SC	1	0	0	0	0
Pink Sallow ( <i>Psectraglaea carnosae</i> )	-	SC	9	5	0	0	0
Pink Streak ( <i>Dargida rubripennis</i> )	-	T	25	0	0	0	3
Collared Cycnia ( <i>Cycnia collaris</i> )	-	T	0	1	0	11	33
Coastal Heathland Cutworm ( <i>Abagrotis benjamini</i> )	-	SC	0	1	0	0	0
Woolly Gray ( <i>Lycia ypsilon</i> )	-	T	0	2	0	0	0
Water-willow Stem Borer ( <i>Papaipema sulphurata</i> )	-	T	0	1	0	0	0
Waxed Sallow Moth ( <i>Chaetoglaea cerata</i> )	-	SC	0	2	0	0	0
Frosted Elfin <sup>12</sup> ( <i>Callophrys irus</i> )	-	SC	5	5	5	TBD	25
Slender Clearwing Sphinx ( <i>Hemaris gracilis</i> )	-	SC	0	0	0	0	5

TABLE 3-1 LIST OF RARE SPECIES REPORTED TO NHESP, cont'd

Quantities shown are not resulting of standardized surveys and should not be interpreted as population trends

Common/Scientific Names	Individuals Reported						
	Fed Status <sup>14</sup>	State Status	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
<b>CRUSTACEANS</b>							
Agassiz's Clam Shrimp <sup>10</sup> ( <i>Eulimnadia agassizii</i> )	-	E	0	6	38	9	3
<b>MAMMALS</b>							
Northern Long-Eared Bat <sup>7,8</sup> ( <i>Myotis septentrionalis</i> )	T	E	15 (1)	2	1	3	TBD
Little Brown Bat <sup>7</sup> ( <i>Myotis lucifugus</i> )	UR	E	22	4	2	6	TBD
Tricolored Bat <sup>7</sup> ( <i>Perimyotis subflavus</i> )	UR	E	7	3	2	3	TBD
Eastern Small-Footed Bat <sup>7</sup> ( <i>Myotis leibii</i> )	UR	E	0	0	0	1	TBD

<sup>1</sup> NHESP is only accepting reports of nesting raptors, rather than opportunistic observations of individuals. Reports are provided as relevant, but common wintering birds or migrants are not individually tracked or reported (e.g., Northern Harrier).

<sup>2</sup> As of TY 2016, quantities only reflect the results of annual survey routes during May, after totaling the minimum number (between two observers) heard at each site. In prior years, the number shown reflects the quantity reported to NHESP, which may include multiple survey windows and repeated counts. Due to Covid-19 concerns, 2020 routes were not run in duplicate, and the number represents the total number of individual birds heard calling throughout the routes.

<sup>3</sup> Comet and Spatterdock Darner are no longer on NHESP's rare species list. Also, Odonate surveys were suspended after TY 2015.

<sup>4</sup> Several known *Ophioglossum* sites could not be surveyed in TY 2016 due to a lack of cease-fire agreement with the off-base Monument Beach Shooting Club. 2019 numbers are likely under representative, as surveys occurred late in the season. In 2020 *Ophioglossum* was surveyed earlier in the year in order to get an accurate count.

<sup>5</sup> Actual 2019 numbers may be as few as 82, MAARNG staff is now studying the genetics of *Triosteum perfoliatum* and *T. aurantiacum* due to difficulty in accurately differentiating the two species. Once the genetics project is completed, 2020 numbers will be reported.

<sup>6</sup> In 2018, only sites with historic records and no recent records were surveyed, and this should not be interpreted as a loss of rare plants between 2017 and 2018.

<sup>7</sup> Acoustic monitoring collects "call sequence" data and the true number of individuals is unknown. Numbers in the table reflect the number of survey sites with acoustic detections confirmed through manual call vetting. Numbers are reported to NHESP, but not tracked by them due to current uncertainty in using acoustic identifications. TY 2020 data is still being processed, these numbers are to be determined at a later date (TBD).

<sup>8</sup> Number in parentheses is captured individuals trackable by NHESP due to species identification confirmation versus acoustic data.

<sup>9</sup> NHESP is not interested in tracking this population, as it is likely of anthropogenic origin (pers. comm. with State Botanist, Bob Wernerehl).

<sup>10</sup> Numbers represent only locations where species was found and ID confirmed by either NHESP Aquatic Ecologist or trained MAARNG staff.

<sup>11</sup> Moths were extensively surveyed under contract with the Lloyd Center for the Environment between 2016 and 2017. There were no surveys in 2018, and MAARNG staff is not recording flight records of Barrens Buckmoth, as they are ubiquitous around the Training Area/Reserve. 2019 quantities represent individuals or groups of individuals (a group of Barrens Buckmoth caterpillars on a single leaf is counted as one, as are a pair of Unexpected *Cynia* caterpillars sharing the same butterflyweed plant).

<sup>12</sup> MAARNG staff did not perform surveys for *Callophrys irus* in 2019, but facilitated USFWS surveys. Results are pending, but USFWS staff found Frosted Elfins across a wider area than was previously known.

<sup>13</sup> Grassland bird numbers represent individual territories observed in a given year rather than the total number of birds observed throughout repeated surveys as was reported in past years (prior to the TY 2019 SOTRR). Upland Sandpiper counts exclude known females, but include unknown birds. Also, the numbers reported in annual reports TY 2015 and earlier included birds found on the Coast Guard airfield, which is not reported by MAARNG Natural Resources. Numbers in this version of Table 3-1 are accurate.

<sup>14</sup> "UR" indicates a species is currently under review for listing on the federal Endangered Species Act.

<sup>15</sup> MAARNG contracted a targeted survey for *Anthophora walshii* in 2019 after an exploratory bee survey in 2017. The first number represents the number of flying/foraging records, and in parentheses the records of nesting activity. Unconfirmed nests were not counted.

<sup>16</sup> Species added to MA Endangered Species List in TY 2020. Observation quantities included for prior years, but would not have been officially reported to NHESP.

also listed as a Species of Special Concern. This species utilizes the grasslands on base as summer nesting habitat and regularly overwinters in lower abundance. The protective measures and habitat management in place already in the grassland management area is consistent with activities to protect and promote this species. Walsh's Anthophora (*Anthophora walshii*) was added to the list as Endangered. Walsh's Anthophora has primarily been observed in the Cantonment Area grasslands in areas experiencing frequent management activities. The species has also been observed on powerline right of ways and one range area on base. From surveys conducted, the species was found to be more abundant in heavily managed areas (mowing, fire, and herbicide use). Hence, this species will not change management activities occurring in the grasslands or other early successional areas. All of these species are expected to benefit from the mitigation actions outlined in the CMP.

Based on recommendations from the State Botanist in 2016, a subset of rare plant sites are surveyed annually, and each site monitored every three years. Hence, the numbers presented in the tables cannot be evaluated as trends in the species. State-listed plants were surveyed at seven sites for *Ophioglossum pusillum* and *Triosteum perfoliatum* in TY 2020, including all sites where *Ophioglossum* is known to be or has recently been extant. *Ophioglossum pusillum* was found in low to moderate quantities at three sites. Surveys were performed earlier this year, as in past years the *Ophioglossum* had senesced by late summer (this happened even earlier in TY 2020 due to drought). In TY 2020, one site had *Triosteum perfoliatum* present. This species is difficult to tell from its congener, *Triosteum aurantiacum*, particularly when plants are in smaller growth stages or less than ideal conditions. In the Training Area/Reserve, it appears that the two species grow in the same areas, adjacent to each other. This makes accurate counts difficult and prompted the Natural Resources Office to contract a genetic and hybridization study, which started in TY 2020. Results are expected in TY 2021, and will guide future monitoring, and possibly restoration efforts. The Natural Resources Office also surveyed the lone population of the Watch List plant *Lupinus perennis*, located in the Training Area. A subset of seed was collected for year two of a five-year translocation project aimed at creating satellite populations for the long-term stability of the species in the area. Seed collected in 2019 was translocated to a site in the Cantonment grasslands, and germination was successful, but the length of the drought made it unlikely that any plants will survive into 2021.

In TY 2020, acoustic monitoring for bats continued. Tetra Tech was contracted to perform manual vetting and database upload, and results will be received in TY 2021. Confirmed detections will be reported to NHESP. All vetted bat data from 2014-2020 was entered by Natural Resources staff into the federal database, NABat, to inform the ongoing USFWS status assessment of *Myotis lucifugus*, *M. septentrionalis*, and *Perimyotis subflavus*. In TY 2020, Tetra Tech vetted data from 2018 and 2019 and produced reports on 2017 and late 2016 data. TY 2019 vetting results detailed the presence of a new bat species for Camp Edwards, the state-listed *Myotis leibii*, at a single site in the southeastern corner of the Training Area.

Starting in TY 2019, grassland bird numbers represent individuals (not double counting the same bird) observed in a given year rather than the total number of birds observed throughout repeated surveys as was reported in past years. This will better represent the number of active territories in a given year. In 2020, there were 34 active Grasshopper Sparrow territories, 7 active Upland Sandpiper territories, and 14 active Eastern Meadowlark territories. There were no Vesper Sparrows observed in TY 2020. Due to the way surveys were run in TY 2020, it's possible that Grasshopper Sparrow territory numbers may include some overlap between sites (inflated numbers).

Harrier sightings were not counted as the species is constant and conspicuous throughout the non-breeding season with much uncertainty to individuals, and NHESP no longer accepts non-nesting reports of this and other raptor species.

### 3.3.2 State and Federally Listed Bats

The Northern Long-eared Bat (NLEB) was federally listed as threatened in May 2015. The listing is primarily due to the severe population crashes (estimated greater than 95%) caused by white-nose syndrome. The extent of population loss drives concerns for impacts on individuals and maternal roost sites throughout the eastern United States. Recent survey efforts have suggested that NLEB are persisting better in coastal areas of the Northeast than any of the rest of their range. Because of this, there is a strong focus on surveys and conservation on Cape Cod and the Islands, Long Island, and coastal New Jersey. A NLEB was discovered on Martha's Vineyard in February 2016 with successively more found hibernating. Acoustic hits for NLEB on base in March and November suggest bats may be overwintering on Cape Cod, as well. If they are utilizing a different type of hibernacula than the caves utilized inland, it could have huge implications for the recovery of the species. Caves allow the spread and growth of white-nose, but a different type of hibernacula or less densely inhabited hibernacula may be allowing coastal bats to avoid white-nose syndrome leading to the greater numbers of bats in coastal areas.

In TY 2020, four sites in the Training Area were acoustically monitored for bats using programs targeting the foraging and echolocation characteristics of NLEB and *Perimyotis subflavus*. Two of these are considered long-term monitoring sites, having been recording at some of our highest-activity NLEB sites year-round since 2015. In TY 2019-2020 program staff aimed to acoustically monitor the state-listed species *Perimyotis subflavus* (also being considered for federal listing), as it is a high-flying species that may require different methods than those used to monitor NLEB. Two of the acoustic sites were set up above the forest canopy to survey specifically for them. These sites will also be monitored through the winter of 2020-2021. *P. subflavus* and NLEB were each recorded at 3 of the 19 acoustic sites monitored in TY 2019, including one site where they were both found, site 15\_35, along the southeastern boundary of the Training Area. *P. subflavus* was recorded at one of the two sites targeting the species in TY 2019, though equipment and insect noise issues were prevalent.

In TY 2020, Tetra Tech, a contractor for the MAARNG, manually vetted bat acoustic data from TY 2018 and TY 2019. Tetra Tech also completed a report interpreting MAARNG bat call vetting results from 2016 and 2017. Tetra Tech is currently working to manually vet bat acoustic data from TY 2020, upload past data into the MAARNG bat acoustic database, and create a scope of work to analyze trends in bat data on base over the last seven years.

The Army National Guard completed a programmatic informal consultation for NLEB addressing small projects implemented by MAARNG at all managed locations to include actions less than 5 acres and incorporating conservation measures. The USFWS concurred with the Army National Guard determination on October 8, 2015 and small projects are kept within the scope of that agreement. Larger projects are scoped to avoid impacts to bats to the extent possible while utilizing the 4(d) rule exemption under the Endangered Species Act as appropriate for habitat management actions. Investment in equipment, personnel training, and collaboration continued in TY 2020 to address concerns both over avoiding impacts to bats and minimizing bat impacts on ongoing actions such as pine barrens habitat management.

The Air Force Civil Engineer Center (AFCEC) manages two 1.5 megawatt (MW) wind turbines in the Training Area/Reserve. Turbine operation is curtailed for the NLEB from July 15 to October 15, 30 minutes before sunset to 30 minutes after sunrise for wind speeds less than 4.5 meters per second. There were no reported bat or bird strikes during TY 2020. However, there is not an active mortality survey effort and any reportable observations would be associated with equipment maintenance activities. Acoustic surveys conducted at Air Force Station Cape Cod, including turbine sites, found relatively low levels of activity dominated by Big Brown Bat.



### 3.3.3 New England Cottontail Rabbit Study

The Natural Resources Office began a study in TY 2010 on the New England cottontail rabbit (*Sylvilagus transitionalis*), at the time a candidate species for federal listing. Original study objectives were to determine the home range and habitat preferences of the species. This information can be used regionally to influence effective management efforts for this species. Current and future efforts are transitioning more from research into population monitoring, though with a strong emphasis on evaluating the effects of habitat management on cottontails. New England cottontails occur throughout suitable scrub oak habitat across Camp Edwards.

In 2015, the USFWS removed New England cottontail from the federal candidate list. The finding was based upon the conservation implementation enacted and future commitments by the large regional partnership, including MAARNG and Camp Edwards. Continued habitat management and monitoring are critical to New England cottontail success and keeping the species from being federally listed.

In TY 2016, contracted wildlife detection dogs readily found pellets at off-base locations and at two on-base sites located along powerlines. At several sites on base that had previously had rabbits, the dogs did not find rabbit sign or not in all repeated surveys at the site. This data could suggest a lower density of rabbits or a higher extinction rate at more interior sites. More interior sites tend to have more native habitat. To further explore the factors driving this, the Natural Resources Office sent fecal samples for diet analysis in TY 2017 and 2018. The low diversity of food resources at interior base sites with more native vegetation may be limiting the density of rabbits on base. In TY 2019, the Natural Resources Office assisted a Harvard graduate student correlating our diet analysis data with availability of vegetative resources through stem density counts. In TY 2020, the graduate student completed his thesis (available here: <https://dash.harvard.edu/handle/1/37365622>). His findings on preferred forage species and management techniques to encourage diverse forage species will be examined in TY 2021 and used in planning management activities for the species.

The Natural Resources Office continued active participation on the Technical Committee, working with partners to prioritize and develop actions and efforts to implement the conservation strategy for the species. Due to a technician leaving the position in the early winter, pellet search efforts in regional plots were suspended in TY 2020. The Natural Resources Office plans to resume pellet searches in TY 2021. In Fiscal Year 2021, the Natural Resources Office plans to contract statistical analysis and reporting for the New England cottontail data compiled thus far. This synthesis of New England cottontail research was approved for funding in TY 2019, but was an unfunded request until late in the year. The timing of funding did not provide sufficient time for preparation and contracting. In TY 2020, the project was again an unfunded request. In TY 2019, the funds that arrived late in the year were used for a habitat restoration project in Training Areas BA-6 and BA-7 to benefit the species. In TY 2020, several habitat management projects totaling 207 acres completed on Camp Edwards this year have benefits for expanding or maintaining New England cottontail habitat. In addition, the establishment of an on-site mitigation bank will continue to manage pine barrens on Camp Edwards to benefit the New England cottontail as well as many state-listed species.

### 3.3.4 Agassiz's Clam Shrimp

Clam shrimp were discovered in roadway puddles on base in TY 2015. Initial attempts at identification indicated the clam shrimp could be two state listed species, *Eulimnadia agassizii* and *Limnadia lenticularis*. In TY 2018, the NHESP Aquatic Ecologist confirmed *E. agassizii* in multiple roadway puddles along with the non-listed *Cyzicus gynecea*. *Limnadia lenticularis* has not been identified on base. In TY 2018, NHESP visited Camp Edwards, viewed some of the known clam shrimp locations, and trained MAARNG staff in proper identification of the species likely to be encountered in the Training Area/Reserve. The Natural Resources Office also received a collection permit to sample clam shrimp on MAARNG lands or any lawfully entered lands in Massachusetts.

*E. agassizii* occurs in roadway puddles on base. These sites are most often heavily trafficked, unvegetated puddles created by roadway compaction. Several puddles along Herbert and Cat Roads had become large enough to impede use for training. In TY 2018, the Natural Resources Office worked with NHESP and Oxbow Associates to create a Conservation and Management Plan (CMP) to address the necessary road repairs and provide net benefit for the species. The plan includes several components: habitat creation, experimental treatments, and monitoring. As part of the mitigation actions in TY 2019, a new puddle was created along the Tank Trail and an existing puddle was modified to create better habitat on Canal View Road. In TY 2020, two sites along Cat Road were repaired as *in situ* sites. One puddle had the egg-bearing sediment scraped, rock and sand laid down and compacted, and the egg-bearing sediment spread on top. The other puddle on Cat Road had a drainage ditch cut in the side to control the water level. The bottom of the puddle was hardened, and this solution allowed the bottom, egg-bearing sediment to be undisturbed. This completed the mitigation actions outlined in the CMP.

The third of three years of monitoring required in the CMP was completed in TY 2020. The methodology used was coordinated with NHESP as part of the CMP process. Natural Resources staff conducted repeated surveys (biweekly or monthly depending on season) at 11 puddles (10 puddles required by the CMP), some known to have had clam shrimp. Pools were measured for area, depth, temperature and pH, and all aquatic life was recorded. *Eulimnadia agassizii* were found in three of these puddles, including two where presence was expected but unconfirmed based on past survey results. Surveys in TY 2020 also documented for the first time the coexistence of *E. agassizii* and *C. gynecia* concurrently in the same pool. Given the dry conditions in TY 2020, few puddles had water during most of the survey period. Given the lack of favorable conditions in TY 2020 and the desire for additional surveys on the newly created and *in situ* puddles, clam shrimp surveys are planned for TY 2021.

### 3.3.5 Walsh's Anthophora

In 2017, the Natural Resources Office contracted bee specialist Michael Veit to perform bumblebee surveys at Camp Edwards. During his work, he discovered a breeding population of *Anthophora walshii*, Walsh's Anthophora, or Walsh's Digger Bee, in the Cantonment grasslands. This species' range is in the central US with Massachusetts having the only extant population east of Ohio. The species has only been documented in two Massachusetts locations in the last 35 years, Martha's Vineyard and Camp Edwards. According to Michael Veit, Camp Edwards seems to have the largest breeding population yet discovered in the Northeastern United States. At the time of this discovery, NHESP had *Anthophora walshii* listed as a Species of Greatest Conservation Need, but in TY 2020 the species was listed as Special Concern under MESA.

In 2019 Michael Veit completed ten days of surveying for *Anthophora walshii* at Camp Edwards. For this survey, sites with large populations of *Baptisia tinctoria*, the primary food plant for the species, were surveyed including sites in the Cantonment Area and the powerline right-of-way on Gibbs Road. *Anthophora walshii* was documented at three grassland parcels owned by MAARNG, one parcel owned by the Coast Guard on Shelton Road, and on the powerline on Gibbs Road near Sierra Range. Both foraging and nesting activity was documented at all sites, except the on the powerline where no nesting activity was documented.

In early July 2020, Natural Resources staff documented foraging of *Anthophora walshii* on *Asclepias* (milkweed) species in two separate parts of the Training Area, 6 km apart, and each roughly 4 km from the nearest known *Anthophora walshii* site. The sites consisted of a small powerline right-of-way with a small population of *Asclepias amplexicaulis* and an unmowed area behind a small arms range with a large, dense population of *Asclepias syriaca*. Through correspondence with Michael Veit it was determined that these were likely males foraging in advance of the emergence of females.

All the sightings of *Anthophora walshii* have been in areas that have been managed with either mowing, prescribed fire, herbicide use or a combination of those treatments. Given the regular management of the grassland parcels, the planned increase in management from the CMP mitigation projects, and the continued management by the utility companies of the rights-of-way, this species is expected to benefit from planned management activities and not impact current operations.

### 3.3.6 Eastern Box Turtle

In support of the MPMG proposed project, AECOM was contracted to create an Eastern Box Turtle Construction Period Monitoring and Protection Plan (CPMPP) and to complete initial canine-assisted surveys around the MPMG range in the fall of 2019. Once NHESP approved the plan, the plan implementation was contracted to AECOM to provide canine-assisted pre-construction turtle surveys and construction period monitoring, including tracking turtles around the project area using radiotelemetry. The CPMPP included silt fence installation followed by the required hours of turtle surveys inside the wildlife barrier completed before October 31. The construction contract was not awarded in TY 2020, which meant the silt fence could not be installed. The agreed upon survey hours and turtle tracking was still completed. A report on all efforts will be submitted to NHESP in TY 2021 and a new timeline for silt fence installation and turtle clearance will be discussed.

In September and October 2020, AECOM completed a similar project for Tango Range including creating an approved CPMPP, completing surveys inside a wildlife barrier, obtaining approval from NHESP for construction to proceed, and completing construction monitoring during the turtle active season. The MAARNG contracted LEC Environmental Consultants, Inc. to do a similar effort for the gym expansion project in the spring of TY 2021. Natural Resources Office biologists have also been coordinating with utility projects on their efforts to protect Eastern Box Turtles and plan around rare species.

In-house turtle searching and telemetry efforts focused on tracking turtles from C-14 and around the MPMG. The majority of these turtles were equipped with transmitters in Fall 2019. Other turtles found in the area and in the areas surrounding Tango and Sierra Range (areas with future construction projects) were also outfitted with transmitters and tracked. At Juliet and Kilo ranges, the tarps covering the STAPP™ system form puddles, where turtles have been found in the past. These puddles were monitored for turtles, with several being found here. The Natural Resources Office also attempted to replicate this on the MPMG Range using black plastic and water filled from fire equipment. No turtles were captured using this method. Given knowledge of turtle use of the tarps at Juliet and Kilo ranges, a technician searched the work area daily during for the turtle active season during the STAPP™ system removal project.

As turtles were monitored, an increasing number of Dipteran larval infestations were observed and monitored. Two turtles were found dead and taken for necropsy at Tufts Wildlife Clinic. Six turtles with radio transmitters were taken to Tufts due to significant fly larvae infestations and concerns for their survival. Two of those will overwinter at Tufts while the rest were healthy enough to be released shortly after treatment. Natural Resources Office staff are coordinating with the State Herpetologist and the veterinarian at Tufts on this recently discovered threat to turtles on base.

During the summer, a turtle mortality was discovered on Echo Range in one of the firing lanes. It is assumed that the turtle fell in the firing lane and was unable to escape. Given the heat in the summer and lack of shade, Range Control conducted twice daily checks of the lanes to prevent another mortality event. During monitoring, one turtle was discovered on the range and relocated to the east. Range Control, with input from the Natural Resources Office, is creating ramps to install in each lane to provide a means of egress for turtles and preclude the need for monitoring during the turtle active season.





Photograph 3-2 A firing lane on Echo Range. Range Control, with input from the Natural Resources Office, will install ramps in the firing lanes as a means of turtle egress.

### 3.3.7 Lepidoptera

The creation of the MPMG, the associated fire control measures, and the required pine barrens management will increase the amount of fire on the landscape. Many of the Lepidoptera species on base are expected to greatly benefit from the reintroduction and increased frequency of fire. The monitoring component of the CMP requires long-term Lepidoptera surveys. The monitoring component needs to evaluate effects of the overall range development, the fire hazard reduction actions, and mitigation actions (short and long term) on the Lepidoptera community. Monitoring of moth and butterfly species will guide adaptive management for the use of fire (e.g., seasonality, intensity, return interval). The Natural Resources Office has contracted Western EcoSystems Technology Inc. to provide a robust analysis of sampling designs to make the most use of the monitoring data. The Natural Resources Office plans to implement the sampling design in TY 2021.

In TY 2019 and 2020 the Natural Resources Office collaborated with a PhD student from the UMass Boston Stevenson Lab in monitoring Lepidopteran diversity at Camp Edwards. The focus of the student's research is Lepidopteran diversity across urban/rural gradients, and the Training Area fits the rural category. While a general moth expert, the student also specializes in the Sphingidae, a declining group. Her studies have expanded our knowledge of Sphingid moths at Camp Edwards and has added to our list of moth species found at Camp Edwards. She introduced survey methods to the Natural Resources Office that directly resulted in the TY 2020 documentation of a state-listed species not previously found at Camp Edwards but



Photograph 3-3 A frosted elfin (*Callophrys irus*)



assumed to be present (*Hemaris gracilis*) and the rediscovery of a northern Training Area population of frosted elfin (*Callophrys irus*) thought to have been extirpated since last seen in 1994 (Photograph 3-3). Her work at Camp Edwards will continue in TY 2021.

### 3.3.8 Eastern Whip-poor-will

Prior to TY 2016, Whip-poor-will numbers shown in the table have included multiple surveys, and likely repeated counts. From TY 2016 onward, the number reported reflects the lowest number (between two observers) heard per site during a single round of surveys to remain conservative in reporting, while keeping detections over negative site records (sites are only considered negative records if surveyors mark paired zeroes).

Due to issues regarding the Covid-19 pandemic, surveys in TY 2020 were not paired, but performed by a single observer. The numbers reported in the table for TY 2020 are the sum of individuals heard by each observer, removing any results from points that were duplicated. Weather and conditions prevented TY 2020 surveys from adhering to Northeastern Nightjar Survey guidelines, and in most cases it took several nights to complete routes that are typically completed in a single night. Between May 13-15 and on May 20, 99 individual Whip-poor-wills were detected at 26 out of 32 sites.

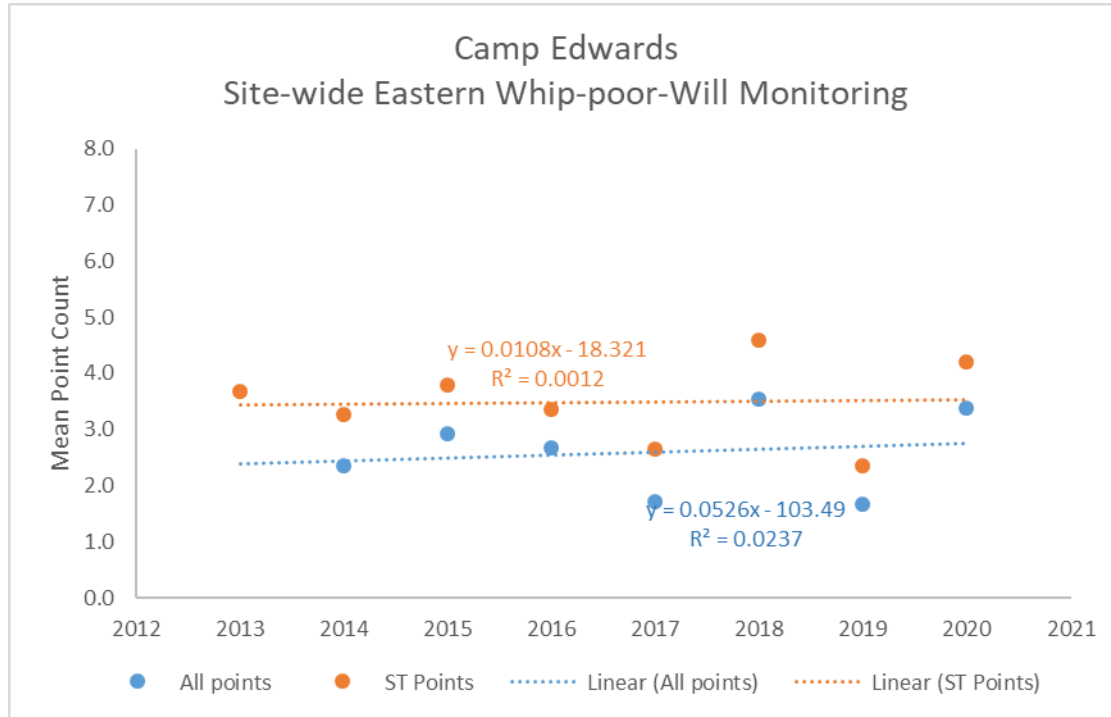
For the fourth year, Natural Resources staff assisted a joint research project led by Marja Bakermans (Worcester Polytechnic Institute) and Andrew Vitz (MassWildlife) on active netting of Whip-poor-wills at Camp Edwards for a migration study. No new GPS tags were deployed at Camp Edwards this year, but there was high recapture success collecting previously deployed dataloggers. Results will be reported separately by the researchers and referenced here when publicly available. MAARNG personnel support was significantly reduced this year due to pandemic concerns with a maximum of two staff assisting primary personnel. However, close coordination allowed for flexible collaboration and reaction to the pandemic challenges.

Annual implementation of the Northeastern Nightjar Survey, as mentioned above, facilitates the evaluation of population trends throughout Camp Edwards and the Training Area/Reserve using a standardized protocol implemented throughout the eastern United States. A subset of 10 points originally set by MassWildlife has been surveyed annually since 2013 and an average of over 34 sites has been surveyed along three routes starting in 2014 providing a site-wide assessment. The Eastern Whip-poor-will is likely a strong indicator of pine barrens habitat health and management condition given its sensitivity and decline throughout the region and close association with dense, but open woodland and shrubland habitat condition that is important to the vast majority of species of conservation concern in southeastern Massachusetts.

Given that the state assigned points target higher quality habitat than the more randomly assigned site-wide points, the state (ST) points have consistently higher mean count of birds per point. A mean count of Whip-poor-wills detected at each point is calculated for a year, throwing out survey nights that have inordinately low detections due to weather, lunar illumination, or other conditions. For population trend analysis the mean for all points within a year is compared across years. The 2014-2020 site-wide mean count of Whip-poor-wills is 2.6 with an insignificantly positive trend slope of 0.05. Likewise, the ST point set from 2013-2020 has a mean count of 3.5 Whip-poor-will per point and no significant trend (0.01 birds per point per year). Graph 3-4 presents the summary annual mean counts and trend lines.

The primary notable trend is the increasing interannual variation first seen with the very low counts in 2017, followed by new high totals in 2018, and continuing to alternate dramatically in 2019 and 2020. This is likely due to the very narrow definition of survey nights for the nightjar survey and calling behavior of whip-poor-wills being quite sensitive to conditions. For example, they reliably call quite actively during the dusk period and just after dark somewhat regardless of conditions, but then will only reliably continue calling with high levels of lunar illumination, relative warm temperatures, and overall calm and dry weather. Some years, like 2017 and 2019,

Graph 3-4 Camp Edwards Site-wide Eastern Whip-poor-will Monitoring



Graph 3-4: Annual results of Camp Edwards Whip-poor-will monitoring using the Northeastern Nightjar Survey protocol. The orange (ST) points are a subset of 10 points originally set by MassWildlife based on habitat associations and the blue points are the overall site-wide monitoring points (mean 34 per year).

have competing priorities including prescribed fire and supporting the whip-poor-will research project that limited available nights and led to attempting surveys under somewhat less favorable conditions. Other potential explanations include a response to management (e.g., prescribed burns) shifting birds around as they are temporarily displaced and/or recolonize areas previously less suitable – with either leading to lower counts at surveyed points – or stochastic dynamics related to regional declines starting to impact local populations. The observation that the restrictions and challenges presented by the ongoing pandemic in 2020 required added flexibility to be able to complete surveys is of particular interest for future surveys. Single observers (as opposed to paired) surveyed fewer points on a survey night taking advantage of the dusk activity period and ending when whip-poor-will activity ended. This more opportunistic structure will make the surveys more achievable and more standardized for survey window by avoiding nights with high early activity and little to no late activity.

However, focal research efforts and longer-term trends suggest that the overall population is healthy and response to management is positive or neutral.

### 3.4 SOIL CONSERVATION MANAGEMENT

All military and civilian uses and activities in the Training Area/Reserve during the year were reviewed by the Natural Resources Office to ensure that they were compatible with the limitations of the underlying soils. All users were instructed to report evidence of soil erosion to Range Control so that potential repairs to roads, bivouac areas and well pads could be identified in a timely manner. None of the existing unimproved roads in the Training Area/Reserve were made into improved roads as a result of IAGWSP remediation activities during the year. Additionally, any maintenance on unimproved roads during the year did not involve paving the roads. Repairs were made by the IAGWSP, coordinated with the EMC's Environmental Officer, on Wood Road, Barlow Road, and Turpentine Road consisting of graveling significantly degraded sections. IAGWSP coordinated closely with Natural Resources to avoid impacting Agassiz's clam shrimp and the programs are working together to

develop a road maintenance plan within the INRMP, coordinated with the towns and NHESP, to ensure provision of abundant clam shrimp habitat while maintaining an effective road network that supports training, remediation, natural resources management, and emergency response.

Three repaving and/or pavement repair projects were completed to stabilize degrading roads and remediate conditions leading to road widening or potential road failure. The IAGWSP, coordinating with the EMC’s Environmental Officer, repaved Turpentine Road from Herbert Road to Pocasset-Forestdale Road. An Army Engineer paving unit repaved Pocasset-Forestdale Road from Frank Perkins Road west to the Ammunition Supply Point and completed major pothole repair on Pocasset-Forestdale Road extending east to Greenway Road.

### 3.4.1 Erosion

The Integrated Training Area Management Program (ITAM) worked with Camp Edwards Facilities Engineering to conduct erosion management on established maneuver trails. No significant projects were conducted.

## 3.5 VEGETATION, HABITAT AND WILDLIFE MANAGEMENT

The Natural Resources Office manages for a diversity of natural communities, plants, and animals. This supports a sustainable military training site and high-quality habitat for rare species (Table 3-1) as well as common ones. Particular emphasis is on maintenance or expansion of earlier successional habitats (e.g., grasslands, shrublands, and young forests) due to the conservation value of these habitats and rapidity at which they are lost to trees or other influences. Mechanical restoration, prescribed fire, resource monitoring, invasive plant management and others are important tools used here. During TY 2020, two larger restoration projects were implemented along with several smaller, focal projects – all of which are discussed in much greater detail in Section 3.5.6. Table 3-2 provides an overview list of the projects. A whole-tree timber harvest restored the area surrounding BP-20 to historically shrub savannah conditions. One hardwood coppice management project recommended by MassWildlife was completed to support rare species mitigation goals as a phase 2 management at Wheelock Overlook. Four battle positions received basic vegetation management, and invasive plant management was continued after emphasis on planning and personnel training and licensing. No prescribed burn operations were conducted due to poor weather conditions and the onset of the Covid-19 pandemic. Additionally, six permits were maintained to continue wildlife and fire operations.

Table 3-2 Training Area Management Projects

Training Area	Acres Treated	Primary Objective	Treatment Method
Battle Position 24	1.3	Training site rehabilitation	Extracted and removed dense immature pitch pine monoculture
Battle Position 20	41	Training site rehabilitation	Whole tree harvest
Wheelock Overlook	40	Habitat management	Targeted herbicide application
BA-6 and BA-7	107	Fuel reduction	Targeted mastication of standing dead trees
Bivouacs and BPs	12	Training site maintenance	Rotary deck and forestry cutting head mowing

Efforts to collect habitat management information for trends analysis were initiated in 2013 and will be continued. Additionally, overall bird surveys were revised in 2013 to use static point-counts and transects through the Training Area to specifically provide long-term trend data over time and intentionally cover specific categories of training areas and habitats for evaluation of site use and impacts. As sufficient data has been collected and additional efforts are begun, those trends will be reported. With eight years of bird monitoring data utilizing the

standardized point counts, Natural Resources Office staff had initiated evaluating trends for focal species. However, much work is left before reporting results. Eastern Whip-poor-will data showing sitewide trends, including extensive habitat restoration efforts since 2013, are reported above. Completing bird survey trend analysis will be carried forward as a priority as it was included in the Conservation and Management Permit to evaluate impacts of large scale mitigation efforts (positive and/or negative) in the Cantonment area and the Training Area.

A significant administrative commitment to ecosystem management was realized in TY 2020 as the Natural Resources and ITAM Program was able to complete a long-term effort to hire two new full-time positions. The addition of a dedicated Wildland Fire Program Coordinator (August 2020) and Vegetation and Wetlands Conservation Biologist (July 2020) will significantly increase our ability to plan, implement, and monitor conservation actions within the Training Area/Reserve including active habitat management.

### 3.5.1 Vegetation Surveys

Limited vegetation survey efforts were conducted beyond targeted state-listed and Watch List plant surveys. However, an initial survey was developed and implemented to assess short- and long-term tree and habitat response to forest management activities (e.g., harvests). At this time there is not sufficient variation between harvest prescriptions as to provide an overview, but details will be added in future years. Typical vegetation surveys for New England cottontails are based on radiotelemetry locations. This year no rabbit trapping was performed, so vegetation surveys were not needed. Fire monitoring plots were not completed this year. Land navigation surveys are performed on an as needed basis and were completed in TY 2017.

### 3.5.2 Invasive and Nuisance Vegetation Management

Invasive plants are non-native species that have spread into natural, minimally managed, or disturbed plant systems in Massachusetts. They can cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems. As defined here, “species” includes all synonyms, subspecies, varieties, forms, and cultivars of that species unless proven otherwise by a process of scientific evaluation. Invasive species are primarily from the Massachusetts Invasive Plants Advisory Group (MIPAG) lists, but also include emerging invasive species as coordinated with partner agencies.

Nuisance species are more selectively or situationally defined and may include native plants under certain conditions. Several native species have displayed such aggressive establishment and regeneration that they require targeted management in order to preserve the training and preferred habitat value of some training venues. Although not exotic, these species, under certain conditions, can display the same dominant and disruptive characteristics normally associated with invasive species. Pitch pine in particular has historically taken advantage of neglected training sites to create impenetrably dense, overstocked pitch pine monocultures that provide little habitat value, produce unhealthy trees, present significant fire hazard, prevent training, and suppress all other vegetation. Other native, desirable species that may situationally present a nuisance condition from a habitat perspective include bayberry and sweetfern due to tendencies towards monoculture through chemical defenses. Exotic invasive plants are a management concern both in the Training Area and within the Cantonment area. Effective management of these species, primarily autumn olive (*Elaeagnus umbellata*), Oriental bittersweet (*Celastrus orbiculatus*), and shrub honeysuckles (*Lonicera spp.*), is both labor and cost intensive. Natural Resources-ITAM has two trained and licensed Massachusetts core pesticide applicators on staff. With this capability, Natural Resources-ITAM representatives carried out targeted, high-impact herbicide applications at several sites, in the Training Area/Reserve as well as the Cantonment area. These actions have likely prevented several new species from becoming established on base. ITAM also conducted hand pulling to remove spotted knapweed (*Centaureia stoebe*) from restored training sites on BP-1, Demo-2, and Wheelock Overlook, covering 7 acres.



The Natural Resources-ITAM Program field technician actively surveyed the Training and Cantonment areas for invasive species, expanding the invasive plant geodatabase. This is an ongoing project that is used to prioritize and record invasive plant control operations and will inform ongoing updates to our integrated pest management plan. Field crews maintained updated knowledge of, and monitored for MIPAG Early Detection Priority species, including mile-a-minute vine (*Persicaria perfoliata*), as there are several populations at nearby Crane Wildlife Management Area. Field personnel also continued mapping, monitoring, and treating populations of *Calamagrostis epigejos* (bushgrass), an invasive grass identified on base in 2016.

In TY 2020 the Natural Resources Office contracted a targeted invasives control project in the northern Training Area, totaling roughly 5 acres of spot-spraying and cut-paint methods. The areas chosen were some of the most impacted by invasives, as well as adjacent to future disturbance sites where the invasive plants would spread rapidly.

The Natural Resources Office is involved in a multi-year effort to stop the spread of black swallow-wort (*Cynanchum louiseae*) from a single one-acre location in the training area. This would have been the fifth year of treatment, but in-house herbicide treatment was not performed in TY 2020 due to Covid-19-related issues. This species is highly invasive in grasslands as well as forest, and can interrupt the life cycle of monarch butterflies, so keeping it from spreading in the Training Area/Reserve is a high priority. Spot-treatment will continue in TY 2021 in order to prevent re-establishment. Elsewhere in the training area, other roadside invasive species were treated with cut-and-paint methods in areas deemed high-risk for off-road spread.

Grassy or disturbed sites with exposed sand, particularly in groundwater treatment areas, bivouac areas, dig sites, or along roadsides, are often rapidly colonized by pitch pine. This can often lead to the exclusion of other species and a monoculture condition that degrades habitat value and training while increasing fire hazard. ITAM contracted mechanical removal of regenerating pitch pine in one battle position with implementation in early TY 2020, followed up by reseeding with a native grass mix.

Many rare plant sites are being encroached by invasive species or overshadowed by native species. In TY 2017, the Natural Resources Office contracted Wilkinson Ecological Design to complete a Vegetation Management Plan for invasive species treatment in rare plant sites and complete the associated MESA permitting. In 2017, Wilkinson completed the site visits and prepared a Vegetation Management Plan, which has since been approved by NHESP. In TY 2018, Wilkinson performed chemical treatment of all invasive plants found at rare plant sites. Natural Resources Office staff performed follow-up treatments where necessary and monitored the sites in 2019 and 2020. No major invasive species problems remain at sites where rare plants still exist, but several of the bowls where rare species have disappeared over the years still have high numbers of invasive shrubs and small trees. The Natural Resources-ITAM Office plans to remedy this through targeted tree removal in order to return frost bottom effects to these bowls.

### 3.5.3 Bird Surveys

This is the eighth year that point counts were conducted along a bird survey route through the Training Area to determine differences in bird activity in a variety of military training areas and habitat types. The routes consisted of 65 sites that were each visited three times to reduce the likelihood of species being undetected. The calculation of detection probabilities for species of survey concern were not calculated in TY 2020 due to other priorities. Additionally, with the completion of eight years, we will start evaluating trend data as able, prioritizing species of significant conservation interest.

Whip-poor-wills (*Antrostomus vociferus*) and other nightjars were surveyed May 13-15 and May 20 at 32 sites (three routes). In TY 2020, Whip-poor-wills were detected at 26 out of 32 sites. Conditions were less than desirable for nightjar surveys, but Natural Resources Office staff documented 99 Whip-poor-wills. No other

nightjars were heard in TY 2020 other than a single flyover Common Nighthawk in May. Trend data and more detailed survey and research discussion for Eastern Whip-poor-wills is included above in Section 3.3.8.

For the sixth year, a point-count methodology was implemented in continuation of a state-wide survey of grassland birds coordinated with the DFW and Mass Audubon. This method is intended to be continued to evaluate trends in grassland bird populations and response to management. State-listed species were reported to NHESP (Table 3-1), including Grasshopper Sparrows (*Ammodramus savannarum*) and Upland Sandpipers (*Bartramia longicauda*). The Eastern Meadowlark (*Sturnella magna*) was also listed as a Species of Special Concern in TY 2020, and will now be reported in Table 3-1.

In TY 2019 and 2020, several points were added to the bird survey routes in order to survey the future site of the MPMG and the Impact Area, along with other points scattered throughout the training area increasing the total number of annual survey points from 39 to 79. This allowed the Natural Resources Office to assess whether any species of concern used areas of interest, but also will facilitate more holistic long-term species trend analysis. The Natural Resources Office will evaluate trends along with the other data to investigate effects of mitigation efforts surrounding range expansion and development areas.

Perhaps the most notable TY 2020 avian observation was Blue-winged Warblers at four locations. This is a new species for the Camp Edwards surveys as showed abundant breeding activity, though no nest searches were performed. Twenty-three Species of Greatest Conservation Need (SGCN), as categorized by the State Wildlife Action Plan, were observed during breeding bird point counts (See Table 3-3). Three species were not included due to the birds being flyovers not using habitat (Black-backed Gull, Common Loon, Herring Gull). Additionally, the Blackpoll Warbler, Nashville Warbler, and Olive-sided Flycatcher are migrants not typically detected despite TY 2020 observations. Additional SGCN are frequently observed at Camp Edwards, but are not readily detected through diurnal point counts, including American Woodcock (occasional focal surveys conducted) and Eastern Whip-poor-will (discussed above). Many of the SGCN reported below are notable in their degree of occupancy (survey sites with detection) at Camp Edwards and several show significantly positive response to habitat management, especially including Brown Thrasher and Field Sparrow, but somewhat surprisingly also species such as Scarlet Tanager. The overall proportion of occupied survey sites is shown in Table 3-3, but some species are more distinctly associated with either the Training Area (TA) or Cantonment grasslands (GLU) and are reported separately. A total of 65 training sites and 14 grassland sites were surveyed in TY 2020.

Species	TY20 Survey Points with Detections	Proportion of Sites (total n=79)	Proportion of Subset (GLU or TA)
American Kestrel	4	0.051	0.286 (GLU)
Black-and-white Warbler	39	0.494	0.569 (TA)
Black-billed Cuckoo	15	0.190	
Blackpoll Warbler*	3	0.038	
Blue-winged Warbler	4	0.051	
Brown Thrasher	56	0.709	
Chimney Swift	3	0.038	
Eastern Meadowlark	11	0.139	0.786 (GLU)
Eastern Towhee	78	0.987	
Field Sparrow	38	0.481	
Grasshopper Sparrow	12	0.152	0.857 (GLU)

TABLE 3-3 BREEDING BIRD POINT COUNTS, cont'd

Species	TY20 Survey Points with Detections	Proportion of Sites (total n=79)	Proportion of Subset (GLU or TA)
Horned Lark	1	0.013	0.071 (GLU)
Nashville Warbler*	4	0.051	
Olive-sided Flycatcher*	1	0.013	
Prairie Warbler	46	0.582	
Purple Finch	15	0.190	
Ruffed Grouse	65	0.823	0.984 (TA)
Scarlet Tanager	62	0.785	0.908 (TA)
Upland Sandpiper	9	0.114	0.571 (GLU)

\*migrant, non-breeder

### 3.5.4 Deer Hunt

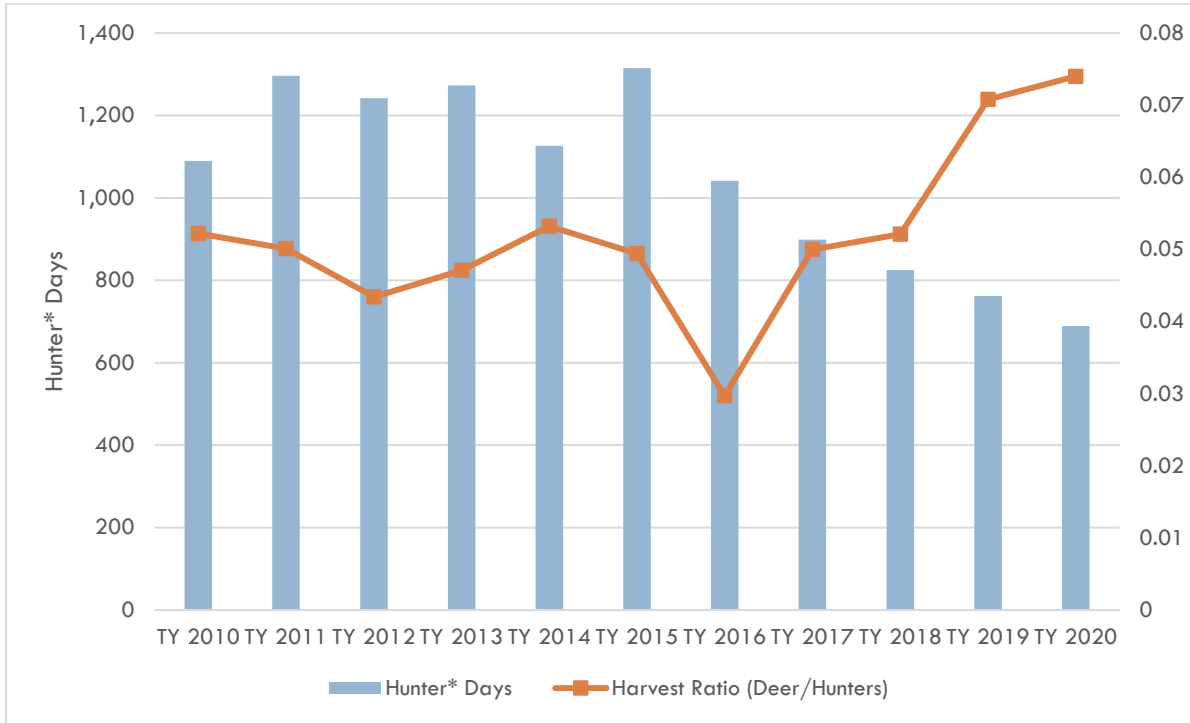
There was a deer hunting season in the Training Area/Reserve during TY 2020 in which 51 deer were taken during 689 hunter days. The Natural Resources Program supports a hunt sufficient to maintain a harvest level that is compatible with a healthy deer herd and healthy ecosystem. MAARNG and DFW generally feel that the recent average of 60 deer per year meets the overall objective.

The Natural Resources Program continues to provide a variety of hunting opportunities to best engage the hunting community and encourage new hunters through events such as the youth day, archery, and military sportsmen hunt. Hunting during TY 2020 included a three-day hunt for paraplegic sportsmen (October 31-November 2, 2019), a one-day youth hunt (September 28, 2019), a two-day opening for archery scouting (November 18-19, 2019), a three-day archery season (November 21-23, 2019), a two-day hunt for military sportsmen (December 2-3, 2019), a six-day shotgun season (December 9-14, 2019), and a two-day primitive (muzzleloader) season (December 19-20, 2019). Graph 3-5 shows the hunter days and deer harvest ratio since TY 2011.

During TY 2020, the Natural Resources Office and the Division of Fisheries and Wildlife conducted hunter surveys to determine hunter preferences, to better respond to queries and requests from hunters, and to determine the success of our advertising efforts. Of the 61 respondents, thirteen (21%) were new hunters to the site and 5 (8%) were hunters that had recently come back to hunt the site. Of the new hunters, more than half had found out about the hunt from other hunters, 31% had found out from hunt clubs, and two (16%) had found out from the DFW website. Roughly 27 percent of hunters use the no deer driving areas. For context, the no deer driving area constitutes roughly 10-15 percent of available hunting area each year. Of the hunters that participate during the shotgun season, 39% conduct deer drives with more than 5 people, and 16% conduct deer drives with less than 5 people. There was some overlap with these two groups with a resulting 45% of respondents participating in deer driving. This means the majority of the shotgun hunters that participated in the survey do not participate in deer drives. The hunter surveys will not be conducted in TY 2021 due to safety protocols to prevent the spread of coronavirus.

In the spring and summer, the core planning team for the hunt met several times to determine appropriate safety protocols to implement at check in and triggers for canceling the hunt. The team decided that an appropriate guide would be the state's phases corresponding to the risk level of the coronavirus pandemic. The team decided that the hunt best fit as a Phase 3 activity given the state classification system. The hunt will proceed if the state is in Phase 3, but not in lower phases. This information as well as detailed safety procedures were advertised on the Division of Fish and Wildlife website. The Southeast District Manager also distributed information to hunters as well.

Graph 3-5 Camp Edwards Deer Harvest



Note: Hunter Days is the sum of the number of hunters each day for each day of the annual hunt.

In TY 2020, the advertising efforts made for the hunt drew comments from the public on social media about the safety of deer meat consumption due to past contamination on the base. The Natural Resources Office quickly coordinated with IAGWSP, the EMC’s Environmental Officer, the Southeast District Manager, and scientists at MassDEP. Several past risk assessments were consulted and IAGWSP provided a message for potential hunters: “The risk of deer being exposed to explosives is extremely low. Explosives have not been detected in surface water on Camp Edwards. Areas with contaminated soil historically were a very small percentage of the overall base acreage. Subsequently, all contaminated soil in these areas has been cleaned up to meet Massachusetts’ strictest standards. Therefore, uptake of significant levels of explosives into plants is unlikely.”

To further formalize a response to such concerns, the Natural Resources Office met with the EMC’s Environmental Officer, the IAGWSP, and a scientist from MassDEP about the creation of a white paper response. The Natural Resources Office has reached out to the two groundwater cleanup offices on base to garner their expertise for a brief overview of the knowledge given past sampling of risk assessments relevant to this issue.

The goal of the hunt program is to provide recreational opportunities to the public and military and to harvest deer for the health of the herd and for ecosystem management. Deer harvests on base have been close to the 60 deer per year goal. Casual observations of browse on site do not indicate excessive browsing, except on specific species. These species are being preferentially browsed and are often state-listed plants. The Natural Resources Office has begun efforts to exclude deer from sites where this species-specific browse has been observed. The Natural Resources Office, Range Control, and the Southeast District of DFW have continued to make as many days and acres available to hunting as is possible given safety concerns and staff resources. Efforts to advertise the hunt were also aimed at increasing harvest as well as recreational use of the site.

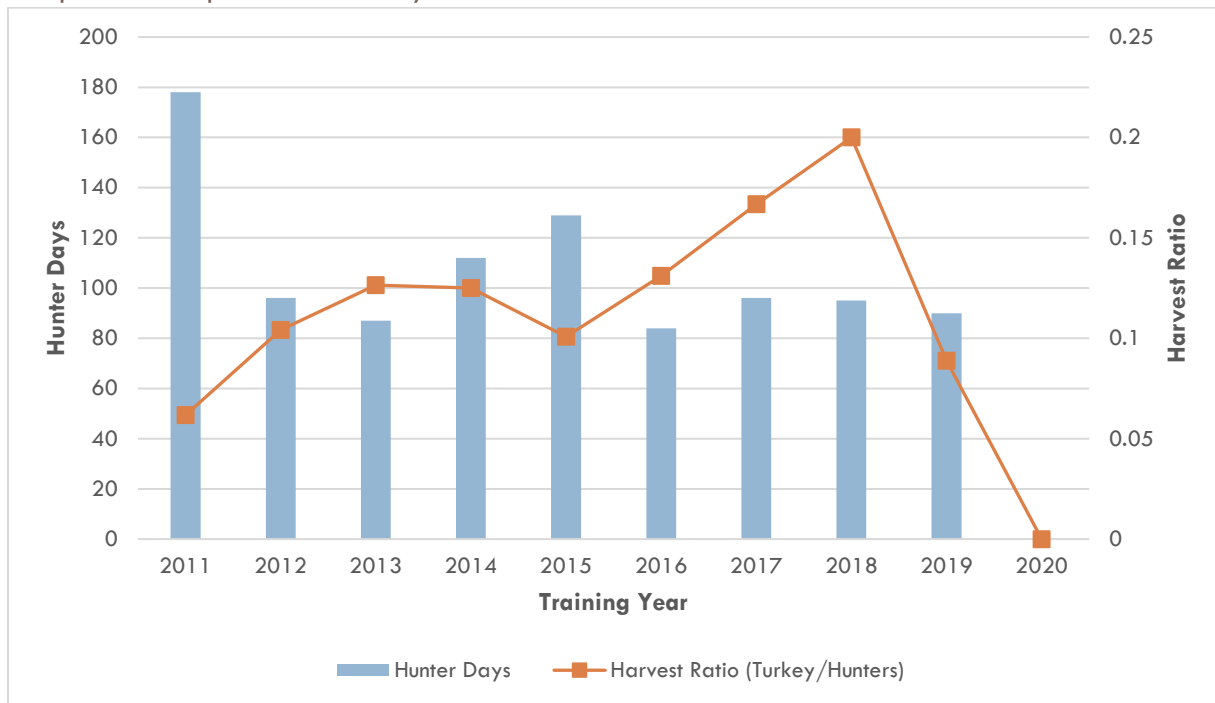
### 3.5.5 Wild Turkey Hunt

Due to the statewide shutdown for coronavirus in the spring, the turkey hunt was canceled in TY 2020. This decision was made to protect the health and safety of the hunting community and the personnel engaged in the



hunt. This information was communicated by DFW to the hunting community in several ways: advertisement on their website, social media pages, and information sent directly to the sporting community. Graph 3-6 provides information on the wild turkey hunts conducted in the spring since TY 2011.

Graph 3-6 Camp Edwards Turkey Harvest



Note: Hunter Days is the sum of the number of hunters each day for each day of the annual hunt. In TY 2020, the turkey hunt was canceled due to the statewide shutdown for the Covid-19 pandemic.

### 3.5.6 Restoration Activities

The Natural Resources/ITAM Program completed significant restoration work on four training sites and habitat patches throughout the base. These projects were conducted in Battle Position (BP) 24, BP-20, Wheelock Overlook, and Training Areas BA-6 and BA-7.

#### 3.5.6.1 BP-24 Restoration

Funded through Training Area management funds and devised in accordance with military requests to develop an air assault-suitable training site adjacent to Wheelock Overlook Observation Point, this site was chosen based on historic disturbance, lack of habitat value (prior to this project), and proximity to the trail network and other training assets.

A contractor was hired to remove 1.3 acres of impenetrably dense pitch pine regeneration. The woody material was removed from the base and the site was subsequently rough-graded and seeded with regionally appropriate warm and cool-season grasses and legumes.

#### 3.5.6.2 BP-20 Timber Harvest

Funded through Training Area management funds and devised in accordance with military requests to develop a large training focus in the northwest maneuver box (suitable objective for a Battalion-level exercise), this site was chosen based on desirable topography, road access and proximity to BPs-12, 14, and 16.

A contractor was hired to conduct a selective timber harvest on 41 acres, preserving larger canopy trees >8” DBH (diameter at breast height) while heavily thinning the midstory and understory. The prescription was determined

by consultation with a forester with Northeast Forest and Fire Management, LLC. The prescription was significantly informed by lessons learned from previous harvests on the base. It left more standing trees and reduced the cut rate along steep slopes, providing benefits for site stability and training value. For example, our Observation Point 9 and 10 harvest in 2017 prescribed leaving ~20 trees per acre, whereas this project retained 114 trees per acre. In total, 38 acres were harvested at the full prescription while 3 acres were harvested at a reduced rate for slope preservation and to retain cover and concealment. The project has already met military objectives, drawing multiple units to a previously underused part of the training area.

Based on the response to earlier harvests, the overstory thinning accomplished by this site is expected to facilitate dramatic regeneration of the shrubby understory critical to many of our threatened and rare species. All woody material resulting from the harvest was removed from the base, meeting our desired conditions for fuel management, reducing the potential for dangerous fire behavior in an otherwise under-managed part of the training area.

The project was programmed for winter months to meet best management practices for minimizing risk to Eastern Box Turtles while reducing compaction caused by forestry equipment.



Photograph 3-4 BP-20

### 3.5.6.3 Wheelock Overlook Vegetation Management

Hardwood coppice regeneration (i.e., oak tree stump sprouting) has exceeded expectations on previously harvested sites on the base. Compared to understory and shrubby regeneration, this coppice regrowth is so dense and productive that it requires management before the rest of the site is ready for standard management (e.g., prescribed fire), jeopardizing the benefits sought in the original management objectives. Overshading by dense canopy is one of the major causes of decline for many state-listed plants and animals at Camp Edwards and the density of tree oak resprouting can facilitate natural community transitions at the expense of biodiversity. Failure to address tree oak coppicing following initial restoration management could compromise the investment and conservation value of the project. The current density of trees is primarily due to land use history evidenced by

even-aged stands of trees with poor health characteristics and a fundamental objective of the restoration projects is to reduce tree density and canopy closure for ecosystem health.

The program consulted with professionals in the Division of Fisheries and Wildlife, seeking successful best management practices from their harvests. In accordance with their advice, the program conducted selective herbicide spraying on regenerating coppices on 40 acres of the Wheelock Overlook timber harvest, conducted in 2019. The spraying was conducted by a licensed professional, using a utility vehicle with an herbicide tank and spray wand. The contractor was instructed to spray 75% of regenerating coppices, leaving the remainder to regenerate naturally. It is our hope that this will provide additional age class diversity as the site develops in coming years.

The contractors were directed to use a product with the active ingredient Triclopyr, which has a history of use on the base. The contractors applied the product to each sprout individually; there was no boom or mist spraying. The contractors were also directed to consider weather conditions and spray pattern to minimize impacts on the surrounding shrub layer. A total of 155 pounds of active ingredient were used on the site, distributed across 40 acres.

Effective conservation management requires focused use of multiple tools to address combined impacts of long-term land use and neglect. It also requires planning and maintenance to meet long-term ecosystem goals. Interagency partnerships, knowledge sharing, and collaboration are critical to success as are developing integrative methods and treatments that can reduce impacts through targeted application. The Wheelock Overlook restoration area is part of the mitigation for the MPMG and overall JBCC mitigation bank discussed in more detail below.

#### **3.5.6.4 BA-6, BA-7 Snag Mowing**

As a result of intense fire, there was a large number of standing dead trees (snags) in training areas BA-6 and BA-7. The trees had decayed to the point where they presented an unacceptable injury risk for troops training and were such a smoke hazard that they prevented further fire management.

Following consultation with a licensed forester and burn boss, the program contracted a forestry firm to enter the training areas with an excavator-mounted forestry mulching head to push over and break up the snags. This was a highly targeted operation intended to cause little to no impact on either the understory or live trees. The prescription called for leaving one or two snags per acre throughout the project area for conservation value while removing all others to facilitate continued habitat restoration and soldier training.

The first iteration of this project was conducted on 107 acres in BA-6 and BA-7 in February to March 2020, intended in part to be a proof of concept. The results met all expectations and were so successful that the program contracted an identical treatment of a further 157 acres in BA-7, to be conducted in December 2020. The project was programmed for winter months to meet best management practices for minimizing risk to Eastern Box Turtles while reducing compaction caused by forestry equipment. This project typifies the program's focus on setting the conditions for long-term maintenance of our management projects.

#### **3.5.6.5 Pending Projects**

The following two projects were conceived and funded in TY 2020, but are scheduled for execution in TY 2021.

**Nuclear, Biological, Chemical (NBC) Mastication:** This project was devised in accordance with military requests to increase tactical training options at the NBC site in Training Area A-4. This site is a popular training venue with a variety of structural training aides and is conveniently located near major roads. The woods surrounding the site had an increasingly overstocked understory and midstory, occluding lines of sight and hindering maneuver. The area was previously managed with prescribed fire in May 2004, leading to significant habitat

benefit, much of which has been lost due to aggressive oak coppice growth resulting from top killing over dense oak trees. Tree slices, taken from a downed pitch pine within the project area in 2019, provide anecdotal evidence of this habitat shift. This 137-year-old tree showed a remarkable increase in growth rate following the 2004 prescribed fire, but gradually slowed as high-density oaks began to compete for resources.

This project involves masticating (mechanically mowing/mulching) trees  $\leq 6$ " DBH in 42 acres surrounding the current perimeter of the site. All material resulting from this project is to be left on the ground for consumption by prescribed fire. The project will not impact mature trees and will open the midstory to permit vision into and out of the site for perimeter defense training. The understory management will also allow dismounted maneuver around the site, permitting infiltration training. All of this will also restore habitat conditions more suitable for species such as the Eastern Whip-poor-will and others of conservation concern.

BA-7 Snag Mowing continued: Following a successful pilot project in December 2019, we programmed another snag mowing contract in Training Area BA-7, to continue removing hazardous snag trees in a further 157 acres.

Like the original 2019 contract, this project will involve pushing over and breaking up standing dead trees that are hazards for smoke management and troop injuries. This project is not wholesale mowing of the entire site. It is a highly targeted approach to remove decaying dead trees to allow reopening Training Area BA-7 for prescribed fire management and troop maneuver. Approximately one to two snags per acre will remain for habitat value.

#### 3.5.6.6 In-House Efforts

Natural Resources and ITAM staff continue to conduct in-house maintenance of bivouacs, battle positions, maneuver trails, and helicopter landing zones. Staff conducted mowing to improve bivouac and maneuver potential in Training Area BA-6, BPs 1, 27, and 28. Additional mowing reopened helicopter landing zones Pinnacle and Deep Bottom Pond. Staff hand-pulled invasive plants encroaching on BP-1, Wheelock Overlook, and Demo-2. Finally, a section of maneuver trail and drainage was repaired at BP-20.

## 3.6 FIRE MANAGEMENT

### 3.6.1 Prescribed Burn Program

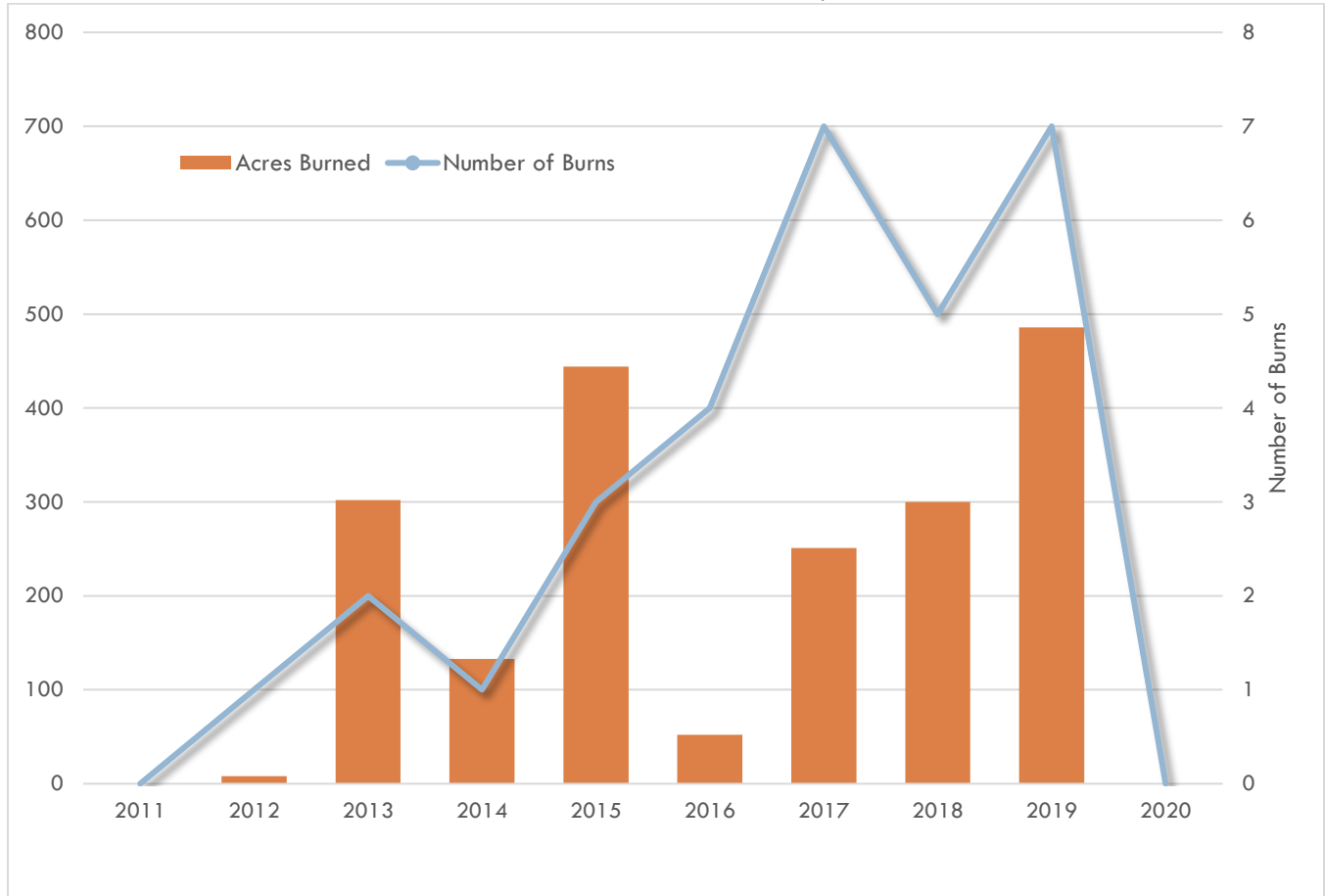
The Natural Resources Office utilizes a prescribed burn program to manage habitat, reduce fuel loads and help prevent wildfires. The program is outlined in the Camp Edwards Fire Management Plan which is available on the E&RC's website: <https://www.massnationalguard.org/ERC/publications.htm>. The Camp Edwards smoke management permit (#4F02008) was renewed November 4, 2020 and is valid through December 31, 2022.

No prescribed burning was conducted within the Training Area/Reserve in TY 2020. The fall weather conditions of 2019 were not conducive to prescribed burning on site. The Covid-19 pandemic began just before the 2020 spring burn season and precluded any burn operations. This was a combination of concerns for personnel on burns (e.g., combining firefighters on engines and other teams) and smoke management during a respiratory illness outbreak. The latter concern was more due to appearances and public perception as typical smoke management would avoid negative impacts but was a prohibitive concern.

The ten-year prescribed fire accomplishment within the Training Area/Reserve is shown in Graph 3-7. Prescribed fire goals for TY 2021 are again to have at least eight operational days and burn approximately 600 acres or more of pine barrens (550+ acres) and grassland habitat (40-60 acres). This is a good balance of objectives to meet primary habitat and training lands management objectives while maintaining overall programmatic functions. Significant emphasis has been placed on burning units in the Impact Area buffer and immediately outside this buffer zone. This serves to maximize the mutual benefits and objectives of every operation – improving and maintaining pine barrens habitat, reducing hazardous fuel loading and wildfire potential, and improving training



Graph 3-7 Prescribed Fire Accomplishment within the Training Area/Reserve



Note: Training Year acreage is graphed on the left and the number of burns is graphed on the right axis. Grassland burns are excluded. In TY 2020, no prescribed burns were conducted due to weather conditions in the fall and the Covid-19 pandemic in the spring.

lands for soldiers. The primary limiting factor for wildland fire has recently been weather/climate with more extreme fluctuations in conditions (e.g., extended drought broken by extreme rain events) and more frequently shifting weather conditions – particularly with respect to wind and precipitation. Shifting weather forecasts led to multiple instances within TY 2018 of planning and notifying of burn operations with favorable weather forecast, followed by cancellation due to unsuitable conditions developing.

Wildland fire efforts for TY 2020 were focused on building the wildland fire program and planning efforts for future years. The most significant success was hiring a dedicated Wildland Fire Program Coordinator (WFPC), which is a new, full-time position within the Natural Resource-ITAM Program, jointly funded by Conservation and Facilities. The new WFPC started in August 2020 and has been working on long-term planning for the program, including updating the Integrated Wildland Fire Management Plan. Additionally, a firebreak assessment was contracted and completed by Northeast Forest and Fire Management, LLC that incorporated on-site vegetation and infrastructure assessment and state of the art wildfire computer modeling to develop recommendations. The assessment provides spatially explicit and data driven recommendations for fuels management (e.g., understory mowing, development of shaded fuel breaks) and firebreak improvements to support the active training within the Training Area/Reserve, including current and future operations (e.g., MPMG range use).

### 3.6.2 Fire Management Training

Wildland fire training remains a critical component of natural resources management and interagency partnerships. The Natural Resources office contracted Northeast Forest and Fire Management, LLC, to assist in again hosting a fall fire training event for partner agencies in November 2019. Based on much feedback from partner agencies and our own needs, Northeast Forest and Fire Management developed and coordinated an advanced course of RX-410, Smoke Management Techniques. As this is a complex course to host, the usual fall mini-academy was not offered. An exceptional instructor cadre for the course represented multiple regions of the US Forest Service, Pennsylvania Game Commission, US EPA, and Northeast Forest and Fire Management. Thirty-one students took the course (free of charge) representing 11 different states and 14 different agencies and organizations.

No wildland fire training was completed during Spring 2020 and no Fall fire academy was planned or hosted during 2020 due to the Covid-19 pandemic. Hopefully, a return to critical wildland fire training will occur in Spring 2021.

## 3.7 PEST MANAGEMENT

During TY 2020, Natural Resources and ITAM contracted precisely targeted herbicide spraying of oak coppice regeneration at Wheelock Overlook. Forty acres were treated with Alligare Triclopyr 3 (Triclopyr 3,5,6). In total, 155 pounds of active ingredient (PAI) were used over the 40 acres. The application was precise, targeting individual clumps and did not involve boom, mist, or aerial spraying (see section 3.5.6 for details). As described under invasive species management, above, the Natural Resources Office also contracted a targeted invasive plant control project totaling roughly 5 acres of spot-spraying and cut-paint methods primarily in training area C15. The areas chosen were some of the most impacted by invasive plants and a total of 17.0 PAI of Ranger Pro Glyphosate and 8.0 PAI Alligare Triclopyr 4 (Triclopyr 3,5,6) were applied to vegetation. Natural Resources-ITAM also used hand pulling to remove spotted knapweed (*Centaurea stoebe*) from restored training sites on BP-1, Demo-2, and Wheelock Overlook, covering 7 acres.

## 3.8 AIR QUALITY MANAGEMENT

### 3.8.1 Air Quality Permits

Potential air emissions from stationary sources at Camp Edwards are below the established federal and state thresholds for the designated primary air pollutants (carbon monoxide, nitrogen oxide, particulate matter, sulfur dioxide, and volatile organic compounds); therefore, Camp Edwards does not require an air quality control permit for stationary source emissions under the provisions of the Clean Air Act (CAA) or to measure and report actual emissions from its stationary sources.

The prescribed burn program requires an air quality control permit. The MassDEP Southeast Regional Office renewed the Camp Edwards smoke management and prescribed burn permit (#4F02008) on November 4, 2020. The permit is valid through December 31, 2022.

### 3.8.2 Air Quality Reports

310 CMR (Code of Massachusetts Regulations) 7.12(2)(b) requires that any person having control of a fuel burning facility or facilities with a maximum energy input capacity of 10,000,000 Btu/hr of natural gas report certain information to MassDEP once every three years. Because of the number of facilities at Camp Edwards, the MAARNG is required to submit a Source Registration/Emissions Statement (SR/ES) report for Camp Edwards every three years on or before the date established by the MassDEP. The Camp Edwards SR/ES report

was submitted December 13, 2019 using calendar year 2017 data; reporting due dates were delayed due to MassDEP's eFile system.

The only MAARNG stationary source emissions locations in the Training Area/Reserve on Camp Edwards are Range Control and the Ammunition Supply Point.

Biennial smoke management reports administered by MassDEP require reporting and renewal submission at the end of each two-year period. The Camp Edwards smoke management permit (#4F02008) was renewed November 4, 2020 and is valid through December 31, 2022. The biennial smoke management report was submitted May 15, 2019. Information on prescribed burn activities within the Training Area/Reserve for TY 2020 is provided in Section 3.6.

### 3.9 NOISE MANAGEMENT

The MAARNG published a Statewide Operational Noise Management Plan in December 2007 that provides a strategy for noise management at MAARNG facilities, including Camp Edwards. The plan includes a description of noise environments, including levels from small arms and aircraft training activities. Elements of the plan include education, complaint management, possible noise and vibration mitigation, noise abatement procedures, and land use management. Specific procedures are provided for noise complaints and protocols are provided for providing public notification for detonation of unexploded ordnance in place and for other unusual noise events.

### 3.10 STORMWATER MANAGEMENT

There were no new stormwater runoff increases in the Training Area/Reserve due to military training activities, and no new stormwater discharges from military training activities were made directly into wetland resource areas in the Training Area/Reserve.

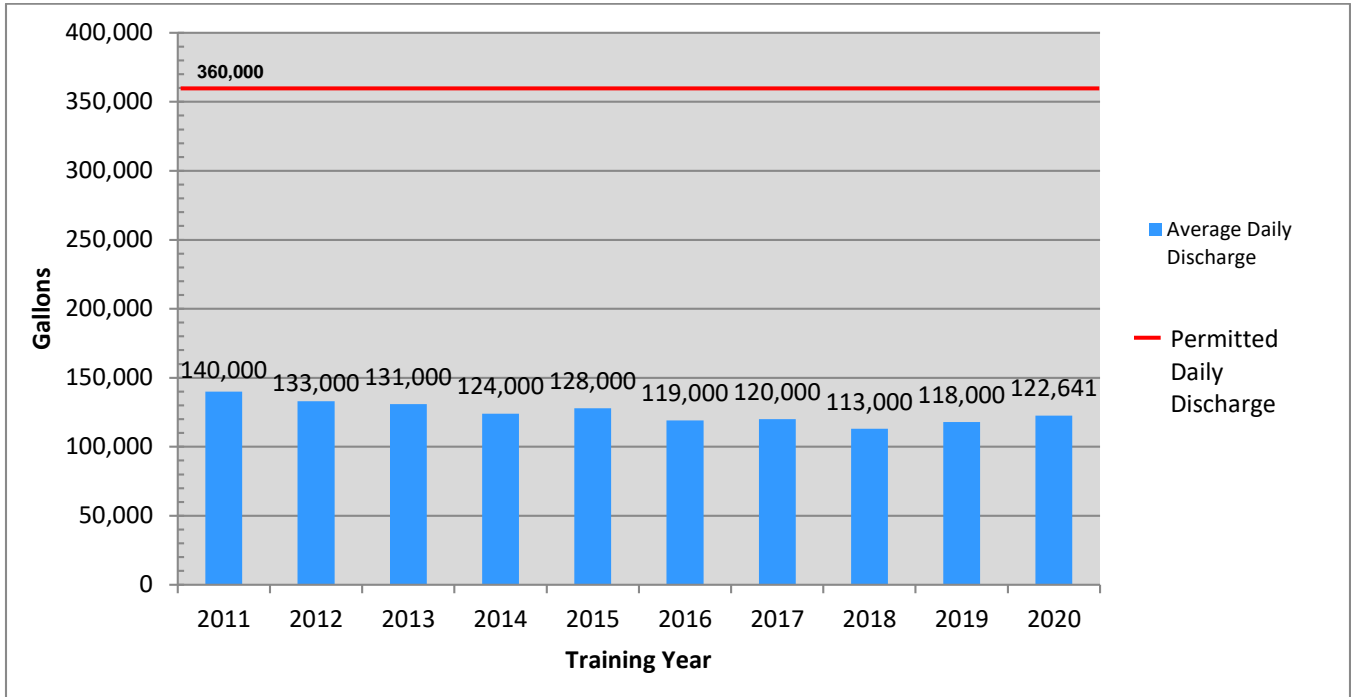
### 3.11 WASTEWATER MANAGEMENT

Depending on the location of facilities, wastewater and sewage from MAARNG training activities in the Training Area/Reserve was pumped from portable toilet facilities and hauled off base for disposal at licensed disposal facilities or discharged through the normal operation of existing septic systems (1,000 gallon) at Range Control and the Ammunition Supply Point that are regulated by MassDEP. (Note: There is a septic system at the former Otis Fish & Game Club located on Camp Edwards in the southwestern corner of the Training Area/Reserve; it is not in use at this time because the building is out of service. There are septic systems within the boundary of the Training Area/Reserve, at Cape Cod AFS and the USCG Communications Station, that are not subject to Chapter 47 of the Acts of 2002 and the EPSs, but which are regulated by MassDEP.)

#### 3.11.1 Wastewater Treatment Plant Discharge

The Otis ANGB wastewater treatment plant operated within the discharge volume limits of its wastewater discharge permit during TY 2020. The plant discharged 44,763,780 gallons of sewage into the sand filtration beds in the Training Area/Reserve; a daily average of 122,641 gallons versus its permitted twelve-month moving average flow of 360,000 gallons. Graph 3-8 shows the daily average pumping rate of the Otis system since TY 2011.

Graph 3-8 Wastewater Treatment Plant Discharge



### 3.12 SOLID WASTE MANAGEMENT

The Camp Edwards Ammunition Supply Point did not turn in any ammunition casings for recycling to the Defense Logistics Agency office in Groton, Connecticut, during TY 2020. Casings are turned in periodically when economical.

The MAARNG published a Statewide Integrated Solid Waste Management Plan for all of its Army National Guard facilities in August 2010. The plan establishes MAARNG policy, responsibilities, goals, and objectives for compliance with statutory requirements for waste minimization, recycling, and solid waste disposal. Chapter 8 of the plan includes solid waste management procedures specific to Camp Edwards, as well as identifying potential future solid waste management alternatives.

### 3.13 HAZARDOUS MATERIALS MANAGEMENT

Camp Edwards has appropriate protocols in place to respond to oils or hazardous materials releases, such as fuel spills, in the Training Area/Reserve. These protocols include the Soldiers Field Card that outlines how Training Area/Reserve users respond if a spill occurs, and Camp Edwards has trained staff to initiate all required spill response actions. All users of the Camp Edwards training lands, including civilians, are required to complete a series of Range Control briefings. Users are directed via verbal instruction, as well as in training videos, to report spills and/or releases of any size to Range Control immediately.

There were no oils or hazardous materials releases in the Training Area/Reserve during TY 2020.

### 3.14 HAZARDOUS WASTE MANAGEMENT

The MAARNG complied with its policy of not performing maintenance activities on military vehicles in the Training Area/Reserve throughout the year. Thus, hazardous wastes normally associated with vehicle maintenance and repair facilities were not generated or stored in the Training Area/Reserve. Vehicle maintenance is completed at the UTES facility, which is outside of the Training Area/Reserve. In instances where the



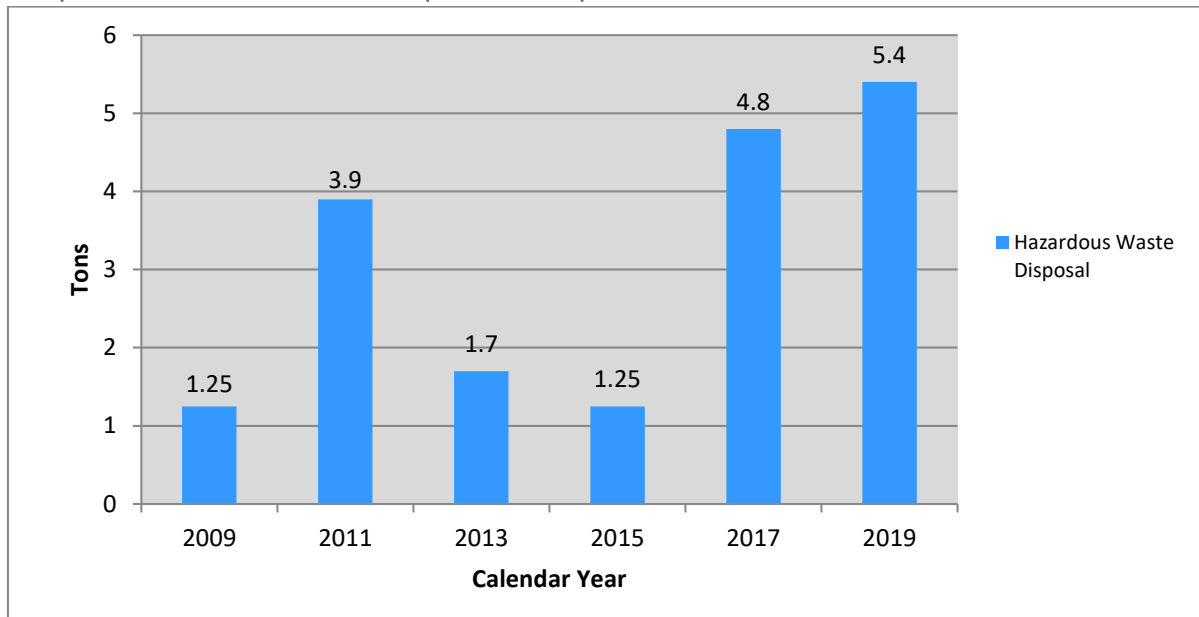
Installation Restoration Program (IRP) or IAGWSP use the EPA identification number of the MAARNG to dispose of wastes generated by remediation activities in the Training Area/Reserve, MAARNG Environmental tracks the procedure to ensure compliance with applicable regulations.

There is one hazardous waste Satellite Accumulation Point in the Training Area/Reserve, established at Range Control in January 2012. Range control accumulates one 55-gallon drum of weapons cleaning rags and patches, and one 55-gallon drum of clean up debris of automotive fluids (i.e., rags, speedy dry and soil contaminated with gasoline, diesel and/or oil). Wastes generated at the Range Control Satellite Accumulation Point are minimal, with a slight increase during Annual Training. On average, the Range Control Satellite Accumulation Point will generate one full 55-gallon drum of waste annually.

### 3.14.1 Hazardous Waste Disposal and Reporting

A biennial Hazardous Waste Report must be prepared and submitted to the EPA and MassDEP in March of even-numbered years reporting on hazardous waste generated by large quantity generators (LQG) during the preceding odd-numbered year. The last report for Camp Edwards was in February 2020 for hazardous waste disposed of during calendar year 2019. Graph 3-9 provides information on the volumes of hazardous waste disposal reported for the past six biennial reports. In addition to the amounts generated and reported in the biennial report, the MAARNG removed approximately 4,400 tons of lead-contaminated soil as part of the IAGWSP cleanup effort in 2017. This material was not reported as part of the biennial report as it was exported to Canada and hazardous waste exported outside the US is not required to be reported in the biennial report.

Graph 3-9 Hazardous Waste Disposal – Camp Edwards



## 3.15 VEHICLE MANAGEMENT

Unauthorized All Terrain Vehicle (ATV) and dirt bike access to the Training Area continued to be a problem in TY 2020. Range Control officials provided information to the Environmental Police as to locations and times such use was identified to help them adjust their patrols accordingly. As the level of unauthorized ATV and dirt bike access increases, continued coordination with the Environmental and local police takes place. Current efforts have seemed to slow the illegal use of the Training Area/Reserve for ATV and dirt bike riding. However, this will be an ongoing effort. The entire Training Area/Reserve is now posted as off limits. This should help with public awareness and the enforcement of no trespass laws.

### 3.16 GENERAL USE AND ACCESS MANAGEMENT

Public access to Camp Edwards is limited; however, under certain circumstances public access to Camp Edwards may be available such as hunting during the deer and turkey seasons (See Section 3.5.4 and 3.5.5).

### 3.17 CULTURAL RESOURCES MANAGEMENT

All MAARNG actions in the Training Area/Reserve are reviewed by the MAARNG Cultural Resource Manager to ensure compliance with all applicable federal, state, and local cultural resource regulations. The MAARNG consults regularly with the Massachusetts State Historic Preservation Office (MA SHPO) ensuring actions are in compliance with Section 106 of the National Historic Preservation Act. In addition to the MA SHPO, the MAARNG consults regularly with the Wampanoag Tribe of Gay Head (Aquinnah) and the Mashpee Wampanoag Tribe on undertakings that may affect historic properties that the Tribe has attached religious and cultural significance.

### 3.18 EPS VIOLATIONS

On October 25, 2019, the MAARNG reported to the EMC a nonconformance with EPS 11 Training Area Fire Management Performance Standard, specifically EPS 11.4 “Other than the above, no open fires are allowed.” While conducting an inspection of the SVL, two burn barrels (55-gallon drums) were found at SVL 1 and one burn barrel was found at SVL 2.

Corrective actions included ensuring all full-time and Mobilization Day staff are instructed to review Training Area Clearing processes and they have been re-briefed on guiding regulations and standards that apply to the Camp Edwards Training Area / Upper Cape Water Supply Reserve. Clear and obvious signage stating that open burning is prohibited has been posted at Range Control, and the Camp Edwards Operations and Training Regulation 350-2 has been updated to clearly state the requirement for clearing training areas and that open burning is prohibited on Camp Edwards.

In a letter dated November 26, 2019, the EMC stated that it concurs that the corrective actions identified in the letter are appropriate and required the MAARNG to update and incorporate the corrective actions into the appropriate sections of a revised Camp Edwards Operations and Training Regulation 350-2.

Appendix G lists violations reported since TY 2011.

### 3.19 MITIGATION

Outstanding and ongoing mitigation requirements are focused on formalized agreements with the MA DFW: NHESP under MESA. Elements below are broken into three categories and are the responsibility of two separate services at JBCC, however a holistic mitigation structure is in development for the joint MANG elements. There are now two formal and ongoing mitigation requirements within the Training Area/Reserve and at JBCC. Both are implemented under and governed by respective CMPs. Previously reported grassland mitigation requirements for the 102<sup>nd</sup> Intelligence Wing have been subsumed within the overarching “master planning” mitigation bank discussed below and established in 2020.

The mitigation associated with the Aggasiz’s Clam Shrimp CMP is discussed in additional detail in Section 3.3.4. In summary, two sites along Cat Road were repaired as *in situ* sites in TY 2020. This completed the habitat creation/improvement mitigation actions outlined in the CMP. The third of three years of monitoring required in the CMP was also completed in TY 2020. In TY 2021, an additional year of monitoring is planned beyond the permit requirements.

The MAARNG received a CMP for the MPMG and several other projects under a “master planning” framework proposed by DFW dated September 29, 2020. Primary projects incorporated into the mitigation strategy are the MPMG Range at the current KD Range location, an Infantry Squad Battle Course at the formerly used Infantry Battle Course location, expansion of Tango and Sierra ranges, Cantonment modernization including the addition of a running track at the gym and classroom buildings in the 1300 area, and the potential for future solar development. The mitigation plan combines project design/impact minimization, take avoidance, land transfers, extensive habitat improvement, and long-term monitoring to provide for net benefit of a large number of state-listed species.

The mitigation plan focuses on species guilds (pine barrens, sandplain grassland) for the majority of species with similar habitat condition needs and/or threats (e.g., loss of open canopy condition through forest closure). The Eastern Box Turtle is treated separately as it has differing needs and threats compared to the other species. Mitigation focal areas, tied to the guilds, have been identified to localize various mitigation actions for maximized benefit. Standards for mitigation have been developed for each type of guild and focal area to ensure sufficient commitments exist and to provide assurances to DFW for net benefit. For example, pine barrens mitigation will require 20% to 40% of habitat improvement work to be in the form of mechanical forestry as the majority of the pine barrens guild species are threatened and declining due to tree encroachment and canopy closure. In addition to pine barrens and grassland focal areas, forest canopy retention areas are identified for box turtle hibernation and these areas will be managed or left to maintain later successional forest condition and closed tree canopy.

Extensive land protection through real property actions was a fundamental component of the master CMP. One parcel (Special Military Reserve Commission Tract 5) that had already been transferred to DFW was included in this agreement as it had been transferred for a project that did not occur and the transfer was specified as mitigation. Additionally, Special Military Reserve Commission Tracts 1-4 were transferred to DFW as mitigation through this agreement in 2020. Tracts 1-5 in total are 260 acres directly adjacent to Crane Wildlife Management area and a significant expansion to this public conservation area. Another parcel previously identified for mitigation land transfer, but not previously completed was Parcel H of Unit K, which is 150 acres of former parade field in cantonment. This transfer was included within the master CMP agreement. The parcel was transferred to Military Division in 2020 and will be fully transferred to DFW with anticipated completion in 2021. The Massachusetts National Guard will receive a license to maintain overall access and use to meet perpetual habitat conversion and long-term management requirements under the mitigation agreement on this parcel, which is outside of the Training Area/Reserve.

The Natural Resources Office budgeted for proactive mitigation implementation for the MPMG range. Early mitigation can better provide for net benefit by supplying improved or newly available habitat condition for impacted species prior to losses or impacts incurred through project development. A total of \$221,150 was spent specifically on contracted mitigation actions for the MPMG range in 2019. This includes the 52-acre timber harvest at Wheelock Overlook in Training Area A-5, eight days of prescribed burning (490 acres), and the development of a box turtle construction support and monitoring plan with an initial survey of the MPMG footprint. Consistent with the forest assessments completed in (1997 and 2003) there are no merchantable timber stands on Camp Edwards due to the species and high density of trees. None of the mechanical forestry projects have generated revenue and all have been contracted at the expense of MAARNG as restoration activities. Additional in-house TY 2019 efforts for actions included in the CMP or to address state-listed species include bat surveys, grassland bird surveys, site-wide bird surveys, Whip-poor-will surveys, and state-listed plant surveys.

Several major mitigation efforts were completed and/or initiated in TY 2020 addressing all the above listed components of the master CMP. Specific projects are listed below. A total of \$528,545 was spent specifically on implementation of mitigation projects under the master plan CMP in TY 2020, not including staff time, which was a significant investment for planning and project development/oversight.

- Project scoping, design minimization, NHESP review:
  - MPMG Range: completion of design and project review with submission to NHESP for review and approval. Completion and approval of turtle protection plan.
  - Tango Range: completion of design and project review with submission to NHESP for review and approval. Completion and approval of turtle protection plan.
  - Track and Field (1800 area): completion of design and project review with submission to NHESP for review and approval. Initial development of turtle protection plan.
  - ISBC Range: design consultation and internal review.
- Species protection:
  - MPMG Range: Intensive year 2 of Eastern Box Turtle surveys implementing approved turtle protection plan. Submission of interim report pending.
  - Tango Range: Completion of initial Eastern Box Turtle surveys and approval of submitted report to begin work on site. Site monitoring ongoing.
- Species monitoring:
  - Eastern Box Turtles: extensive in-house monitoring of box turtles found both opportunistically and during targeted surveys in 2019 and 2020 near future construction projects (see Section 3.3.6 for more details).
  - Bird surveys: completion of Cantonment and Training Area point count surveys and annual Eastern Whip-poor-will surveys – both reported in more detail above.
  - Lepidoptera (moths and butterflies): contracted scientific development of a monitoring plan to evaluate impacts of mitigation and range support habitat management efforts including prescribed burning and mechanical fuels management. MAARNG and DFW require a statistically sound, informative, and yet achievable monitoring protocol to evaluate impacts on listed moths and butterflies.
- Habitat management and planning
  - Forestry assessment: completed forestry assessment and timber harvest planning for burn unit RAW3 to restore pine barrens habitat conditions, including restoration of a large frost bottom feature.
  - Pine barrens restoration: Contracted and completed phase 2 treatment at Wheelock Overlook site as recommended by DFW. Targeted herbicide application was used across 50 acres to follow timber harvest and address tree oak coppicing that outcompetes and overshadows favored vegetation. Additional details above in Section 3.7 Pest Management
  - Pine barrens restoration: contracted phase 2 treatment in BA-7 mechanically mowing dead trees across 157 acres to facilitate second entry with prescribed fire and continue long-term pine barrens restoration. This is a critical step and includes spot mowing of shrub vegetation to introduce more heterogeneity in shrub layer structure.



Photograph 3-5 An Eastern Box Turtle being monitored by the Natural Resources Program. The radio transmitter is visible on the back left of the shell.



## SECTION 4

# REMEDIATION PROGRAM ACTIVITIES

### 4.0 INTRODUCTION

This section of the Annual Report provides summaries on remediation activities in the Training Area/Reserve during TY 2020

### 4.1 INVESTIGATION AND REMEDIATION PROGRAMS

There are two independent cleanup programs operating at JBCC: the Installation Restoration Program and the Impact Area Groundwater Study Program.

The IRP was initially established at the installation in 1982 under Air National Guard management. Oversight of the program was transitioned to the Air Force Center for Environmental Excellence, now known as the Air Force Civil Engineer Center (AFCEC), in 1996. The program operates under the regulatory guidance of the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The majority of the activity of the IRP has been focused in the Cantonment Area and in off-installation plumes emanating from the Cantonment Area. AFCEC is responsible for two IRP sites in the Training Area/Reserve: Chemical Spill-19 (CS-19) and Fuel Spill-12 (FS-12) and three Military Munitions Response Program (MMRP) sites: Old K Range, former Mock Village, and former Otis Gun Club. The MMRP addresses potential threats to human health and the environment from munitions and munitions constituents in non-operational range areas.

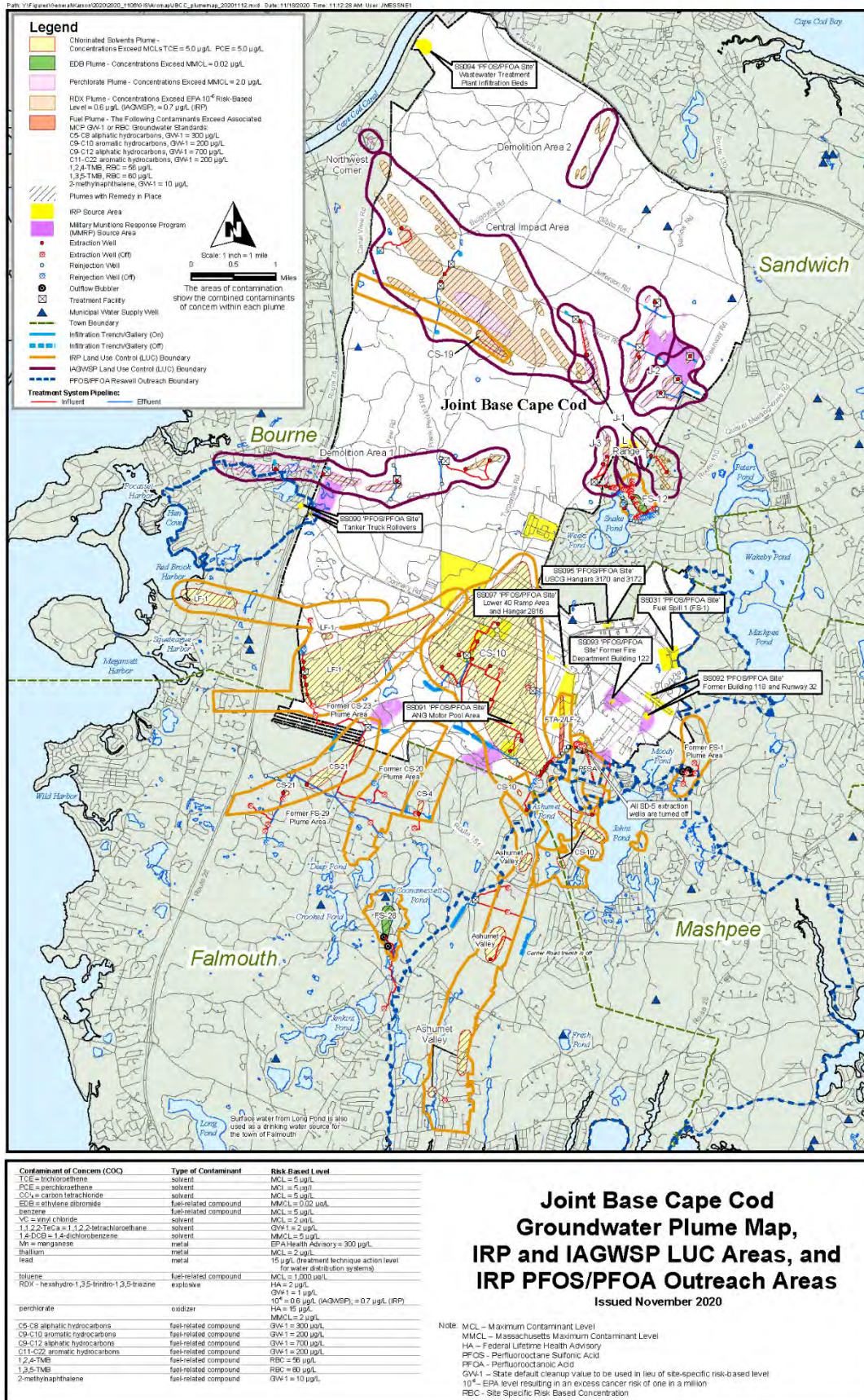
The IAGWSP is being managed by the Army National Guard. Investigation of the environmental impacts of legacy training in the upper 14,886 acres of JBCC began in 1996 and cleanup of groundwater contamination began in 2004. Seventeen treatment systems are currently operating on seven groundwater plumes to clean more than 4.1 million gallons of groundwater per day. More than 14 billion gallons of groundwater have been treated to date. While no public or private drinking water supplies are affected by the groundwater contamination being addressed by the IAGWSP, the contamination is being addressed to prevent any possible future exposures. Information on the IAGWSP can be obtained on its website: <http://jbcc-iagwsp.org>.

Both the IRP and IAGWSP have active regulatory participation and community involvement programs. The communities surrounding the installation are kept informed through neighborhood notices and meetings, media releases, community updates, fact sheets, publication and distribution of plans and reports, websites, and information repositories at local libraries.

The programs meet regularly with EPA Region 1 and MassDEP to discuss findings and determine appropriate response actions. Public comment periods are held, as necessary, to present and solicit input on proposed actions. The programs also provide updates on their activities to public meetings of the joint citizens' advisory team, the JBCC Cleanup Team. The JBCC Cleanup Team includes representatives from the surrounding communities and the regulatory agencies.

The IRP and IAGWSP each operate under different regulatory directives and mostly address different contaminants of concern. However, they share sampling results, equipment, technical innovations, and even a treatment facility. Figure 4-1 shows the areas under remediation by the IRP and the IAGWSP in the Training Area/Reserve. The map in Figure 4-1 is available at [jbcc-iagwsp.org/community/facts/jbcc\\_plume\\_map\\_051320.pdf](http://jbcc-iagwsp.org/community/facts/jbcc_plume_map_051320.pdf)

Figure 4-1 JBCC Groundwater Plume Map





## 4.2 INSTALLATION RESTORATION PROGRAM ACTIVITIES IN THE TRAINING AREA/RESERVE

In TY 2020, AFCEC finalized the Comprehensive Site Evaluation (CSE) Phase II (similar to a Site Inspection) investigation at 10 MMRP sites, including the three sites that are located in the Training Area/Reserve. A Streamlined Remedial Investigation/Feasibility Study (RI/FS) was prepared for the former Mock Village and has been finalized. A RI was completed in TY 2019 at the Old K Range and an FS is being drafted. Numerous 2.36-inch rockets and other ordnance were discovered at the Old K Range during the CSE Phase II and RI field work. Because some of the rockets contained high explosives, this site is currently off limits. A RI was also completed for the Otis Gun Club and an FS has been completed.

In addition to the MMRP sites, AFCEC manages two groundwater plumes in the Training Area/Reserve (CS-19 and FS-12). AFCEC closed a former site referred to as CS-18, which was also located in the Training Area/Reserve.

In TY 2020, groundwater monitoring was conducted at CS-19 where the contaminant of concern is RDX. RDX was detected above the EPA risk-based level of 0.97 µg/L in one of three monitoring wells sampled. The highest RDX concentration (1.3 µg/L) was detected at a well located just downgradient of the source area.

AFCEC also manages three 1.5 MW wind turbines at JBCC, two of which are located in the Training Area/Reserve. The turbines offset the energy use in the IRP by 100% (approximately \$1.5M per year). The turbine operation is curtailed for the Northern Long-Eared Bat from July 15 to October 15, 30 minutes before sunset to 30 minutes after sunrise for wind speeds less than 4.5 meters per second. There were no reported bat or bird strikes during TY 2020.

## 4.3 IMPACT AREA GROUNDWATER STUDY PROGRAM ACTIVITIES

During TY 2020, the IAGWSP operated groundwater treatment systems for plumes associated with the Demolition Area 1, J-3 Range, J-2 Range (northern and eastern), the J-1 Range (southern and northern), and the Central Impact Area (CIA). These systems are treating approximately 4.1 million gallons of water per day.

Removal of munitions from the source of the CIA plume continued in TY 2020. Work on Phase III Area 3 (10 acres) of the CIA long-term source area response continued throughout the year. In the Central Impact Area, 83 acres have been cleared to 90%. Teams from the Army Corps of Engineers used Metal Mapper, a multi-sensor electromagnetic detection technology, for the removal efforts. This geophysical technology is designed to discriminate between munitions and scrap metal in the subsurface. Use of the Metal Mapper allows the program to increase the efficiency of unexploded ordnance removal while reducing impacts to the surface soil and vegetation when compared to traditional excavation techniques.

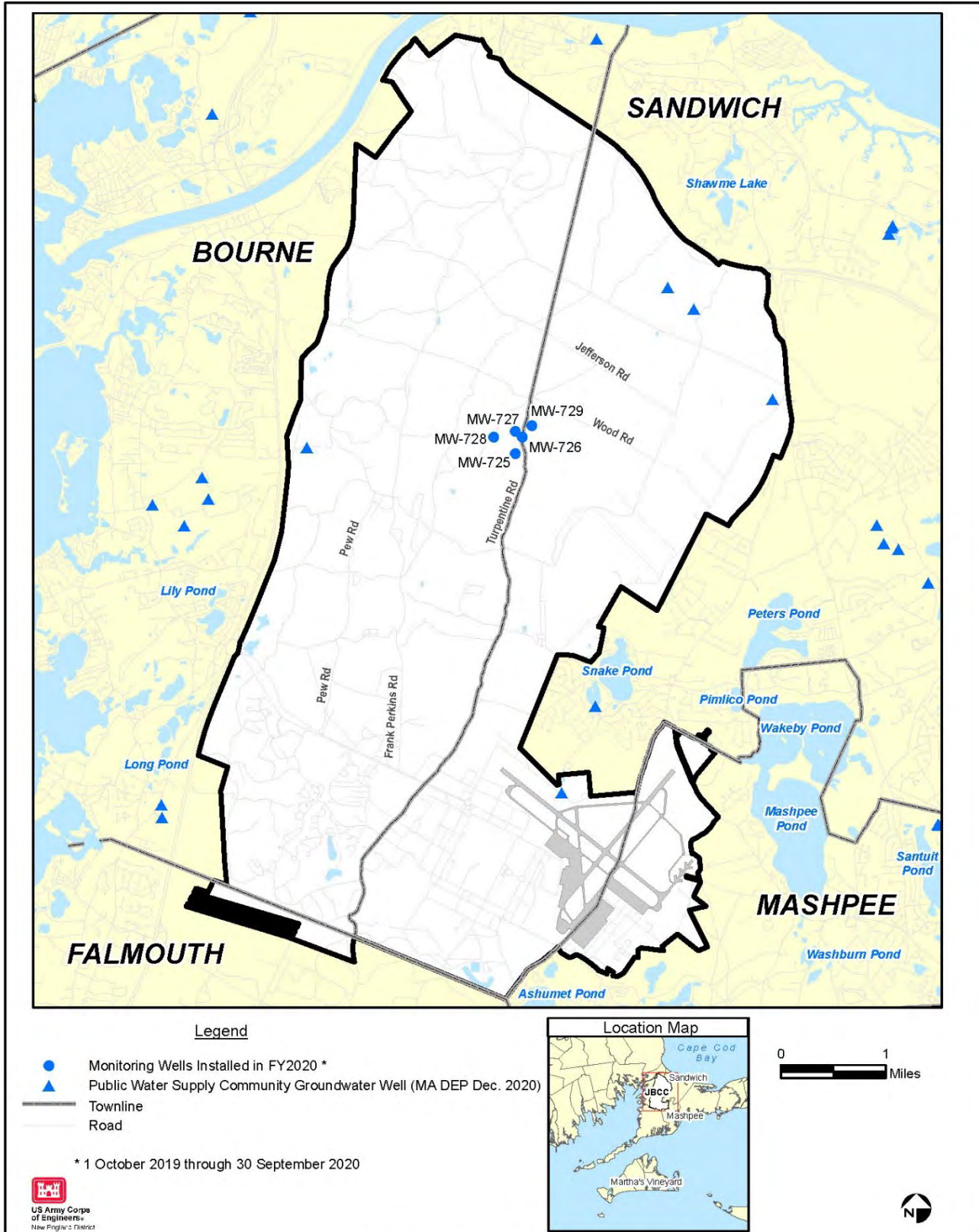
The IAGWSP evaluated whether Per- and polyfluoroalkyl substances (PFAS) are present in the groundwater from sites where open burning/open detonation is known to have occurred. Sampling conducted in TY 2020 was a follow-up to 2019 PFAS sampling where results showed some detections but none exceeding the state or federal regulatory thresholds. Locations sampled in 2020 included: J-3 Demolition Area and J-3 melt/pour facility (where the melting/pouring or pressing of plastic bonded explosives occurred), J-1 Interberm Area, and J-2 Disposal Area 2 (where the subsequent disposal in liquid or solid form of the explosives occurred).

The 2020 J-2 Range results showed PFAS levels were below EPA and MassDEP thresholds. At the J-3 Range, two wells had detections above the Massachusetts Maximum Contaminant Level (MMCL) of 20 nanograms per liter (ng/L); PFAS compounds of concern were observed in 13 of the 17 wells at concentrations below the 20 ng/L MMCL standard, two were non-detect. Results from the J-1 Range are pending. Recommendations for sampling of additional wells and further investigations are being developed for Agency review and approval.

Five new monitoring wells were added in TY 2020 (Figure 4-2) in support of groundwater investigations at the Central Impact Area plume. Three water table wells were installed to monitor the impacts of ongoing munitions removal work; one well was installed to monitor downgradient of the 2,000-meter berm plume; and one downgradient of the junction of Turpentine & Tank Alley Roads to fill a gap between existing monitoring wells.



Figure 4-2 IAGWSP Wells Installed During TY 2020



Impact Area Groundwater Study Program  
Monitoring Wells Installed in FY2020

FIGURE  
1

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## SECTION 5

# MISCELLANEOUS MILITARY AND CIVILIAN ACTIVITIES AND ENVIRONMENTAL PROGRAM PRIORITIES

### 5.0 MISCELLANEOUS MILITARY ACTIVITIES

#### 5.1 PROJECTS AT CAMP EDWARDS

##### 5.1.1 Trespassing and Critical Infrastructure Protection

In coordination with the MANG and the EMC, using mitigation money received by the EMC from Eversource (then NStar) in 2012 for a wetlands-related EPS violation for the transmission lines running through the Training Area/Reserve, the DFW's Southeast District posted signage on the base border during TY 2019. The signs were posted every 100 feet on the perimeter of the Training Area/Reserve. The signs read "No Trespassing, Camp Edwards \* Upper Cape Water Supply Reserve, Access controlled by Camp Edwards Commander." Signage language was agreed upon by the MAARNG, DFW and the EMC. In TY 2020 three cameras, purchased using the same money, were installed in key areas where trespassing and infrastructure security is a concern.

#### 5.2 JOINT BASE CAPE COD EXECUTIVE DIRECTOR

The Adjutant General of the Massachusetts National Guard established the position of the Executive Director of JBCC in late TY 2012. The primary roles of the position are to ensure inter-agency communication and coordination are implemented and practiced and that government and community stakeholders are kept informed. Additionally, the Executive Director is responsible for looking at efficiencies that might be gained through consolidation and cost-sharing of base operating support operations and activities.

The Executive Director serves as the Adjutant General's representative to the Joint Oversight Group that considers items of mutual concern. The Executive Director also serves on the Commonwealth of Massachusetts's Military Asset and Security Strategy Task Force helping to secure the military bases of the Commonwealth. Brigadier General (ret) Christopher Faux was appointed JBCC Executive Director in June 2018.



Photograph 5-1 Signage posted on the perimeter of the Training Area/Reserve.

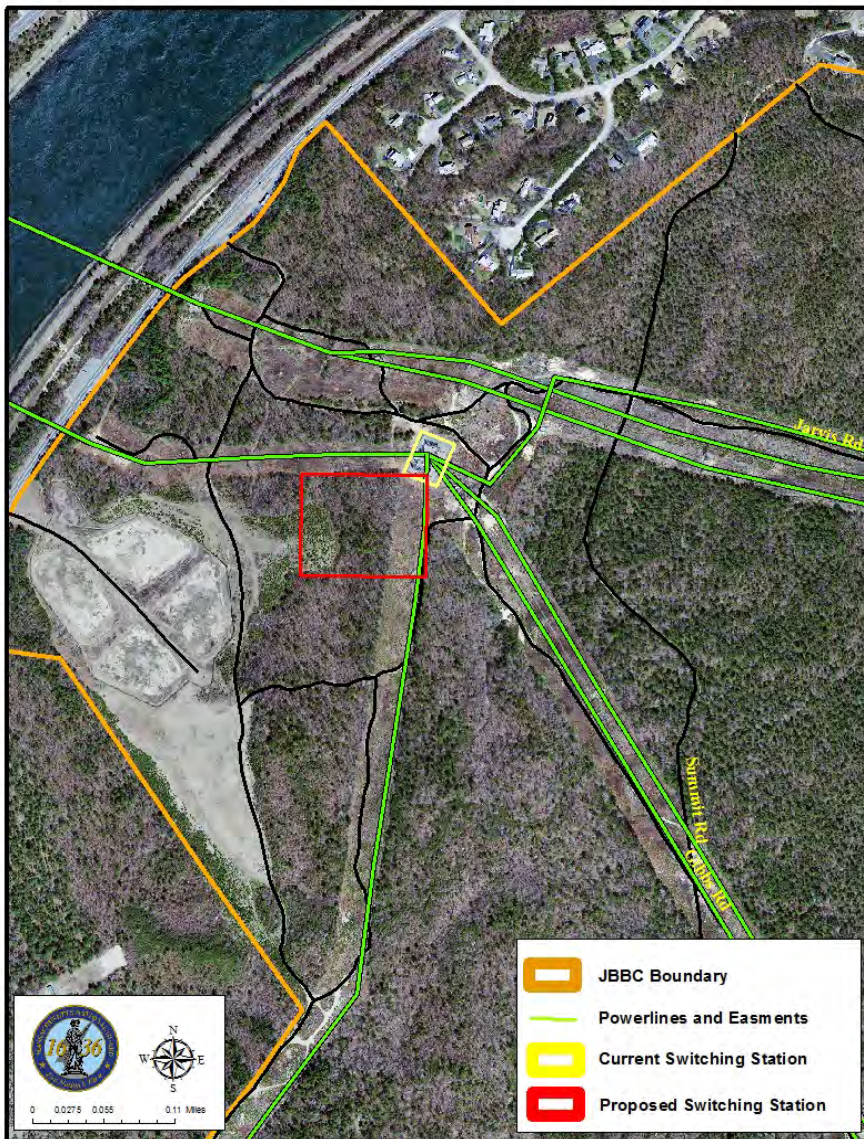


## 5.3 MISCELLANEOUS CIVILIAN ACTIVITIES

### 5.3.1 Eversource Projects

As part of the Mid Cape Reliability Project, Eversource is upgrading an existing Eversource switching station (Bourne Switching Station #917) located on an easement in the Training Area/Reserve (Figure 5-2). Eversource evaluated several sites for minimal loss of training land and impact to state priority habitat. Eversource is siting the switching station southwest of the current substation (Figure 5-1). The property transfers between Eversource and the state leaves a net benefit of approximately 2.51 acres for the MAARNG for training. Because the Training Area/Reserve is land protected under Article 97 Articles of Amendment to the Constitution of the Commonwealth of Massachusetts, legislation was required to be passed to change the use of the property. Governor Charlie Baker signed the bill to change its use in August 2018. Eversource submitted an Environmental Notification Form to the MEPA office on December 17, 2018. For this project, all review and permitting is complete. Completion of the project is anticipated for 2023.

Figure 5-1 Eversource Switching Station Area





As part of the construction, there will be approximately 52,000 cubic yards of soil that will be removed from the site. At the time of this report site preparation and soil removal are in process. Eversource had the soil sampled with samples being tested for the following characterization parameters: PFAS, PFOA, volatile organic compounds, semi-volatile organic compounds, total petroleum hydrocarbons, polychlorinated biphenyls, Massachusetts Contingency Plan (MCP; 310 CMR 40.0000) 14 metals, conductivity, corrosivity, ignitability, reactivity, pH, pesticides, herbicides, perchlorate, and explosives. All samples were below or within regulatory guidelines, specifically MassDEP S1 standards. The MAARNG will be able to repurpose most of the material for use on Camp Edwards at Dig Site 3 to be used for repair and maintenance as needed and for engineering training within the dig site. Over the last eight years, the EMC and the MANG at Camp Edwards have been involved stakeholders in Eversource's proposal to replace the switching station. Other partner agencies include MEPA, NHESP and DFW, the Cape Cod Commission, and the four Upper Cape Cod towns surrounding JBCC.

In TY 2019, Eversource came to the MAARNG with a new reliability project for another utility line from the switching station running down Cape to the Town of Barnstable. This will create a redundant line that will help ensure the Cape has reliable power. Eversource will use its current easement for the project.

### 5.3.2 Cape Cod Canal Transportation Study

In November 2014, the Massachusetts Department of Transportation (MassDOT) announced that it is conducting the Cape Cod Canal Transportation Study to identify existing and future transportation deficiencies and needs around the Cape Cod Canal area in Bourne and Sandwich. Due to the age of the Bourne and Sagamore bridges crossing the canal and the increasing need to maintain them, the study was devised to entail the development and analysis of a full range of transportation alternatives including highway, interchange, and non-highway improvements, as well as options and design elements that improve access for all transportation modes.

The final study was released in October 2019 and recommends intersection improvements including upgrades to the Bourne Rotary, interchange investments at Belmont Circle, relocation the Route 6 westbound Exit 1C and adding an additional Route 6 eastbound travel lane from the Canal to approximately Exit 2. Some changes could have potential impacts to JBCC and specifically the Camp Edwards Training Site. The final report is available online at <https://www.mass.gov/lists/cape-cod-canal-study-documents#cape-cod-canal-transportation-study:-final-report-> MassDOT established a "Working Group" comprised of town and regional officials and interested organizations to obtain input on the study. The Working Group included representation from the JBCC commands and the EMC.

The Army Corps of Engineers conducted its own study of the Bourne and Sagamore Bridges: the Major Rehabilitation Evaluation Report. The Army Corps of Engineers held a comment period on the draft report, released October 2019, with five public meetings, once of which was held in Bourne on October 16, 2019. The final report was released in March 2020, which recommends replacing the Bourne and Sagamore bridges with new bridges parallel to the old bridges. Each new bridge would have four travel lanes, an auxiliary lane, a median, shoulders and a bicycle/pedestrian lane. It is estimated that the Army Corps of Engineers would need to acquire 4.5 acres for the Sagamore Bridge and 11 acres for the Bourne Bridge. The report states that commercial properties in Bourne and Sagamore would need to be acquired.

### 5.3.3 Mayflower Wind

The Massachusetts Department of Public Utilities has contracted with Mayflower Wind to bring offshore wind power to Massachusetts. Mayflower Wind is proposing to use Eversource's easement and switching station as their power interconnect for bringing offshore power to the state. Mayflower Wind has been meeting with Camp Edwards, the EMC, Eversource, and MassDEP to keep them apprised of their progress and to determine the processes they need to complete to bring this transmission line through the Training Area/Reserve.

## 5.4 ENVIRONMENTAL PROGRAM PRIORITIES

### 5.4.1 TY 2020 Environmental Program Priorities

The following subsections provide a list of the environmental program priorities established for TY 2020 as published in the TY 2019 Annual Report for its activities associated with the Training Area/Reserve and the status of achieving them.

#### Natural Resources and ITAM Management

- Engage appropriate stakeholders to conduct an INRMP review of operation and effect and update as needed. (Accomplished)
- Address potential federal status changes to species at Camp Edwards through interagency consultation and planning. (On going)
- Further develop supplemental plans for Natural Resources/ITAM long-term budgets and implementation, including invasive species, wildland fire, and land rehabilitation. (On going)
- Continue implementation and refinement of management focused monitoring of rare species, habitat management, and training capabilities. (On going)
- Continue offering regional wildland fire training to support regional programs and partner agencies and organizations. (Accomplished)
- Continue upscaling of habitat and land management actions, including mechanical work and prescribed burning, through internal actions and partnerships. (On going)
- Continue and further develop interagency partnerships with Massachusetts Division of Fisheries and Wildlife, NHESP, US Fish and Wildlife Service, EMC, DCR, MassDEP, and others through active engagement to seek mutual benefit. (On going)

#### Cultural Resources Management

- Conduct applicable reviews of all IAGWSP, IRP and MAARNG proposed activities in the Training Area/Reserve for potential cultural resources impacts. (Accomplished)
- Document any new occurrences of identified cultural resources. (None identified)

#### Other E&RC Environmental Management Programs

- Coordinate required soil, lysimeter and groundwater sampling at active small arms ranges in accordance with approved range management plans. (Accomplished)
- Provide appropriate support to Camp Edwards for small arms range development. (Accomplished)
- Continue to support Camp Edwards through the environmental process for proposed training venues in the Training Area/Reserve. (Accomplished)
- Provide support as needed to the JBCC Executive Director Office with regards to community involvement and environmental and training issues. (Accomplished)
- Attend all scheduled EMC, CAC and SAC meetings, both internally and externally, that may involve activities within and surrounding the Training Area/Reserve. (Accomplished)
- Provide information on environmental program activities regarding the Training Area/Reserve.
- Work closely with Camp Edwards, the Natural Resources Office, and the EMC to ensure training is compatible with the EPSs. (Accomplished)

- Provide support for the EMC and its advisory councils as required in Chapter 47 of the Acts of 2002. (Accomplished)
- Publish the final TY 2019 State of the Reservation Report. (Accomplished)

### 5.4.2 TY 2021 Environmental Program Priorities

The following subsections provide a list of environmental program priorities for Camp Edwards for activities associated with the Training Area/Reserve in TY 2020.

#### Natural Resources and ITAM Management

- Finalize Sikes Act signatures on updated INRMP and implement annual review.
- Implement projects and planning identified in the Conservation and Management Permit that established an onsite mitigation bank and long-term habitat management and resource monitoring requirements.
- Continue to address potential federal status changes to species at Camp Edwards through interagency consultation, planning, and partnership.
- Further develop supplemental plans for Natural Resources/ITAM long-term budgets and implementation, including invasive species, wildland fire, and land rehabilitation.
- Continue implementation and refinement of management focused monitoring of rare species, habitat management, and training capabilities.
- Continue to update wildland fire planning and program opportunities after hiring dedicated Wildland Fire Program Coordinator, including updating Integrated Wildland Fire Management Plan and planning for increased range usage.
- Continue upscaling of habitat and land management actions, including mechanical work and prescribed burning, through internal actions and partnerships, to increase long-term ecosystem health and resilience.
- Develop water feature conservation plans that provide for ephemeral features (e.g., vernal pools) while minimizing impacts to wildlife and training.
- Continue and further develop interagency partnerships with Massachusetts Division of Fisheries and Wildlife, NHESP, US Fish and Wildlife Service, EMC, DCR, MassDEP, and others through active engagement to seek mutual benefit.

#### Other E&RC Environmental Management Programs

- Coordinate required soil, lysimeter and groundwater sampling at active small arms ranges in accordance with approved range management plans.
- Provide appropriate support to Camp Edwards for small arms range development.
- Continue to support Camp Edwards through the environmental process for proposed training venues in the Training Area/Reserve.
- Provide support as needed to the JBCC Executive Director Office with regards to community involvement and environmental and training issues.
- Attend all scheduled EMC, CAC and SAC meetings, both internally and externally, that may involve activities within and surrounding the Training Area/Reserve.
- Provide information on environmental program activities regarding the Training Area/Reserve.
- Work closely with Camp Edwards, the Natural Resources Office, and the EMC to ensure training is compatible with the EPSs.

- Provide support for the EMC and its advisory councils as required in Chapter 47 of the Acts of 2002.
- Publish the final TY 2020 *State of the Reservation Report*.



# APPENDIX A ENVIRONMENTAL PERFORMANCE STANDARDS AS AMENDED ON APRIL 6, 2017

## **ENVIRONMENTAL PERFORMANCE STANDARDS APRIL 6, 2017**

For Massachusetts National Guard Properties at the Massachusetts Military Reservation

### **CAMP EDWARDS TRAINING AREA GENERAL PERFORMANCE STANDARDS**

None of the following banned military training activities shall be allowed in the Camp Edwards Training Areas:

- Artillery live fire
- Mortar live fire
- Demolition live fire training
- Artillery bag burning
- Non-approved digging, deforestation or vegetation clearing
- Use of 'CS', riot control, or tear gas for training outside the NBC bunkers
- Use of field latrines with open bottoms
- Vehicle refueling outside designated Combat Service Area and Fuel Pad locations
- Field maintenance of vehicles above operator level

Limitations on the use of small arms ammunition and live weapon fire fall into the following two categories:

- Live weapon fire is prohibited outside of established small arms ranges. Live weapon fire is not allowed on established small arms ranges except in accordance with Environmental Performance Standard 19, other applicable Performance Standards, and a range-specific plan approved through the Environmental Management Commission (EMC).
- Blank ammunition for small arms and simulated munitions may be used in areas outside of the small arms ranges, using only blank ammunition and simulated munitions identified on an approved list of munitions. Joint review and approval for inclusion on the list shall be through by the Environmental & Readiness Center (E&RC) and the EMC.

Each user will be responsible for proper collection, management, and disposal of the wastes they generate, as well for reporting on those actions.

Use and application of hazardous materials or disposal of hazardous waste shall be prohibited except as described in the Groundwater Protection Policy.

Vehicles are only authorized to use the existing network of improved and unimproved roads, road shoulders, ranges and bivouac areas, except where necessary for land rehabilitation and management, water supply development, and remediation, or where roads are closed for land rehabilitation and management.

#### **Protection and management of the groundwater resources in the Camp Edwards Training Area will focus on the following:**

- Development of public and Massachusetts Military Reservation water supplies.
- Preservation and improvement of water quality and quantity (recharge).
- Activities compatible with the need to preserve and develop the groundwater resources.

All users of the Camp Edwards Training Area must comply with the provisions of the Groundwater Protection Policy and any future amendments or revisions to the restrictions and requirements. These will apply to all uses and activities within the overlays relative to Wellhead Protection, Zone II's within the Cantonment Area, and the Camp Edwards Training Areas.

Development of water supplies will be permitted within the Camp Edwards Training Area after review and approval by the managing agencies, principally the Department of the Army and its divisions, together with the Massachusetts Department of Environmental Protection, and the Massachusetts Division of Fish and Wildlife.

All phases of remediation activities will be permitted within the Camp Edwards Training Area after review and approval by the managing agencies, principally the Department of the Army and its divisions, together with the federal and state agencies who will have jurisdiction for remediation.

**Pollution prevention and management of the Camp Edwards training ranges will focus on and include the following:**

The Camp Edwards Training Area, including the Small Arms Ranges (SAR) and their associated "Surface Danger Zones," and any areas where small arms or other munitions or simulated munitions are used, shall be managed as part of a unique water supply area under an adaptive management program that integrates pollution prevention, and best management practices (BMP), including the recovery of projectiles. This will be done through individual range-specific plans that are written by the Massachusetts National Guard and approved for implementation through the EMC and any other regulatory agency having statutory and/or regulatory oversight. Adaptive, in this context, means making decisions as part of a continual process of monitoring, reviewing collected data, evaluating advances in range monitoring, design and technology, and responding with management actions as dictated by the resulting information and needs of protecting the environment while providing compatible military training within the Upper Cape Water Supply Reserve.

A range plan shall be designed and followed to reduce the potential for an unintended release to the environment outside of the established containment system(s) identified in the range-specific plans. All users must be aware of, and comply with, the Environmental Performance Standards that are applicable to all SAR activities. Any range specific requirements will be coordinated through the E&RC with the EMC, incorporating those specific requirements into the appropriate range-specific plans and range information packets. Camp Edwards SAR Pollution Prevention Plan shall be followed to prevent or minimize releases of metals or other compounds related to the normal and approved operation of each SAR. The adaptive SAR management program components required in each range-specific plan shall include:

- Consultation with applicable agencies with oversight of the training area before undertaking any actions that are subject to state and/or federal regulatory requirements.
- Specific recovery plans for the removal and proper disposition of spent projectiles, residues and solid waste associated with the weapons, ammunition, target systems, and/or their operation and maintenance.
- Reduction of adverse impacts to the maximum extent feasible, including consideration for the design/redesign and/or relocation of the activity or encouraging only those activities that result in meeting the goal of overall projectile and/or projectile constituent containment.
- Internal and external coordination of documentation for the Camp Edwards range management programs and other related Camp Edwards management programs including: the Integrated Training Area Management Program, Range Regulations, Camp Edwards Environmental Management System, Civilian Use Manual, and Standard Operating Procedures.
- Long-term range maintenance, monitoring and reporting of applicable parameters and analysis.

The Massachusetts National Guard shall ensure that all training areas where munitions or simulated munitions are used or come to be located, including range areas, range surface danger zones, and any other areas within the Upper Cape Water Supply Reserve that are operational ranges are maintained and monitored following approved management plans that include planning for pollution prevention, sustainable range use and where applicable, restoration.

**Protection and management of the vegetation of the Camp Edwards Training Area for focus on the following:**

- Preservation of the habitat for federal- and state-listed rare species and other wildlife.
- Preservation of the wetland resource areas.
- Activities compatible with the need to manage and preserve the vegetative resources.
- Realistic field training needs.
- Identification and restoration of areas impacted by training activities.

**Goals for the Adaptive Ecosystem Management approach to management of the Camp Edwards properties will be as follows:**

- Management of the groundwater for drinking water resources
- Conservation of endangered species.
- Management of endangered species habitat for continuation of the species.
- Ensuring compatible military training activities.
- Allowing for compatible civilian use.
- Identification and restoration of areas impacted by training activities.

The Environmental Performance Standards will be incorporated into the programs and regulations of the Massachusetts National Guard as follows. Those standards relating to natural resources management shall be incorporated as standards into each of the state and federal environmental management programs and attached as an appendix or written into the documentation accompanying the plan or program. All the Environmental Performance Standards will be attached to the Integrated Training Area Management Plan 'Trainer's Guide' and to the Camp Edwards Range Regulations. Modification of the Standards Operating Procedures will include review and conformance with the Environmental Performance Standards for trainers and soldiers at Camp Edwards.

**SPECIFIC RESOURCE PERFORMANCE STANDARDS IN THE CAMP EDWARDS TRAINING AREA**

**1. Groundwater Resources Performance Standards**

1.1. All actions, at any location within the Camp Edwards Training Areas, must preserve and maintain groundwater quality and quantity, and protect the recharge areas 1:0 existing and potential water supply wells. All areas within Camp Edwards Training Areas will be managed as State Zone U, and, where designated, Zone I, water supply areas.

1.2 The following standards shall apply to designated Wellhead Protection Areas:

- The 400-foot radius around approved public water supply wells will be protected from all access with signage. That protection will be maintained by the owner and/or operator of the well, or the leaseholder of the property.
- No new stormwater discharges may be directed into Zone I areas.



- No in ground septic system will be permitted within a Zone I area.
- No solid wastes may be generated or held within Zone I areas except as incidental to the construction, operation, and management of a well.
- Travel in Zone I areas will be limited to foot travel or to vehicles required for construction, operation, and maintenance of wells.
- No new or existing bivouac activity or area shall be located within a Zone I area.
- All other areas will be considered as Zone II designated areas and will be subject to the standards of the Groundwater Protection Policy.

1.3 Land-use activities that do not comply with either the state Wellhead Protection regulations (310 CMR 22.00 et seq.) or the Groundwater protection Policy are prohibited.

1.4 All activities will support and not interfere with either the Impact Area Groundwater Study and/or the Installation Restoration Program. All activities shall conform to the requirements of Comprehensive Environmental Response, Compensation and Liability Act, the Massachusetts Contingency Plan, and the Safe Drinking Water Act.

1.5 Extraction, use, and transfer of the groundwater resources must not de-grade [e.g. draw down surface waters] in freshwater ponds, vernal pools, wetlands, and marine waters, unless properly reviewed, mitigated, and approved by the managing and regulating agencies.

1.6 Land uses and activities in the Camp Edwards Training Areas will meet the following standards:

- Will conform to all existing and applicable federal, state and local regulations.
- Must be able to be implemented without interference with ongoing remediation projects.
- Allow regional access to the water supplies on the Massachusetts Military Reservation.

1.7 The following programs and standards will be used as the basis for protecting groundwater resources in the Camp Edwards Training Areas:

- Groundwater Protection Policy.
- Federal and Department of Defense environmental programs: Integrated Natural Resources Management Plan, Integrated Training Area Management Program, Range Regulations, Spill Prevention Control and Countermeasures Plan (or equivalent), Installation Restoration *Plan*, Impact Area Groundwater Study, or other remediation programs.
- State and federal laws and regulations pertaining to water supply.

## **2. Wetlands and Surface Water Performance Standards**

2.1 Since there are relatively few wetland resources found at the Massachusetts Military Reservation, and since they are important to the support of habitat and water quality on the properties, the minimum standard will be no net loss of any of the wetland resources or their 100-foot buffers.

2.2 Land uses and activities will be managed to prevent and mitigate new adverse impacts and eliminate or reduce existing conditions adverse to wetlands and surface water resource areas. Impacts from remediation activities may be acceptable with implementation of reasonable alternatives.

2.3 Wetland area management priorities:

- Protection of existing; wetland resource areas for their contributions to existing and potential drinking water supplies.
- Protection of wetlands for rare species and their habitats.
- Protection of human health and safety.

2.4. Activities will be managed to preserve and protect wetlands and vernal pools as defined by applicable, federal, state, and local regulations. These activities will include replacement or replication of all wetland resource buffer areas, which are lost after completion of an activity or use.

2.5 All land altering activities within 100 feet of a certified vernal pool must be reviewed before commencement by the Massachusetts Department of Environmental Protection/Wetlands Unit and the Natural Heritage and Endangered Species Program within the Division of Fish and Wildlife for impacts to wildlife and habitat. The certification of vernal pools will be supported by the on site personnel and will proceed with the assistance of the appropriate state agencies.

2.6 All new uses or activities will be prohibited within the wetlands and their 100-foot buffers, except those associated with an approved habitat enhancement or restoration program; those on existing improved and unimproved roads where appropriate sediment and erosion controls are put in place prior to the activity; or those where no practicable alternative to the proposed action is available. No new roads should be located within the 100-foot buffers. Existing roads within such buffers should be relocated provided that:

- The relocation does not cause greater environmental impact to other resources.
- There are funds and resources allocated for resource management and that those resources are approved and available for the relocation.

2.7 During the period of 15 February to 15 May, listed roads/trails within 500 feet of wetlands will be closed to vehicle access to protect the migration and breeding of amphibians. Emergency response and environmental management activities will not be restricted.

- Donnelly and Little Halfway Ponds maneuver trails (excluding the permanently closed section along the eastern edge of Donnelly Pond) from Frank Perkins Road north to Wood Road
- Red Maple Swamp trail from Wood Road north and east to Avery Road
- Orchard and Jefferson Roads (continuous) from Cat Road south and east to Burgoyne Road
- Maneuver trail(s) in powerline easement north of Gibbs Road from Goat Pasture Road west to the boundary of training areas C-13 and C-14
- Grassy Pond trail (side access to Sierra Range) from Gibbs Road south to Sierra Range
- Sandwich Road from the powerline easement north to the gas pipeline right of way
- Bypass Bog/Mike Range Road from entrance to Mike Range south and west to Greenway Road

2.8 No new bivouac area shall be located within 500 feet of any wetland. Any existing bivouac within a wetland buffer shall be relocated provided there are funds and resources allocated for the relocation.

### **3. Rare Species Performance Standards**

3.1 As the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife has identified the entire Massachusetts Military Reservation as State Priority Habitat for state-listed species (version dated 2000-2001), all activities and uses must comply with the Massachusetts Endangered Species Act and its regulations.

3.2 Where activities and uses are not specifically regulated under the Camp Edwards Training Area Range and Environmental Regulations, including these Environmental Performance Standards, the MMR Environmental and Readiness Center must review the activities for conformance with the Integrated Natural Resource Management Plan, and shall- consult with the Natural Heritage and Endangered Species Program regarding potential impacts to state-listed species.

3.3 All activities impacting rare species habitat must be designed to preserve or enhance that habitat as determined by the MMR Environmental and Readiness Center in consultation with the Natural Heritage and Endangered Species Program.

3.4 Users are prohibited from interfering with state and federal listed species.

3.5 Users will report all sightings of recognized listed species, e.g. box turtles, within any area of the Massachusetts Military Reservation.

#### **4. Soil Conservation Performance Standards**

4.1 Activities and uses must be compatible with the limitations of the underlying soils. Limitations on uses and activities may be made where the soils or soil conditions would not support the activity.

4.2 Agricultural soil types will be preserved for future use.

4.3 Any perennial or intermittent stream identified by the Environmental & Readiness Center Office will be protected from siltation by retaining undisturbed vegetative buffers to the extent feasible.

4.4 Cultural resource evaluations must be completed before any earth-moving operation may take place in undisturbed areas with high potential for cultural resources, and earth moving may be limited to specific areas (See Cultural Resource Performance Standards).

4.5 An erosion control analysis will be made part of the land management programs (Integrated Natural Resource Management Plan, the Integrated Training Area Management Program, Range Regulations, Civilian Use, and Standard Operating Procedures) for the Camp Edwards Training Area, including appropriate mitigation measures where existing or potential erosion problems are identified.

4.6 For all improved and unimproved roads, ditches and drainage ways:

- All unimproved roads, ditches, roads and drainage ways identified for maintenance will be cleaned of logs, slash and debris.
- Unimproved roads and roads may not otherwise be improved unless approved for modification.
- Any trail, ditch, road, or drainage way damaged by activities will be repaired in accordance with the hazard and impact it creates.

4.7 Erosion-prone sites will be inspected periodically to identify damage and mitigation measures.

#### **5. Vegetation Management Performance Standards**

5.1 All planning and management activities impacting vegetation

- Will ensure the maintenance of native plant communities, and
- Shall be performed to maintain the biological diversity.

5.2 Revegetation of disturbed sites will be achieved by natural and artificial recolonization by native species.

5.3 Timber harvesting or clear-cutting of forested areas should not occur on steep slopes with unstable soils or within the buffers to wetland resources.

5.4 Vegetation management will be subject to a forest management and fire protection program prepared by the users in accordance with federal standards, and carried out in a manner acceptable to the Massachusetts Military Reservation Committee and other state agencies or commissions, as may be designated by the Commonwealth of Massachusetts.

## **6. Habitat Management Performance Standards**

6.1 The Camp Edwards Training Area will be managed as a unique rare species and wildlife habitat area under an adaptive ecosystem management program that integrates ecological, socio-economic, and institutional perspectives, and which operates under the following definitions:

- Adaptive means making decisions as part of a continual process of monitoring, reviewing collected data, and responding with management actions as dictated by the resulting information and needs of the system.
- Ecosystem means a system-wide understanding of the arrangements of living and non-living things, and the forces that act upon and within the system.
- Management entails a multi-disciplinary approach where potentially competing interests are resolved with expert analysis, user and local interest considerations, and a commitment to compromise interests when the broader goal is achieved to manage the Camp Edwards Training Area as a unique wildlife habitat area.

6.2 The adaptive ecosystem management program will include:

- Coordinated documentation for the management programs, Integrated Natural Resource Management Plan, the Integrated Training Area Management Program, Range Regulations, Civilian Use, and Standard Operating Procedures.
- The Massachusetts National Guard Environmental and Readiness Center staff and necessary funding to support its ecosystem management plans, as related to the amount of training occurring.
- Cooperative agreements to create a management team of scientific and regulatory experts.
- Long-term land maintenance, monitoring of resources and trends, study and analysis.
- Recovery plans for species and habitats identified for improvement.
- Consultation with Federal and State agencies charged with oversight of the Endangered Species Program before any actions that may affect state and federal-listed species habitat.
- Reduction of adverse impacts to the maximum extent possible, including consideration for the relocation of the activity or encouraging only those activities that result in meeting a habitat management goal.
- Habitat management activities designed to promote protection and restoration of native habitat types.

## **7. Wildlife Management Performance Standards**

7.1 Native wildlife habitats and ecosystems management will focus on the following:

- Protecting rare and endangered species, and,
- Maintaining biodiversity.



7.2 Hunting, recreation and educational trips must be approved, scheduled, planned, and supervised through Range Control.

7.3 Any activity or use will prioritize protection of life, property, and natural resource values at the boundaries of the Camp Edwards Training Area where wildlife interfaces with the surrounding built environment.

7.4 Wildlife management will include the following actions, specific to the species targeted for management:

- Development and implementation of a plan to monitor hunting of game species.
- Planning for multi-use objectives for recreation and hunting that incorporate public input and recommendations.
- Development of suitable monitoring programs for federal and state-listed species, and regular exchange of information with the Natural Heritage and Endangered Species Program.

## **8. Air Quality Performance Standard**

8.1 All uses and activities will be responsible for compliance with both the State Implementation Plan for Air Quality and the Federal Clean Air Act.

8.2 Air quality management activities will include air sampling if required by regulation of the activity.

## **9. Noise Management Performance Standards**

9.1 Noise management activities shall conform to the Army's Environmental Noise Management Program policies for evaluation, assessment, monitoring, and response procedures.

## **10. Pest Management Performance Standards**

10.1 Each user will develop and implement an Integrated Pest Management Program to control pest infestations that may include outside contracting of services. Non-native biological controls should not be considered unless approved by federal and state agencies.

10.2 Each user will be held responsible for management of pests that threaten rare and endangered species, or are exotic and invasive species, Invasive plant species that may be considered pest species are those defined by the United States Fish and Wildlife Service and the Massachusetts Natural Heritage and Endangered Species Program of the Division of Fisheries and Wildlife office. Site-specific analysis will be performed before implementation of any proposed pest management plans.

10.3 Pest vegetation control must be balanced against environmental impact and any proposed pest management activities, including the use of herbicides and mechanical methods, within rare species habitat areas must be approved by the Natural Heritage and Endangered Species Program, or in the case of federally listed species, by the United States Fish and Wildlife Service.

10.4 Only herbicide formulations approved by the United States Environmental Protection Agency, the Department of Agriculture, the agency managing the user, and the Commonwealth of Massachusetts may be applied.

10.5 Herbicides and pesticides will not be applied by aerial spraying unless required by emergency conditions and approved under applicable state and federal regulations.

## **11. Fire Management Performance Standards**

11.1 All activities and uses shall manage, prevent, detect, and suppress fires on the Camp Edwards Training Area in coordination with the local and state fire services and natural resource managers in the Environmental & Readiness Center.

11.2 Prescribed burns will be used as a habitat management and fire prevention tool. Prescribed burns will be used to reduce natural fire potential and create or maintain diverse and rare species habitat.

11.3 Pre-suppression activities will include strategic firebreaks and other management of vegetation in high risk and high-incidence areas. The Integrated Natural Resource Management Plan and Fire Management Plan will be consulted for proposed actions.

11.4 Other than the above, no open fires are allowed.

## **12. Stormwater Management Performance Standards**

12.1 All stormwater facilities shall comply with the State Department of Environmental Protection Guidelines for Stormwater Management, including Best Management Practices and all other applicable standards for control and mitigation of increased storm water flow rates and improvement of water quality.

12.2 All increases in stormwater runoff will be controlled within the user's property.

12.3 No new stormwater discharges will be made directly into wetlands or wetland resource areas.

## **13. Wastewater Performance Standards**

13.1 All wastewater and sewage disposal will be in conformance with the applicable Federal and Massachusetts Department of Environmental Protection agency regulations.

## **14. Solid Waste Performance Standards**

14.1 All solid waste streams (i.e., wastes not meeting the criteria for hazardous wastes) will be monitored and managed to substitute, reduce, recycle, modify processes, implement best management practices, and/or reuse waste, thereby reducing the total tonnage of wastes,

14.2 All users will be held responsible for collection, removal and disposal outside of the Camp Edwards Training Areas of solid wastes generated by their activities.

14.3 All users must handle solid wastes using best management practices to minimize nuisance odors, windblown litter, and attraction of vectors.

14.4 No permanent disposal of solid waste within the Groundwater protection Policy area/Camp Edwards field training areas will be permitted.

## **15. Hazardous Materials Performance Standards**

15.1 Where they are permitted, use and application of hazardous materials shall be otherwise minimized in accordance with pollution prevention and waste minimization practices, including material substitution.

15.2 No permanent disposal of hazardous wastes within the Groundwater protection Policy area/Camp Edwards field training areas will be permitted.

### 15.3 Fuel Management

15.3.1 Spill Prevention, Control, and Countermeasure Plan, is in place to reduce potential for a release. Camp Edwards Spill Response Plan is in place to respond to a release if an event should occur. All users will comply with these plans at the Camp Edwards Training Area.

15.3.2 If found, non-complying underground fuel storage tanks will be removed in accordance with state and federal laws and regulations to include remediation of contaminated soil.

15.3.3 No storage or movement of fuels for supporting field activities, other than in vehicle fuel tanks, will be permitted except in approved containers no greater than five gallons in capacity.

15.3.4 New storage tanks are prohibited unless they meet the following requirements:

- Are approved for maintenance heating, or, permanent emergency generators and limited to propane or natural gas fuels.
- Conform to the Groundwater Protection Policy and applicable codes.

### 15.4 Non-fuel Hazardous Material Storage

15.4.1 No storage above those quantities necessary to support field training activities will be allowed within the Camp Edwards Training Area except where necessary to meet regulatory requirements, and where provided with secondary containment.

15.4.2 When required by applicable regulation, the user shall implement a Spill Prevention, Control and Containment/Emergency Response or other applicable response plan.

## **16. Hazardous Waste Performance Standards**

16.1 All uses shall comply with applicable local, state, and federal regulations governing hazardous waste generation, management, and disposal (including overlays relative to Wellhead Protection, Zone II' s within the Cantonment Area) .

16.2 Accumulations of hazardous waste shall be handled in accordance with regulations governing accumulation and storage.

16.3 Existing facilities must implement pollution prevention and waste minimization procedures (process modifications, material substitution, recycling, and best management practices) to minimize waste generation and hazardous materials use.

16.4 Occupants and users will be held responsible for removing all solid or hazardous wastes generated during the period of use/tenancy/visitation upon their departure or in accordance with other applicable or relevant regulations.

16.5 Remedial activities undertaken under the Installation Restoration Program, the Impact Area Groundwater Study Program, the Massachusetts Contingency Plan, or other governing remediation programs are exempt from additional regulation (e.g., waste generation volume limits). Removal, storage, and disposal of contaminated material are required to comply with all state, and federal regulations.

16.6 Post-remedial uses and activities at previously impacted sites will be allowed in accordance with terms and conditions of the applicable regulations.

16.7 All hazardous wastes will be transported in accordance with federal Department of Transportation regulations governing shipment of these materials.

16.8 Transport shall reduce the number of trips for transfer and pick-up of hazardous wastes for disposal to extent feasible. Tills may include planning appropriate routes that minimize proximity to sensitive natural resource areas, and reducing internal transfers of material, including transfers from bulk storage tanks to drums, tankers, carboys, or other portable containers or quantities.

16.9 No permanent disposal of hazardous wastes within the Groundwater Protection Policy area/Camp Edwards field training areas will be permitted.

### **17. Vehicle Performance Standards**

17.1 Vehicles within the Camp Edwards Training Area will be limited to the existing improved and unimproved road system except where required for natural resource management or property maintenance or where off-road activity areas are located and approved by the Environmental and Readiness Center in consultation with the Massachusetts Division of Fisheries and Wildlife.

17.2 Unimproved, established access ways will be limited to use by vehicles in accordance with soil conditions as described in the Soil Conservation Performance Standards.

17.3 The number of military and civilian vehicles within the Camp Edwards Training Area will be controlled using appropriate scheduling and signage.

### **18. General Use and Access Performance Standards**

18.1 General User Requirements. Requirements that will apply to all users, both public and private, in the Camp Edwards Training Area include the following:

- All acts that pollute the groundwater supply are prohibited.
- No litter or refuse of any sort may be thrown or left in or on any property.
- All users will be held responsible for providing, maintaining, and re- moving closed-system, sanitary facilities necessary for their use and activity.
- No person shall wade or swim in any water body except for activities approved by the Massachusetts National Guard including remediation, scientific study, or research.
- Vehicles may only be driven on roads authorized and designated for such use and parked in designated areas, and may not cross any designated wetland.
- Public users may not impede the military training activities.

18.2. Civilian Use Manual. To guide public conduct on the Massachusetts Military Reservation, a Civilian Use Manual will be prepared and periodically updated. All civilian users will obtain and follow this Manual.

#### 18.3. Siting and Design Performance Standards

18.3.1 New or expanded buildings should not be proposed within the Camp Edwards Training Areas, with the following exceptions:



- Buildings to support allowed training, operations and activities, including upgrading of those facilities currently in place,
- Buildings used for the purposes of remediation activities,
- Buildings used for the purposes of development, operation and maintenance of water supplies,
- Buildings used for the purpose of natural resource and land management.

### **19. Range Performance Standards**

19.1. All operational ranges including but not limited to small arms ranges (SAR) shall be managed to minimize harmful impacts to the environment within the Upper Cape Water Supply Reserve. Range management at each range shall include to the maximum extent practicable metal recovery and recycling, prevention of fragmentation and ricochets, and prevention of sub-surface percolation of residue associated with the range operations. Camp Edwards shall be held responsible for the implementation of BMPs by authorized range users, including collection and removal of spent ammunition and associated debris.

19.2. Small arms ranges shall only be used in accordance with approved range plans. These plans shall be designed to minimize to the maximum extent practicable the release of metals or other contaminants to the environment outside of specifically approved containment areas/systems. Occasional ricochets that result in rounds landing outside of these containment areas is expected and every effort to minimize and correct these occurrences shall be taken. Failure to follow the approved range plans shall be considered a violation of this EPS.

19.3. All operational SARs shall be closely monitored by the Massachusetts National Guard to assess compliance of the approved range plans as well as the implementation and effectiveness of the range specific BMPs.

19.4. Camp Edwards/Massachusetts National Guard Environmental and Readiness Center shall staff and request appropriate funding to support its SAR management plans.

19.5. All users must use and follow Camp Edwards' Range Control checklists and procedures to:

- Minimize debris on the range (e.g. shell casings, used targets)
- Minimize or control residues on the ranges resulting from training (e.g., unburned constituents, metal shavings from the muzzle blast)
- Ensure the range is being used for the designated purpose in accordance with all applicable plans and approvals

19.6. Camp Edwards is responsible for following range operation procedures and maintaining range pollution prevention systems. Range BMPs shall be reviewed annually for effectiveness and potential improvements in their design, monitoring, maintenance, and operational procedures in an effort to continually improve them. Each year the annual report shall detail the range-specific activities including, but not limited to, the number of rounds fired, number of shooters and their organization, and the number of days the range was in use. The annual report will also detail active SAR groundwater well and lysimeter results, as well as any range maintenance/management activities that took place that training year and the result of such activities, i.e. lbs. of brass and projectiles recovered and recycled, etc. The Massachusetts National Guard shall provide regular and unrestricted access for the EMC to all its data and information, and will provide immediate access to environmental samples from the range, including range management and monitoring systems and any other applicable activities operating on the ranges.

19.7. Range plans and BMPs for training areas shall be reviewed and/or updated at least every three years. Management plans for new and upgraded ranges shall be in place prior to construction or utilization of the range. Range plans, at a minimum, will address long-term sustainable use, hydrology and hydrogeology, physical design, operation, management procedures, record keeping, pollution prevention, maintenance, monitoring, and applicable technologies to ensure sustainable range management. Range plans shall be integrated with other training area planning processes and resources.

19.8. The Massachusetts National Guard shall establish procedures for range maintenance and where applicable, maintenance and/or clearance operations to permit the sustainable, compatible, and safe use of operational ranges for their intended purpose within the Upper Cape Water Supply Reserve. In determining the frequency and degree of range maintenance and clearance operations, the Massachusetts National Guard shall consider, at a minimum, the environmental impact and safety hazards, each range's intended use, lease requirements, and the quantities and types of munitions or simulated munitions expended on that range.

# APPENDIX B

## LIST OF CONTACTS

## **LIST OF CONTACTS**

### **Massachusetts National Guard Environmental & Readiness Center**

Emily Kelly  
Building 3468 Beaman Street  
Camp Edwards, MA 02542  
Telephone: 339-202-9341  
emily.d.kelly2.nfg@mail.mil

### **Impact Area Groundwater Study Program**

Pamela Richardson  
PB 0516 West Outer Road  
Camp Edwards, MA 02542  
Telephone: 339-202-9360  
Pamela.j.richardson.nfg@mail.mil

### **Air Force Center for Civil Engineering**

Doug Karson  
322 East Inner Road  
Otis ANG Base, MA 02542  
Telephone: 508-968-4678, ext. 2  
douglas.karson@us.af.mil

### **Joint Base Cape Cod**

Paul Rendon  
Building 3468, Beaman Street  
Camp Edwards, MA 02542  
Telephone: 774-327-0643  
paul.rendon@state.ma.us

### **102d Intelligence Wing Massachusetts Air National Guard**

Timothy Sandland  
158 Reilly Street, 102d Intelligence Wing  
Otis ANG Base, MA 02542  
Telephone: 508-968-4697  
timothy.d.sandland.civ@mail.mil

### **U.S. Coast Guard Base Cape Cod**

Elizabeth Kirkpatrick  
USCG Base Cape Cod, MA 02542  
Telephone: 508-968-6696  
elizabeth.l.kirkpatrick@uscg.mil

**6th Space Warning Squadron (PAVE PAWS)**

Patrick McNamara  
1 Flatrock Road  
Sagamore, MA 02561-0428  
508-968-3275  
patrick.mcnamara.1@us.af.mil

**Massachusetts National Guard, Public Affairs Office**

Aaron Smith  
2 Randolph Road  
Hanscom AFB, MA 01731  
Telephone: 339-202-3950  
Aaron.d.smith3.mil@mail.mil

**Environmental Management Commission Environmental Officer**

Leonard Pinaud  
Building 3468, Beaman Street  
Camp Edwards, MA 02542  
Telephone: 508-946-2871  
leonard.Pinaud@mass.gov

**Barnstable County Correctional Facility**

Sheriff James Cummings  
6000 Sheriff's Place  
Bourne MA, 02532  
Telephone:508-563-4302  
jcummings@bsheriff.net





# APPENDIX C

## SMALL ARMS RANGE AND SOLDIER VALIDATION LANE INFORMATION

## **Operations Maintenance and Monitoring Activities**

**OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES**  
**JULIET & KILO RANGE**  
**TY 2020**

Date	Juliet	Kilo
5 Oct 19	Pre/post fire inspection (3 cm)	Pre/post fire inspection (W 7 cm; E 6.5 cm)
15 Oct 19	Maintenance: 50 gallons pumped (3 cm)	Maintenance: 40 gallons pumped (W 5 cm; E 6.5 cm)
19, 20 Oct 19	-----	Pre/post fire inspection (W 5 cm; E 6.5 cm)
21 Oct 19	Maintenance: 40 gallons pumped (1 cm)	Maintenance: 40 gallons pumped (1 cm)
2 Nov 19	-----	Pre/post fire inspection (W 5 cm; E 6.5 cm)
15 Nov 19	-----	Pre/post fire inspection (W 9 cm; E 6.5 cm)
15, 16 Nov 19	Pre/post fire inspection (4 cm)	-----
16 Nov 19	-----	Pre/post fire inspection (W 10 cm; 6.5 cm)
19 Nov 19	-----	Maintenance: 60 gallons pumped (W 1 cm; E 6.5 cm)
5 Dec 19	Maintenance: 50 gallons pumped (3 cm)	Maintenance: 45 gallons pumped (W 4 cm; E 6.5 cm)
16 Dec 19	Maintenance: 30 gallons pumped (3 cm)	Maintenance: 60 gallons pumped (W 4 cm; 6.5 cm)
28 Jan 20	-----	Maintenance: tarp cover fixed; 50 gallons pumped (W 3 cm; E 6.5 cm)
12 Feb 20	Maintenance: tarp fixed and 50 gallons pumped (2 cm)	Maintenance: tarp cover replaced; 90 gallons pumped (W 3.5 cm; E 6.5 cm)
18 Feb 20	Maintenance: tarp fixed and water level checked (4.5 cm)	-----
18 Mar 20	-----	Maintenance: 60 gallons (W 4 cm; E 6.5 cm)
31 Mar 20	-----	Maintenance: 35 gallons pumped (W 2.5 cm; E 6.5 cm)
1 Apr 20	Pre/post fire inspection (4.5 cm)	Pre/post fire inspection (W 2.5 cm; E 6.5 cm)
4 May 20	Pre/post fire inspection; 55 gallons pumped (2 cm)	Maintenance: 45 gallons pumped (W 6 cm; E 6.5 cm)
29 May 20	Pre/post fire inspection (2 cm)	-----
4 Jun 20	-----	Maintenance: 60 gallons pumped (W 2 cm; E 6.5 cm)
15, 26 Jun 20	-----	Pre/post fire inspection (W 12 cm; E 6.5 cm)
29 Jun 20	Maintenance: 55 gallons pumped (2 cm)	Maintenance: 45 gallons pumped (W 2 cm; E 6.5 cm)
16 Jul 20	Maintenance: 40 gallons pumped (1 cm)	Maintenance: 55 gallons pumped (W 1 cm; E 6.5 cm)
31 Jul 20	Maintenance: repaired STAPP top cover and water level checked (1 cm)	Maintenance: repaired STAPP top cover and water level checked (W 1 cm; E 6.5 cm)
1 Aug 20	-----	Pre/post fire inspection (W 1 cm; E 6.5 cm)
2 Aug 20	Pre/post fire inspection (1 cm)	-----
8 Aug 20	-----	Pre/post fire inspection (W 10 cm; E 6.5 cm)
23 Aug 20	-----	Pre/post fire inspection (W 10 cm; E 6.5 cm)

**OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES**  
**SIERRA & INDIA RANGES**  
**TY 2020**

Date	Sierra	India
5 Oct 19	-----	Pre/post fire inspection
5, 6 Oct 19	Pre/post fire inspection	-----
18, 20 Oct 19	Pre/post fire inspection	-----
19, 25 Oct 19	-----	Pre/post fire inspection
26, 27 Oct 19	Pre/post fire inspection	Pre/post fire inspection
1, 2 Nov 19	-----	Pre/post fire inspection
1, 3 Nov 19	Pre/post fire inspection	
15, 16 Nov 19	-----	Pre/post fire inspection
15, 17 Nov 19	Pre/post fire inspection	-----
2, 6 Mar 20	-----	Maintenance: Firing line flattened; all bullet pockets filled
4 Mar 20	Maintenance: Bullet pockets filled with screened loam	
7 Mar 20	Pre/post fire inspection	-----
13, 14 Mar 20	Pre/post fire inspection	Pre/post fire inspection
15 Jun 20	-----	Pre/post fire inspection
25, 26 Jun 20	Pre/post fire inspection	
26 Jun 20	-----	Pre/post fire inspection
10 Jul 20	Pre/post fire inspection	-----
17 Jul 20	Pre/post fire inspection	-----
18, 19 Jul 20	Pre/post fire inspection	-----
8 Aug 20	Pre/post fire inspection	-----
9, 17 Aug 20	Pre/post fire inspection	Pre/post fire inspection
20, 21 Aug 20	Pre/post fire inspection	-----
21 Aug 20	-----	Maintenance: bullet pockets repaired
23 Aug 20	Pre/post fire inspection	-----
23-25 Aug 20	-----	Pre/post fire inspection
24 Aug 20	Maintenance: bullet pockets filled with screened loam	-----
4 Sep 20	Pre/post fire inspection	-----
10, 11 Sep 20	-----	Pre/post fire inspection
10, 12 Sep 20	Pre/post fire inspection	-----
25 Sep 20	Pre/post fire inspection	Pre/post fire inspection
26 Sep 20	Pre/post fire inspection	-----
26, 27 Sep 20	-----	Pre/post fire inspection



**OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES**  
**LIMA RANGE**  
**TY 2020**

Date	Activity
12, 14 Feb 20	Maintenance: Range netting repaired
26, 27 Feb 20	Pre/post fire inspection
17 Jul 20	Pre/post fire inspection

**OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES  
ECHO RANGE  
TY 2020**

Date	Activity
9, 15 Jan 20	Maintenance: Firing lane excavation, electrical work, firing lane backfilled
26 Jun 20	Pre/post fire inspection
10 Aug 20	Pre/post fire inspection
18 Aug 20	Pre/post fire inspection
9 Sep 20	Pre/post fire inspection
10, 12 Sep 20	Pre/post fire inspection

## **Lead Ammunition Use**

### **Juliet, Kilo, Tango and Echo Ranges**

LEAD AMMUNITION USE HISTORY								
JULIET RANGE								
Training Year	.40 Cal Lead	9 mm Lead	7.62 mm Lead	5.56 mm Lead	.38 Cal Lead	.45 Cal Lead	.233 Cal Lead	Total
TY 2020	0	7,690	0	0	0	0	0	7,690
TY 2019	0	17,774	0	12,315	0	0	0	30,089
TY 2018	0	12,781	0	23,802	0	0	0	36,583
TY 2017	0	26,108	0	25,789	0	0	0	51,897
TY 2016	0	9,200	0	51,852	0	0	0	61,052
TY 2015	2,500	24,828	0	36,938	0	1,000	0	65,266
TY 2014	2,400	18,874	9,000	6,663	0	0	0	36,937
TY 2013	2,450	9,260	0	27,286	0	0	1,200	40,196
TY 2012	750	12,819	0	14,457	0	0	3,000	31,026
TY 2011	0	16,911	0	46,630	0	0	0	63,541
TY 2010	0	7,311	0	27,060	0	0	0	34,371
TY 2009	0	4,780	0	11,482	0	0	0	16,262
TY 2008	0	0	0	0	0	0	0	0
TY 2007	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>8,100</b>	<b>168,336</b>	<b>9,000</b>	<b>284,274</b>	<b>0</b>	<b>1,000</b>	<b>4,200</b>	<b>474,910</b>

Note: A STAPP™ bullet capture system was installed at Juliet Range in August/September 2008.

LEAD AMMUNITION USE HISTORY								
KILO RANGE								
Training Year	.40 Cal Lead	9 mm Lead	7.62 mm Lead	5.56 mm Lead	.38 Cal Lead	.45 Cal Lead	.233 Cal Lead	Total
TY 2020	0	61,480	0	21,052	0	1,500	0	84,032
TY 2019	0	44,428	0	36,751	0	0	0	81,179
TY 2018	0	25,803	0	93,539	0	0	0	119,342
TY 2017	0	50,147	0	65,515	0	0	0	115,662
TY 2016	0	21,373	0	28,265	0	0	0	49,638
TY 2015	0	15,601	0	54,372	0	0	0	69,973
TY 2014	0	31,304	0	49,052	0	0	0	80,356
TY 2013	0	731	0	73,011	0	0	0	73,742
TY 2012	0	7,181	0	52,731	0	0	0	59,912
TY 2011	14,362	9,850	0	100,942	0	0	0	125,154
TY 2010	1,450	7,500	0	51,412	0	0	0	60,362
TY 2009	0	6,675	0	23,108	0	0	0	29,783
TY 2008	0	0	0	0	0	0	0	0
TY 2007	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>15,812</b>	<b>282,073</b>	<b>0</b>	<b>649,750</b>	<b>0</b>	<b>1,500</b>	<b>0</b>	<b>949,135</b>

Note: A STAPP™ bullet capture system was installed at Kilo Range in August/September 2008.

LEAD AMMUNITION USE HISTORY									
TANGO RANGE									
Training Year	.40 Cal Lead	9 mm Lead	7.62 mm Lead	5.56 mm Lead	.38 Cal Lead	.45 Cal Lead	.233 Cal Lead	.22 Cal Lead	Total
TY 2017	0	2,250	4,240	9,380	0	0	0	625	16,495
TY 2016	0	4,200	0	0	0	0	0	0	4,200
TY 2015	0	5,240	0	1,720	0	0	0	0	6,960
TY 2014	0	0	0	3,220	0	0	0	0	3,220
TY 2013	1,600	1,800	0	2,000	0	0	4,550	0	9,950
TY 2012	2,800	7,373	0	1,944	0	0	0	0	12,117
TY 2011	5,200	6,765	0	25,157	0	0	0	0	37,122
TY 2010	40,341	2,496	0	41,042	0	6,449	0	0	90,328
TY 2009	0	31,985	0	105,077	300	0	0	0	137,362
TY 2008	4,075	9,094	4,556	0	0	0	0	0	17,725
TY 2007	0	0	0	8,547	0	0	0	0	8,547
<b>TOTAL</b>	<b>54,016</b>	<b>71,203</b>	<b>8,796</b>	<b>198,087</b>	<b>300</b>	<b>6,449</b>	<b>4,550</b>	<b>625</b>	<b>344,026</b>

Note: A STAPP™ bullet capture system was installed at Tango Range in July 2006 and dismantled in October 2017.

LEAD AMMUNITION USE HISTORY					
ECHO RANGE					
Training Year	.40 Cal Lead	9 mm Lead	.38 Cal Lead	.45 Cal Lead	Total
TY 2020	0	14,308	0	0	14,308
TY 2019	0	4,350	0	0	4,350
TY 2018	0	0	0	0	0
TY 2017	0	0	0	0	0
TY 2016	0	0	0	0	0
TY 2015	0	347 <sup>1</sup>	0	0	347
TY 2014	0	0	0	0	0
TY 2013	0	0	0	0	0
TY 2012	0	0	0	0	0
TY 2011	0	0	0	0	0
TY 2010	0	0	0	0	0
TY 2009	0	0	0	0	0
TY 2008	0	0	0	0	0
TY 2007	0	100 <sup>1</sup>	0	0	100
<b>TOTAL</b>	<b>0</b>	<b>19,105</b>	<b>0</b>	<b>0</b>	<b>19,105</b>

Notes: Echo Range became operational in Fall 2019.

1. Firing at Echo Range in TY 2007 and TY 2015 were part of tests for reintroducing lead ammunition.



LEAD AMMUNITION USE HISTORY							
CUMULATIVE							
Training Year	Echo Range	Sierra Range	KD Range	Tango Range	Juliet Range	Kilo Range	Total
TY 2020	14,308	0	0	0	7,690	84,032	106,030
TY 2019	4,350	0	0	0	30,089	81,179	115,618
TY 2018	0	0	0	0	36,583	119,342	155,925
TY 2017	0	0	0	16,495	51,897	115,662	184,054
TY 2016	0	0	0	4,200	61,052	49,638	114,890
TY 2015	347 <sup>1</sup>	0	1,993 <sup>3</sup>	6,960	65,266	69,973	144,539
TY 2014	0	0	0	3,220	36,937	80,356	120,513
TY 2013	0	0	0	9,950	40,196	73,742	123,888
TY 2012	0	0	0	12,117	31,026	59,912	103,055
TY 2011	0	2,120 <sup>2</sup>	0	37,122	63,541	125,154	227,937
TY 2010	0	0	0	90,328	34,371	60,362	185,061
TY 2009	0	0	0	137,362	16,262	29,783	183,407
TY 2008	0	0	0	17,725	0	0	17,725
TY 2007	100 <sup>1</sup>	0	0	8,547	0	0	8,647
<b>TOTAL</b>	<b>19,105</b>	<b>2,120</b>	<b>1,993</b>	<b>344,026</b>	<b>474,910</b>	<b>949,135</b>	<b>1,791,289</b>

Notes: 1. Firing at Echo Range in TY 2007 and TY 2015 were part of tests for reintroducing lead ammunition.

2. Firing at Sierra Range in TY 2011 was part of a Line of Sight Analysis test.

3. Firing at KD Range in TY 2015 was part of a planning-level noise assessment.

## **Copper Ammunition Use**

### **Sierra and India Ranges**

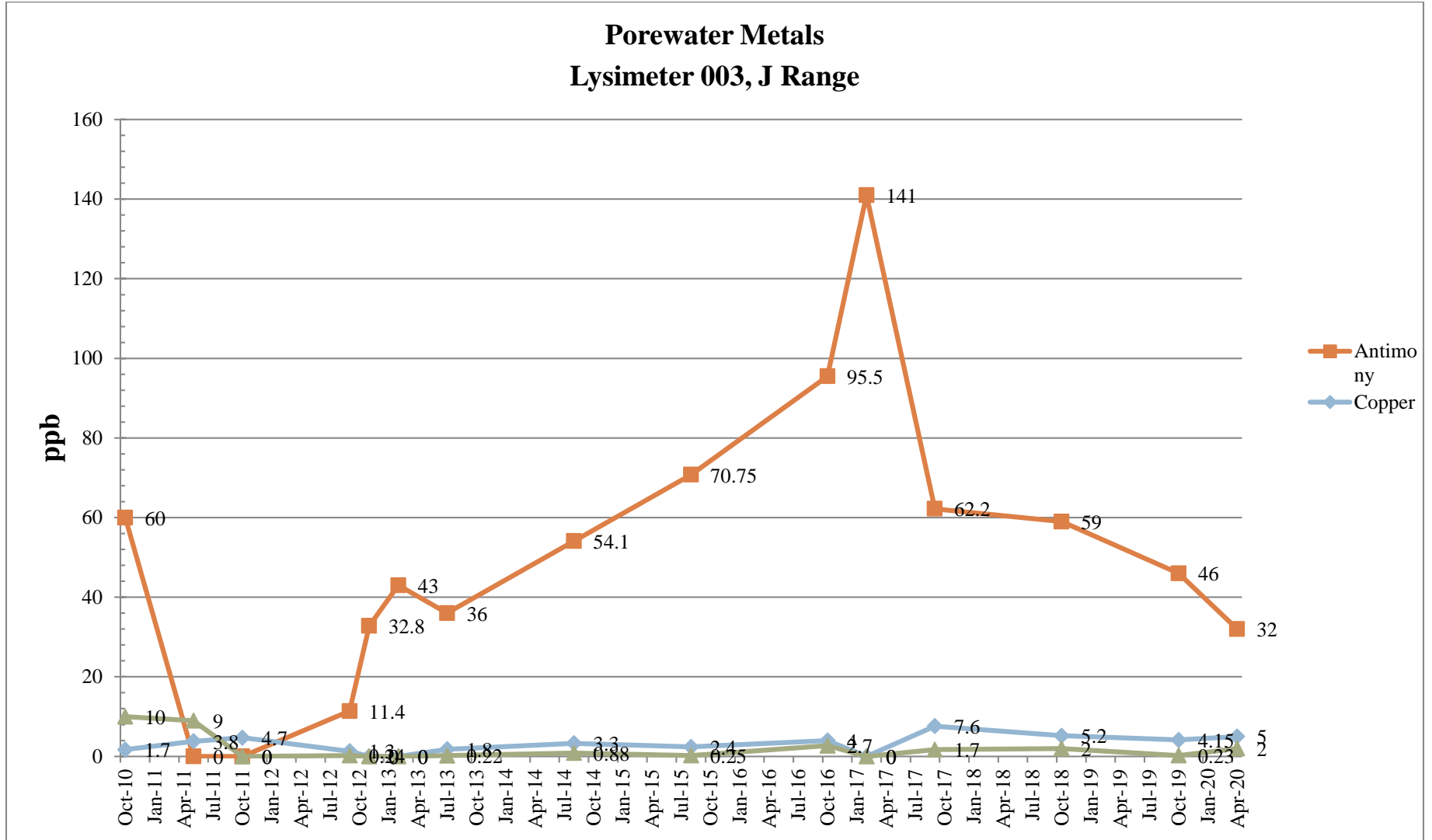
COPPER AMMUNITION USE HISTORY SIERRA AND RANGES			
Training Year	Sierra Range 5.56 Copper	India Range 5.56 Copper	Total
TY 2020	131,274	90,849	222,123
TY 2019	98,426	71,098	169,524
TY 2018	98,393	105,143	203,536
TY 2017	95,905	109,892	205,797
TY 2016	80,747	60,571	141,318
TY 2015	66,086	12,947	79,033
TY 2014	46,804	27,872	74,676
TY 2013	34,493	10,918	45,411
TY 2012	34,359	6,601	40,960
<b>TOTAL</b>	<b>686,487</b>	<b>491,098</b>	<b>1,182,378</b>

Note: Firing of copper ammunition began at Sierra Range on July 8, 2012 and at India Range on September 15, 2012.

## **Juliet, Kilo, Tango and India Ranges**

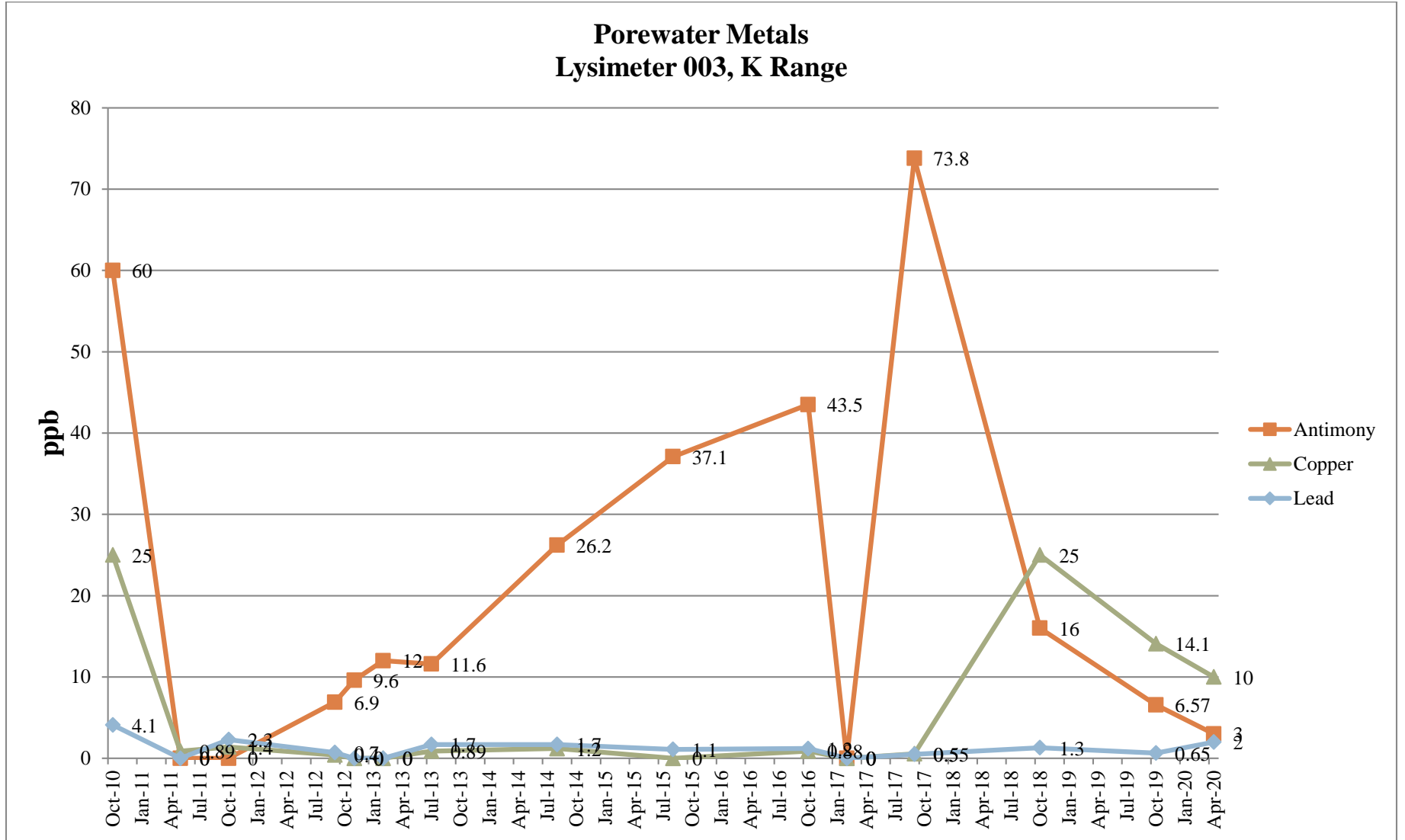
Porewater Graphs

Porewater Metals, Lysimeter 003, J Range

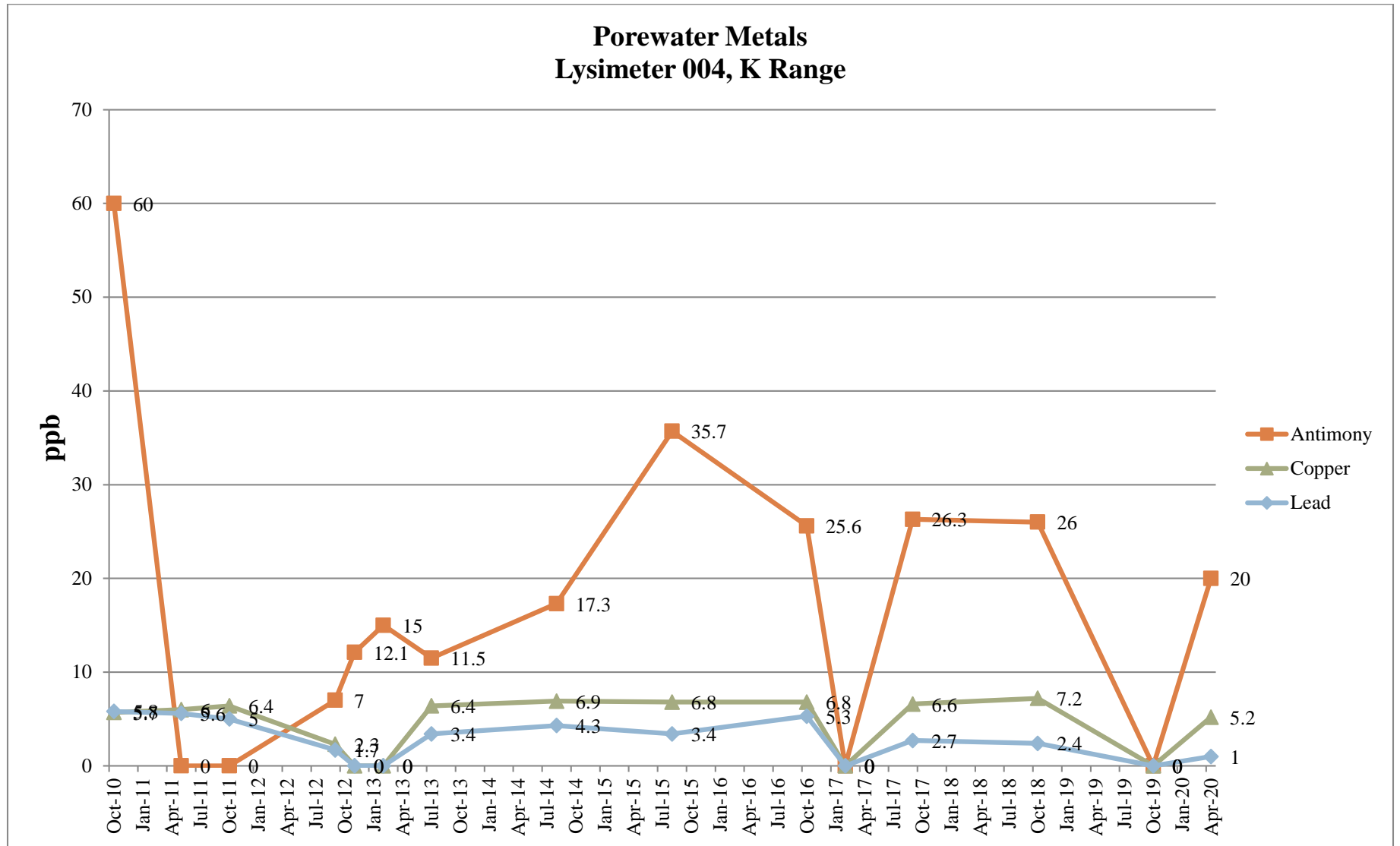




Porewater Metals, Lysimeter 003, K Range

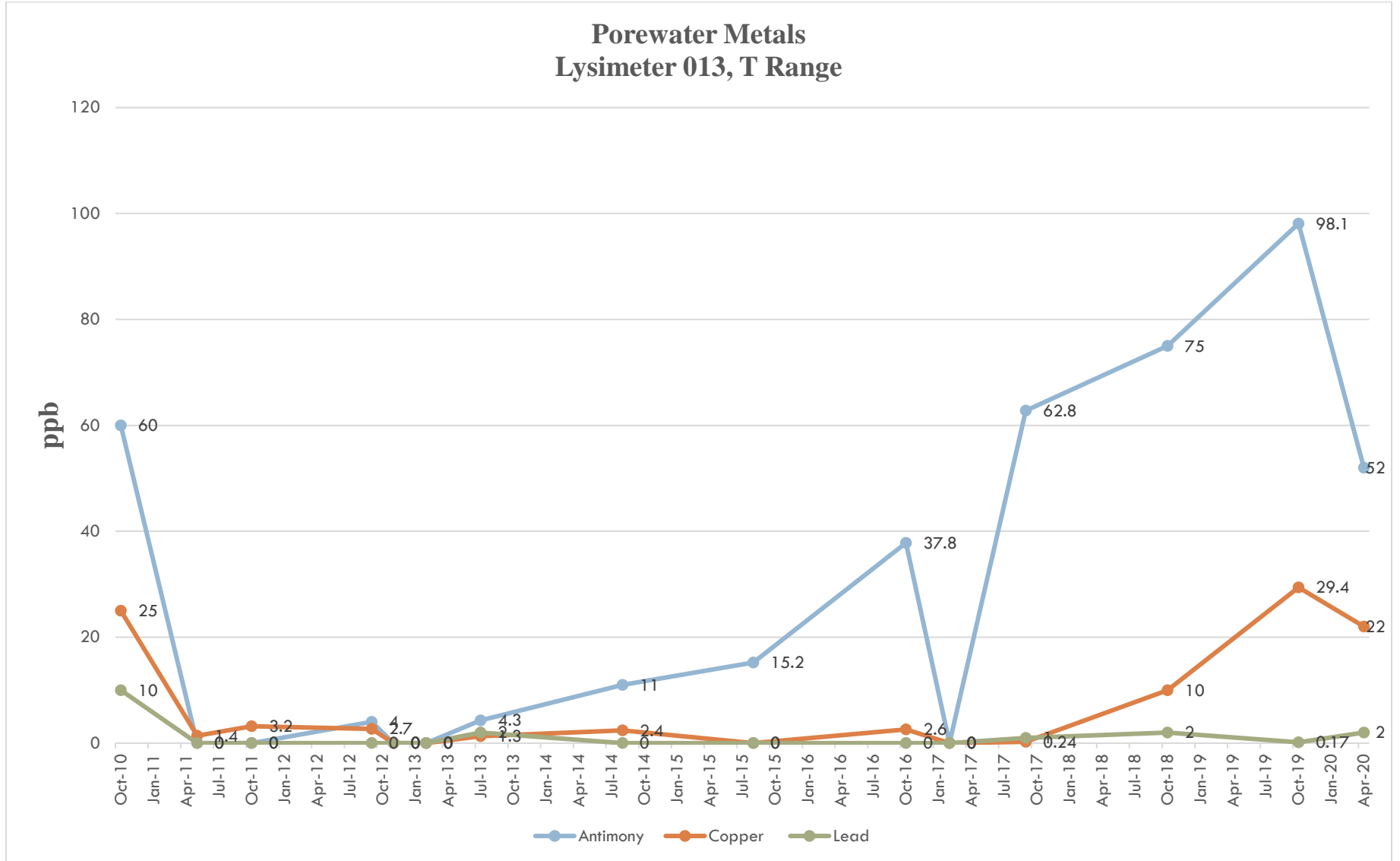


Porewater Metals, Lysimeter 004, K Range

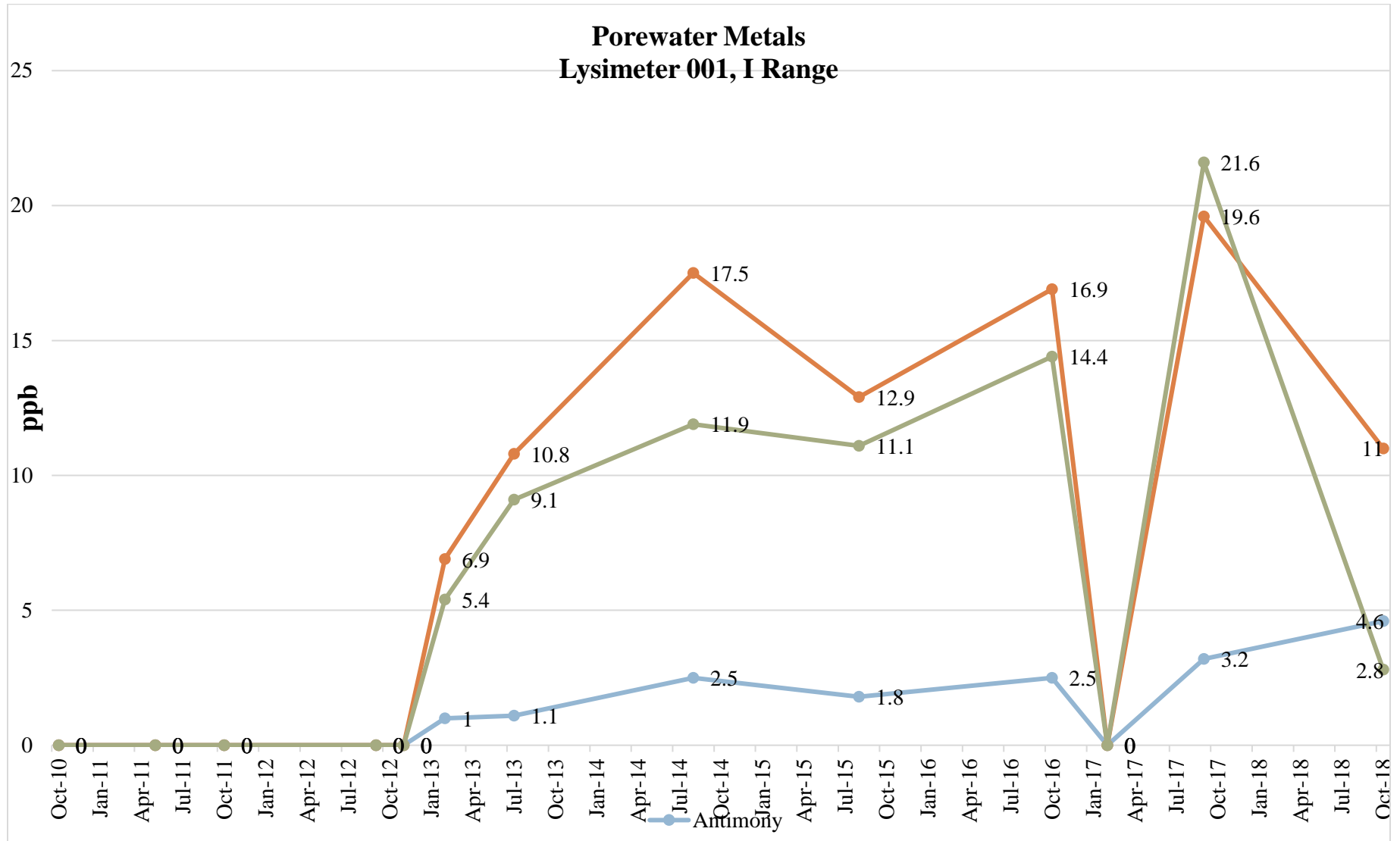


Note: October 2019, unable to obtain sample from the lysimeter.

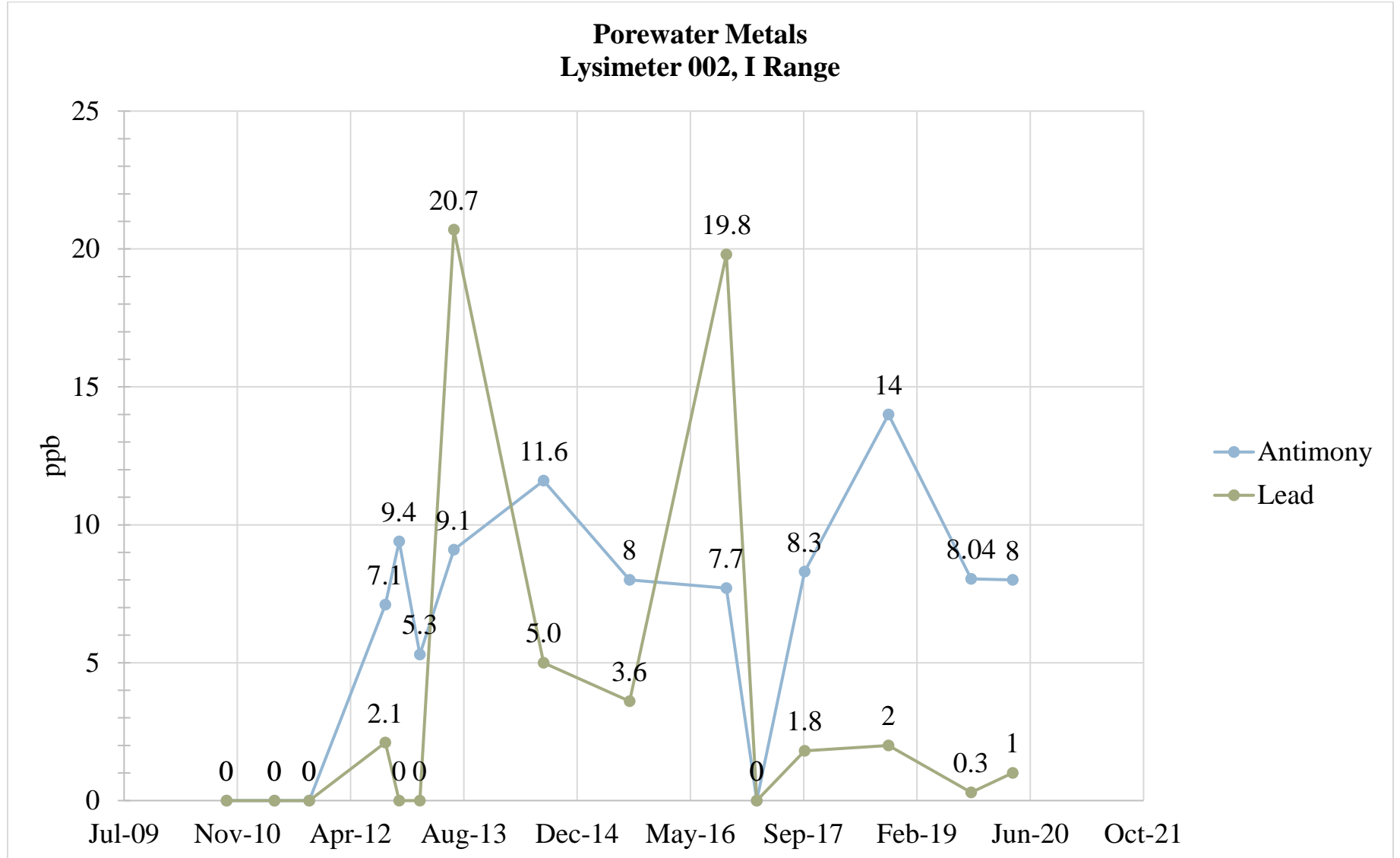
Porewater Metals, Lysimeter 013, T Range



Porewater Metals, Lysimeter 001, I Range

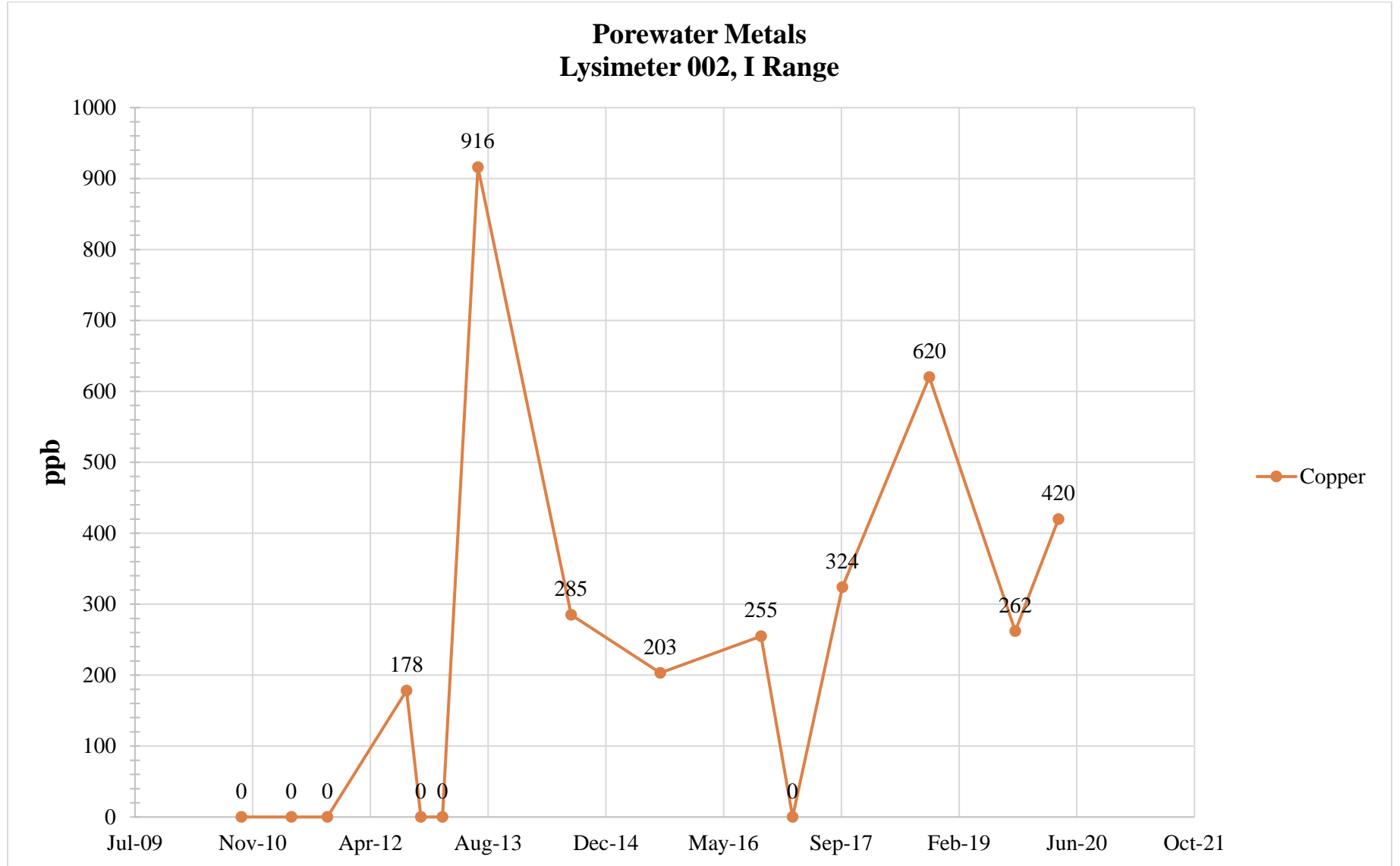


Porewater metals, Lysimeter 002, I Range





Porewater Metals, Lysimeter 002, I Range



## **Small Arms Range Sampling Reports**

### Soil Sampling Results

Fall 2019

**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
E Range	SSERNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.43	0.69	0.43	0.06	UJ	ND, MS%R	300
E Range	SSERNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	428	8.6	6.9	1.6	J	MS%R	
E Range	SSERNG001_OCT19	Soil	Chloride	SW9056A	mg/L	11	20	10	0.993	J	TR	
E Range	SSERNG001_OCT19	Soil	Copper	SW6010C	mg/kg	4.42	2.2	0.86	0.14			10,000
E Range	SSERNG001_OCT19	Soil	Lead	SW6010C	mg/kg	11.2	0.43	0.34	0.075			3,000
E Range	SSERNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	681	8.6	6.9	0.59	J	MS%R	
E Range	SSERNG001_OCT19	Soil	pH	SW9045D	pH units	5.4	0.1	--	0.1			
E Range	SSERNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	240	19	9.4	4.9			
E Range	SSERNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	397	86	43	2.5			
E Range	SSERNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	24.7	86	43	1.3	J	TR	
E Range	SSERNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	8.7	10	5.0	0.637	J	TR	
E Range	SSERNG002_OCT19	Soil	Antimony	SW6010C	mg/kg	0.41	0.65	0.41	0.057	U	ND	300
E Range	SSERNG002_OCT19	Soil	Calcium	SW6010C	mg/kg	399	8.2	6.5	1.5			
E Range	SSERNG002_OCT19	Soil	Chloride	SW9056A	mg/L	14	20	10	0.993	J	TR	
E Range	SSERNG002_OCT19	Soil	Copper	SW6010C	mg/kg	5.26	2	0.82	0.13			10,000
E Range	SSERNG002_OCT19	Soil	Lead	SW6010C	mg/kg	11.8	0.41	0.33	0.071			3,000
E Range	SSERNG002_OCT19	Soil	Magnesium	SW6010C	mg/kg	718	8.2	6.5	0.55			
E Range	SSERNG002_OCT19	Soil	pH	SW9045D	pH units	5.4	0.1	--	0.1			
E Range	SSERNG002_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	200	19	9.4	4.9			
E Range	SSERNG002_OCT19	Soil	Potassium	SW6010C	mg/kg	395	82	41	2.4			
E Range	SSERNG002_OCT19	Soil	Sodium	SW6010C	mg/kg	22.7	82	41	1.2	J	TR	
E Range	SSERNG002_OCT19	Soil	Sulfate	SW9056A	mg/L	11	10	5.0	0.637			
E Range	SSERNG003_OCT19	Soil	Antimony	SW6010C	mg/kg	0.33	0.52	0.33	0.046	U	ND	300
E Range	SSERNG003_OCT19	Soil	Calcium	SW6010C	mg/kg	506	6.6	5.2	1.2			
E Range	SSERNG003_OCT19	Soil	Chloride	SW9056A	mg/L	14	20	10	0.993	J	TR	
E Range	SSERNG003_OCT19	Soil	Copper	SW6010C	mg/kg	4.98	1.6	0.66	0.11			10,000
E Range	SSERNG003_OCT19	Soil	Lead	SW6010C	mg/kg	11.7	0.33	0.26	0.057			3,000
E Range	SSERNG003_OCT19	Soil	Magnesium	SW6010C	mg/kg	779	6.6	5.2	0.45			
E Range	SSERNG003_OCT19	Soil	pH	SW9045D	pH units	5.6	0.1	--	0.1			
E Range	SSERNG003_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	200	15	7.5	3.9			
E Range	SSERNG003_OCT19	Soil	Potassium	SW6010C	mg/kg	388	66	33	1.9			
E Range	SSERNG003_OCT19	Soil	Sodium	SW6010C	mg/kg	22.9	66	33	0.98	J	TR	
E Range	SSERNG003_OCT19	Soil	Sulfate	SW9056A	mg/L	7.8	10	5.0	0.637	J	TR	
E Range	SSERNG003_OCT19EB	Water	Alkalinity, total	SM2320B	mg/L	2.3	5.0	4.0	0.23	J	TR	
E Range	SSERNG003_OCT19EB	FIELDQC	Antimony	SW6020A	µg/L	0.16	1.0	0.50	0.055	J	TR	300
E Range	SSERNG003_OCT19EB	FIELDQC	Calcium	SW6020A	µg/L	39	100	80	21	J	TR	



## CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
E Range	SSERNG003_OCT19EB	FIELDQC	Chloride	SW9056A	mg/L	1.0	2.0	1.0	0.0993	U	ND	
E Range	SSERNG003_OCT19EB	FIELDQC	Copper	SW6020A	µg/L	1.1	3.0	2.0	0.19	J	TR	10,000
E Range	SSERNG003_OCT19EB	FIELDQC	Lead	SW6020A	µg/L	0.12	1.0	0.50	0.075	J	TR	3,000
E Range	SSERNG003_OCT19EB	FIELDQC	Magnesium	SW6020A	µg/L	15	100	80	8	J	TR	
E Range	SSERNG003_OCT19EB	FIELDQC	Phosphorus, total	E365.4	mg/L	0.080	0.10	0.080	0.0461	U	ND	
E Range	SSERNG003_OCT19EB	FIELDQC	Potassium	SW6020A	µg/L	400	1,000	400	31	U	ND	
E Range	SSERNG003_OCT19EB	FIELDQC	Sodium	SW6020A	µg/L	130	1,000	400	19	J	TR	
E Range	SSERNG003_OCT19EB	FIELDQC	Sulfate	SW9056A	mg/L	0.50	1.0	0.50	0.064	U	ND	
E Range	SSERNG003_OCT19EB	FIELDQC	Sulfate	SW9056A	mg/L	0.50	1.0	0.50	0.064	U	ND	
E Range	SSERNG004_OCT19	Soil	Antimony	SW6010C	mg/kg	0.26	0.41	0.26	0.036	U	ND	300
E Range	SSERNG004_OCT19	Soil	Calcium	SW6010C	mg/kg	518	5.2	4.1	0.93			
E Range	SSERNG004_OCT19	Soil	Chloride	SW9056A	mg/L	24	20	10	0.993			
E Range	SSERNG004_OCT19	Soil	Copper	SW6010C	mg/kg	5.27	1.3	0.52	0.082			10,000
E Range	SSERNG004_OCT19	Soil	Lead	SW6010C	mg/kg	12.2	0.26	0.21	0.045			3,000
E Range	SSERNG004_OCT19	Soil	Magnesium	SW6010C	mg/kg	771	5.2	4.1	0.35			
E Range	SSERNG004_OCT19	Soil	pH	SW9045D	pH units	5.6	0.1	--	0.1			
E Range	SSERNG004_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	280	21	11	5.5			
E Range	SSERNG004_OCT19	Soil	Potassium	SW6010C	mg/kg	423	52	26	1.5			
E Range	SSERNG004_OCT19	Soil	Sodium	SW6010C	mg/kg	25.4	52	26	0.77	J	TR	
E Range	SSERNG004_OCT19	Soil	Sulfate	SW9056A	mg/L	6.8	10	5.0	0.637	J	TR	
E Range	SSERNG005_OCT19	Soil	Antimony	SW6010C	mg/kg	0.044	0.5	0.32	0.044	J	TR	300
E Range	SSERNG005_OCT19	Soil	Calcium	SW6010C	mg/kg	657	6.3	5	1.1			
E Range	SSERNG005_OCT19	Soil	Chloride	SW9056A	mg/L	14	20	10	0.993	J	TR	
E Range	SSERNG005_OCT19	Soil	Copper	SW6010C	mg/kg	3.92	1.6	0.63	0.1			10,000
E Range	SSERNG005_OCT19	Soil	Lead	SW6010C	mg/kg	10.5	0.32	0.25	0.055			3,000
E Range	SSERNG005_OCT19	Soil	Magnesium	SW6010C	mg/kg	652	6.3	5	0.43			
E Range	SSERNG005_OCT19	Soil	pH	SW9045D	pH units	5.5	0.1	--	0.1			
E Range	SSERNG005_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	240	18	8.8	4.6			
E Range	SSERNG005_OCT19	Soil	Potassium	SW6010C	mg/kg	367	63	32	1.8			
E Range	SSERNG005_OCT19	Soil	Sodium	SW6010C	mg/kg	23.2	63	32	0.95	J	TR	
E Range	SSERNG005_OCT19	Soil	Sulfate	SW9056A	mg/L	8.0	10	5.0	0.64	J	TR	
E Range	SSERNG006_OCT19	Soil	Antimony	SW6010C	mg/kg	0.42	0.67	0.42	0.059	U	ND	300
E Range	SSERNG006_OCT19	Soil	Calcium	SW6010C	mg/kg	574	8.4	6.7	1.5			
E Range	SSERNG006_OCT19	Soil	Chloride	SW9056A	mg/L	11	20	10	0.993	J	TR	
E Range	SSERNG006_OCT19	Soil	Copper	SW6010C	mg/kg	16.5	2.1	0.84	0.13			10,000
E Range	SSERNG006_OCT19	Soil	Lead	SW6010C	mg/kg	14.1	0.42	0.34	0.073			3,000

**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
E Range	SSERNG006_OCT19	Soil	Magnesium	SW6010C	mg/kg	882	8.4	6.7	0.57			
E Range	SSERNG006_OCT19	Soil	pH	SW9045D	pH units	5.6	0.1	--	0.1			
E Range	SSERNG006_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	230	16	8.1	4.2			
E Range	SSERNG006_OCT19	Soil	Potassium	SW6010C	mg/kg	422	84	42	2.4			
E Range	SSERNG006_OCT19	Soil	Sodium	SW6010C	mg/kg	26.8	84	42	1.3	J	TR	
E Range	SSERNG006_OCT19	Soil	Sulfate	SW9056A	mg/L	12	10	5.0	0.637			
I Range	SSIRNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.45	0.57	0.36	0.05	J	TR	300
I Range	SSIRNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	936	7.1	5.7	1.3			
I Range	SSIRNG001_OCT19	Soil	Chloride	SW9056A	mg/L	14	20	10	0.993	J	TR	
I Range	SSIRNG001_OCT19	Soil	Copper	SW6010C	mg/kg	27.9	1.8	0.71	0.11			10,000
I Range	SSIRNG001_OCT19	Soil	Lead	SW6010C	mg/kg	70.3	0.36	0.28	0.062			3,000
I Range	SSIRNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,130	7.1	5.7	0.48			
I Range	SSIRNG001_OCT19	Soil	pH	SW9045D	pH units	5.8	0.1	--	0.1			
I Range	SSIRNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	560	30	15	7.8			
I Range	SSIRNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	559	71	36	2.1			
I Range	SSIRNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	33.1	71	36	1.1	J	TR	
I Range	SSIRNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	4.8	10	5.0	0.64	J	TR	
J Range	SSJRNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.45	0.71	0.44	0.062	J	TR/MS%R	300
J Range	SSJRNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	5,130	8.9	7.1	1.6			
J Range	SSJRNG001_OCT19	Soil	Chloride	SW9056A	mg/L	8.1	20	10	0.993	J	TR/MS%R	
J Range	SSJRNG001_OCT19	Soil	Copper	SW6010C	mg/kg	34.8	2.2	0.89	0.14			10,000
J Range	SSJRNG001_OCT19	Soil	Lead	SW6010C	mg/kg	32.1	0.44	0.36	0.078	J	MS%R	3,000
J Range	SSJRNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	7,250	8.9	7.1	0.61			
J Range	SSJRNG001_OCT19	Soil	pH	SW9045D	pH units	7.8	0.1	--	0.1			
J Range	SSJRNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	300	21	11	5.5			
J Range	SSJRNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	2,760	89	44	2.6	J	MS%R	
J Range	SSJRNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	80	89	44	1.3	J	TR	
J Range	SSJRNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	18	10	5.0	0.64	J	MS%R	
J Range	SSJRNG002_OCT19	Soil	Antimony	SW6010C	mg/kg	0.47	0.78	0.49	0.068	J	TR	300
J Range	SSJRNG002_OCT19	Soil	Calcium	SW6010C	mg/kg	2,540	9.7	7.8	1.8			
J Range	SSJRNG002_OCT19	Soil	Chloride	SW9056A	mg/L	17	20	10	0.993	J	TR	
J Range	SSJRNG002_OCT19	Soil	Copper	SW6010C	mg/kg	15.5	2.4	0.97	0.16			10,000
J Range	SSJRNG002_OCT19	Soil	Lead	SW6010C	mg/kg	52.4	0.49	0.39	0.085			3,000
J Range	SSJRNG002_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,160	9.7	7.8	0.66			
J Range	SSJRNG002_OCT19	Soil	pH	SW9045D	pH units	7.2	0.1	--	0.1			
J Range	SSJRNG002_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	300	18	8.8	4.6			



**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
J Range	SSJRNG002_OCT19	Soil	Potassium	SW6010C	mg/kg	677	97	49	2.8			
J Range	SSJRNG002_OCT19	Soil	Sodium	SW6010C	mg/kg	39.5	97	49	1.5	J	TR	
J Range	SSJRNG002_OCT19	Soil	Sulfate	SW9056A	mg/L	9.1	10	5.0	0.637	J	TR	
J Range	SSJRNG003_OCT19	Soil	Antimony	SW6010C	mg/kg	0.49	0.66	0.41	0.058	J	TR	300
J Range	SSJRNG003_OCT19	Soil	Calcium	SW6010C	mg/kg	2,260	8.2	6.6	1.5			
J Range	SSJRNG003_OCT19	Soil	Chloride	SW9056A	mg/l.	13	20	10	0.993	J	TR	
J Range	SSJRNG003_OCT19	Soil	Copper	SW6010C	mg/kg	19.7	2.0	0.82	0.13			10,000
J Range	SSJRNG003_OCT19	Soil	Lead	SW6010C	mg/kg	79.3	0.41	0.33	0.072			3,000
J Range	SSJRNG003_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,880	8.2	6.6	0.56			
J Range	SSJRNG003_OCT19	Soil	pH	SW9045D	pH units	7.1	0.1	--	0.1			
J Range	SSJRNG003_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	280	15	7.5	3.9			
J Range	SSJRNG003_OCT19	Soil	Potassium	SW6010C	mg/kg	611	82	41	2.4			
J Range	SSJRNG003_OCT19	Soil	Sodium	SW6010C	mg/kg	40.2	82	41	1.2	J	TR	
J Range	SSJRNG003_OCT19	Soil	Sulfate	SW9056A	mg/l.	7.8	10	5.0	0.64	J	TR	
J Range	SSJRNG004_OCT19	Soil	Antimony	SW6010C	mg/kg	0.58	0.72	0.45	0.063	J	TR	300
J Range	SSJRNG004_OCT19	Soil	Calcium	SW6010C	mg/kg	2,630	9.0	7.2	1.6			
J Range	SSJRNG004_OCT19	Soil	Chloride	SW9056A	mg/L	16	20	10	0.993	J	TR	
J Range	SSJRNG004_OCT19	Soil	Copper	SW6010C	mg/kg	23.2	2.2	0.90	0.14			10,000
J Range	SSJRNG004_OCT19	Soil	Lead	SW6010C	mg/kg	69.7	0.45	0.36	0.078			3,000
J Range	SSJRNG004_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,270	9.0	7.2	0.61			
J Range	SSJRNG004_OCT19	Soil	pH	SW9045D	pH units	7.2	0.1	--	0.1			
J Range	SSJRNG004_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	240	19	9.4	4.9			
J Range	SSJRNG004_OCT19	Soil	Potassium	SW6010C	mg/kg	724	90	45	2.6			
J Range	SSJRNG004_OCT19	Soil	Sodium	SW6010C	mg/kg	44.8	90	45	1.3	J	TR	
J Range	SSJRNG004_OCT19	Soil	Sulfate	SW9056A	mg/L	8.3	10	5.0	0.64	J	TR	
J Range	SSJRNG005_OCT19	Soil	Antimony	SW6010C	mg/kg	0.44	0.72	0.45	0.063	J	TR	300
J Range	SSJRNG005_OCT19	Soil	Calcium	SW6010C	mg/kg	2,590	9.0	7.2	1.6			
J Range	SSJRNG005_OCT19	Soil	Chloride	SW9056A	mg/L	20	20	10	0.993			
J Range	SSJRNG005_OCT19	Soil	Copper	SW6010C	mg/kg	30.6	2.2	0.9	0.14			10,000
J Range	SSJRNG005_OCT19	Soil	Lead	SW6010C	mg/kg	129	0.45	0.36	0.078			3,000
J Range	SSJRNG005_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,460	9.0	7.2	0.61			
J Range	SSJRNG005_OCT19	Soil	pH	SW9045D	pH units	7.2	0.1	--	0.1			
J Range	SSJRNG005_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	300	21	11	5.5			
J Range	SSJRNG005_OCT19	Soil	Potassium	SW6010C	mg/kg	727	90	45	2.6			
J Range	SSJRNG005_OCT19	Soil	Sodium	SW6010C	mg/kg	44.4	90	45	1.3	J	TR	
J Range	SSJRNG005_OCT19	Soil	Sulfate	SW9056A	mg/l.	9.1	10	5.0	0.64	J	TR	

**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
J Range	SSJRNG006_OCT19	Soil	Antimony	SW6010C	mg/kg	0.19	0.54	0.34	0.047	J	TR	300
J Range	SSJRNG006_OCT19	Soil	Calcium	SW6010C	mg/kg	1,190	6.8	5.4	1.2			
J Range	SSJRNG006_OCT19	Soil	Chloride	SW9056A	mg/L	11	20	10	0.993	J	TR	
J Range	SSJRNG006_OCT19	Soil	Copper	SW6010C	mg/kg	11.1	1.7	0.68	0.11			10,000
J Range	SSJRNG006_OCT19	Soil	Lead	SW6010C	mg/kg	69.2	0.34	0.27	0.059			3,000
J Range	SSJRNG006_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,110	6.8	5.4	0.46			
J Range	SSJRNG006_OCT19	Soil	pH	SW9045D	pH units	6.9	0.1	-	0.1			
J Range	SSJRNG006_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	260	14	6.9	3.6			
J Range	SSJRNG006_OCT19	Soil	Potassium	SW6010C	mg/kg	481	68	34	2			
J Range	SSJRNG006_OCT19	Soil	Sodium	SW6010C	mg/kg	25.8	68	34	1	J	TR	
J Range	SSJRNG006_OCT19	Soil	Sulfate	SW9056A	mg/L	3.7	10	5.0	0.64	J	TR	
K Range	SSKRNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.704	0.6	0.38	0.053	J	MS%R	300
K Range	SSKRNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	4,950	7.6	6.0	1.4	J	MS%R	
K Range	SSKRNG001_OCT19	Soil	Chloride	SW9056A	mg/L	8.8	20	10	0.993	J	TR	
K Range	SSKRNG001_OCT19	Soil	Copper	SW6010C	mg/kg	53.7	1.9	0.76	0.12	J	MS%R	10,000
K Range	SSKRNG001_OCT19	Soil	Lead	SW6010C	mg/kg	21.7	0.38	0.3	0.066	J	MS%R	3,000
K Range	SSKRNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	9,630	7.6	6.0	0.51			
K Range	SSKRNG001_OCT19	Soil	pH	SW9045D	pH units	7.8	0.1	-	0.1			
K Range	SSKRNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	510	48	24	12			
K Range	SSKRNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	3,480	76	38	2.2			
K Range	SSKRNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	116	76	38	1.1			
K Range	SSKRNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	10	10	5.0	0.637			
K Range	SSKRNG002_OCT19	Soil	Antimony	SW6010C	mg/kg	0.49	0.62	0.39	0.055	J	TR	300
K Range	SSKRNG002_OCT19	Soil	Calcium	SW6010C	mg/kg	3,240	7.8	6.2	1.4			
K Range	SSKRNG002_OCT19	Soil	Chloride	SW9056A	mg/L	21	20	10	0.993			
K Range	SSKRNG002_OCT19	Soil	Copper	SW6010C	mg/kg	20.6	2.00	0.78	0.12			10,000
K Range	SSKRNG002_OCT19	Soil	Lead	SW6010C	mg/kg	30.8	0.39	0.31	0.068			3,000
K Range	SSKRNG002_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,860	7.8	6.2	0.53			
K Range	SSKRNG002_OCT19	Soil	pH	SW9045D	pH units	7.3	0.1	-	0.1			
K Range	SSKRNG002_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	310	19	9.4	4.9			
K Range	SSKRNG002_OCT19	Soil	Potassium	SW6010C	mg/kg	802	78	39	2.3			
K Range	SSKRNG002_OCT19	Soil	Sodium	SW6010C	mg/kg	40.8	78	39	1.2	J	TR	
K Range	SSKRNG002_OCT19	Soil	Sulfate	SW9056A	mg/L	4.0	10	5.0	0.637	J	TR	
K Range	SSKRNG003_OCT19	Soil	Antimony	SW6010C	mg/kg	0.31	0.50	0.31	0.044	J	TR	300
K Range	SSKRNG003_OCT19	Soil	Calcium	SW6010C	mg/kg	1,940	6.2	5.0	1.1			
K Range	SSKRNG003_OCT19	Soil	Chloride	SW9056A	mg/L	15	20	10	0.993	J	TR	



**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
K Range	SSKRNG003_OCT19	Soil	Copper	SW6010C	mg/kg	11.3	1.6	0.62	0.1			10,000
K Range	SSKRNG003_OCT19	Soil	Lead	SW6010C	mg/kg	52.6	0.31	0.25	0.054			3,000
K Range	SSKRNG003_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,970	6.2	5	0.43			
K Range	SSKRNG003_OCT19	Soil	pH	SW9045D	pH units	7.1	0.1	-	0.1			
K Range	SSKRNG003_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	290	21	11	5.5			
K Range	SSKRNG003_OCT19	Soil	Potassium	SW6010C	mg/kg	629	62	31	1.8			
K Range	SSKRNG003_OCT19	Soil	Sodium	SW6010C	mg/kg	33.6	62	31	0.94	J	TR	
K Range	SSKRNG003_OCT19	Soil	Sulfate	SW9056A	mg/L	4.4	10	5.0	0.64	J	TR	
K Range	SSKRNG004_OCT19	Soil	Antimony	SW6010C	mg/kg	0.29	0.45	0.28	0.04	J	TR	300
K Range	SSKRNG004_OCT19	Soil	Calcium	SW6010C	mg/kg	2,200	5.7	4.5	1.0			
K Range	SSKRNG004_OCT19	Soil	Chloride	SW9056A	mg/L	13	20	10	0.993	J	TR	
K Range	SSKRNG004_OCT19	Soil	Copper	SW6010C	mg/kg	13.1	1.4	0.57	0.091			10,000
K Range	SSKRNG004_OCT19	Soil	Lead	SW6010C	mg/kg	28.6	0.28	0.23	0.049			3,000
K Range	SSKRNG004_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,120	5.7	4.5	0.39			
K Range	SSKRNG004_OCT19	Soil	pH	SW9045D	pH units	7.1	0.1	-	0.1			
K Range	SSKRNG004_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	230	19	9.4	4.9			
K Range	SSKRNG004_OCT19	Soil	Potassium	SW6010C	mg/kg	617	57	28	1.6			
K Range	SSKRNG004_OCT19	Soil	Sodium	SW6010C	mg/kg	32.6	57	28	0.85	J	TR	
K Range	SSKRNG004_OCT19	Soil	Sulfate	SW9056A	mg/L	4.6	10	5.0	0.64	J	TR	
K Range	SSKRNG004_OCT19	Soil	Sulfate	SW9056A	mg/L	4.6	10	5.0	0.64	J	TR	
K Range	SSKRNG005_OCT19	Soil	Antimony	SW6010C	mg/kg	0.29	0.73	0.46	0.064	J	TR	300
K Range	SSKRNG005_OCT19	Soil	Calcium	SW6010C	mg/kg	2,240	9.1	7.3	1.6			
K Range	SSKRNG005_OCT19	Soil	Chloride	SW9056A	mg/L	14	20	10	0.993	J	TR	
K Range	SSKRNG005_OCT19	Soil	Copper	SW6010C	mg/kg	14.1	2.3	0.91	0.15			10,000
K Range	SSKRNG005_OCT19	Soil	Lead	SW6010C	mg/kg	36.9	0.46	0.36	0.079			3,000
K Range	SSKRNG005_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,080	9.1	7.3	0.62			
K Range	SSKRNG005_OCT19	Soil	pH	SW9045D	pH units	7.3	0.1	-	0.1			
K Range	SSKRNG005_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	280	19	9.4	4.9			
K Range	SSKRNG005_OCT19	Soil	Potassium	SW6010C	mg/kg	681	91	46	2.6			
K Range	SSKRNG005_OCT19	Soil	Sodium	SW6010C	mg/kg	34.7	91	46	1.4	J	TR	
K Range	SSKRNG005_OCT19	Soil	Sulfate	SW9056A	mg/L	5.5	10	5.0	0.637	J	TR	
K Range	SSKRNG005_OCT19	Soil	Sulfate	SW9056A	mg/L	5.5	10	5.0	0.637	J	TR	
K Range	SSKRNG006_OCT19	Soil	Antimony	SW6010C	mg/kg	0.11	0.64	0.4	0.057	J	TR	300
K Range	SSKRNG006_OCT19	Soil	Calcium	SW6010C	mg/kg	1,180	8.1	6.4	1.5			
K Range	SSKRNG006_OCT19	Soil	Chloride	SW9056A	mg/L	18	20	10	0.993	J	TR	
K Range	SSKRNG006_OCT19	Soil	Copper	SW6010C	mg/kg	11	2	0.81	0.13			10,000

**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
K Range	SSKRNG006_OCT19	Soil	Lead	SW6010C	mg/kg	24.5	0.4	0.32	0.07			3,000
K Range	SSKRNG006_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,060	8.1	6.4	0.55			
K Range	SSKRNG006_OCT19	Soil	pH	SW9045D	pH units	6.8	0.1	--	0.1			
K Range	SSKRNG006_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	200	15	7.5	3.9			
K Range	SSKRNG006_OCT19	Soil	Potassium	SW6010C	mg/kg	455	81	40	2.3			
K Range	SSKRNG006_OCT19	Soil	Sodium	SW6010C	mg/kg	24.8	81	40	1.2	J	TR	
K Range	SSKRNG006_OCT19	Soil	Sulfate	SW9056A	mg/L	9.9	10	5.0	0.637	J	TR	
L Range	SSLRNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.094	0.57	0.35	0.05	J	TR	300
L Range	SSLRNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	1,990	7.1	5.7	1.3			
L Range	SSLRNG001_OCT19	Soil	Chloride	SW9056A	mg/L	35	20	10	0.993			
L Range	SSLRNG001_OCT19	Soil	Copper	SW6010C	mg/kg	13.3	1.8	0.71	0.11			10,000
L Range	SSLRNG001_OCT19	Soil	Lead	SW6010C	mg/kg	13.2	0.35	0.28	0.062			3,000
L Range	SSLRNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,440	7.1	5.7	0.48			
L Range	SSLRNG001_OCT19	Soil	pH	SW9045D	pH units	5.5	0.1	--	0.1			
L Range	SSLRNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	530	48	24	12			
L Range	SSLRNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	741	71	35	2.1			
L Range	SSLRNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	42.6	71	35	1.1	J	TR	
L Range	SSLRNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	4.2	10	5.0	0.64	J	TR	
L Range	SSLRNG002_OCT19	Soil	Antimony	SW6010C	mg/kg	0.42	0.68	0.42	0.059	U	ND	300
L Range	SSLRNG002_OCT19	Soil	Calcium	SW6010C	mg/kg	6,020	8.4	6.8	1.5			
L Range	SSLRNG002_OCT19	Soil	Chloride	SW9056A	mg/L	46	20	10	0.993			
L Range	SSLRNG002_OCT19	Soil	Copper	SW6010C	mg/kg	15.3	2.1	0.84	0.14			10,000
L Range	SSLRNG002_OCT19	Soil	Lead	SW6010C	mg/kg	12	0.42	0.34	0.074			3,000
L Range	SSLRNG002_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,530	8.4	6.8	0.57			
L Range	SSLRNG002_OCT19	Soil	pH	SW9045D	pH units	7.8	0.1	--	0.1			
L Range	SSLRNG002_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	370	35	18	9.1			
L Range	SSLRNG002_OCT19	Soil	Potassium	SW6010C	mg/kg	724	84	42	2.5			
L Range	SSLRNG002_OCT19	Soil	Sodium	SW6010C	mg/kg	47.4	84	42	1.3	J	TR	
L Range	SSLRNG002_OCT19	Soil	Sulfate	SW9056A	mg/L	13	10	5.0	0.637			
S Range	SSSRNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.648	0.43	0.27	0.038			300
S Range	SSSRNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	976	5.4	4.3	0.97			
S Range	SSSRNG001_OCT19	Soil	Chloride	SW9056A	mg/L	23	20	10	0.993			
S Range	SSSRNG001_OCT19	Soil	Copper	SW6010C	mg/kg	50.6	1.3	0.54	0.086			10,000
S Range	SSSRNG001_OCT19	Soil	Lead	SW6010C	mg/kg	17.8	0.27	0.21	0.047			3,000
S Range	SSSRNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,020	5.4	4.3	0.36			
S Range	SSSRNG001_OCT19	Soil	pH	SW9045D	pH units	6.1	0.1	--	0.1			



**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
S Range	SSSRNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	290	15	7.5	3.9			
S Range	SSSRNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	497	54	27	1.6			
S Range	SSSRNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	27.6	54	27	0.8	J	TR	
S Range	SSSRNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	8.2	10	5.0	0.637	J	TR	
T Range	SSTRNG001_OCT19	Soil	Antimony	SW6010C	mg/kg	0.089	0.78	0.49	0.068	J	TR/MS%R	300
T Range	SSTRNG001_OCT19	Soil	Calcium	SW6010C	mg/kg	3,130	9.8	7.8	1.8			
T Range	SSTRNG001_OCT19	Soil	Chloride	SW9056A	mg/L	34	20	10	0.993	J	MS%R	
T Range	SSTRNG001_OCT19	Soil	Copper	SW6010C	mg/kg	17.5	2.4	0.98	0.16			10,000
T Range	SSTRNG001_OCT19	Soil	Lead	SW6010C	mg/kg	17.3	0.49	0.39	0.085	J	MS%R	3,000
T Range	SSTRNG001_OCT19	Soil	Magnesium	SW6010C	mg/kg	3,550	9.8	7.8	0.66			
T Range	SSTRNG001_OCT19	Soil	pH	SW9045D	pH units	7.4	0.1	--	0.1			
T Range	SSTRNG001_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	340	32	16	8.4			
T Range	SSTRNG001_OCT19	Soil	Potassium	SW6010C	mg/kg	1,600	98	49	2.8			
T Range	SSTRNG001_OCT19	Soil	Sodium	SW6010C	mg/kg	67	98	49	1.5	J	TR	
T Range	SSTRNG001_OCT19	Soil	Sulfate	SW9056A	mg/L	24	10	5.0	0.637			
T Range	SSTRNG002_OCT19	Soil	Antimony	SW6010C	mg/kg	0.15	0.74	0.46	0.065	J	TR	300
T Range	SSTRNG002_OCT19	Soil	Calcium	SW6010C	mg/kg	2,030	9.3	7.4	1.7			
T Range	SSTRNG002_OCT19	Soil	Chloride	SW9056A	mg/L	66	20	10	0.993			
T Range	SSTRNG002_OCT19	Soil	Copper	SW6010C	mg/kg	14.4	2.3	0.93	0.15			10,000
T Range	SSTRNG002_OCT19	Soil	Lead	SW6010C	mg/kg	39.6	0.46	0.37	0.081			3,000
T Range	SSTRNG002_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,540	9.3	7.4	0.63			
T Range	SSTRNG002_OCT19	Soil	pH	SW9045D	pH units	6.8	0.1	--	0.1			
T Range	SSTRNG002_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	460	29	14	7.5			
T Range	SSTRNG002_OCT19	Soil	Potassium	SW6010C	mg/kg	713	93	46	2.7			
T Range	SSTRNG002_OCT19	Soil	Sodium	SW6010C	mg/kg	41.6	93	46	1.4	J	TR	
T Range	SSTRNG002_OCT19	Soil	Sulfate	SW9056A	mg/L	8.9	10	5.0	0.64	J	TR	
T Range	SSTRNG003_OCT19	Soil	Antimony	SW6010C	mg/kg	0.618	0.7	0.43	0.061	J	TR	300
T Range	SSTRNG003_OCT19	Soil	Calcium	SW6010C	mg/kg	3,640	8.7	7	1.6			
T Range	SSTRNG003_OCT19	Soil	Chloride	SW9056A	mg/L	33	20	10	0.993			
T Range	SSTRNG003_OCT19	Soil	Copper	SW6010C	mg/kg	75.8	2.2	0.87	0.14			10,000
T Range	SSTRNG003_OCT19	Soil	Lead	SW6010C	mg/kg	176	0.43	0.35	0.076			3,000
T Range	SSTRNG003_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,010	8.7	7	0.59			
T Range	SSTRNG003_OCT19	Soil	pH	SW9045D	pH units	7	0.1	--	0.1			
T Range	SSTRNG003_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	1,400	85	42	22			
T Range	SSTRNG003_OCT19	Soil	Potassium	SW6010C	mg/kg	767	87	43	2.5			
T Range	SSTRNG003_OCT19	Soil	Sodium	SW6010C	mg/kg	50.5	87	43	1.3	J	TR	



## CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
T Range	SSTRNG003_OCT19	Soil	Sulfate	SW9056A	mg/L	4.7	10	5.0	0.64	J	TR	
T Range	SSTRNG004_OCT19	Soil	Antimony	SW6010C	mg/kg	0.32	0.81	0.51	0.071	J	TR	300
T Range	SSTRNG004_OCT19	Soil	Calcium	SW6010C	mg/kg	2,430	10	8.1	1.8			
T Range	SSTRNG004_OCT19	Soil	Chloride	SW9056A	mg/L	30	20	10	0.993			
T Range	SSTRNG004_OCT19	Soil	Copper	SW6010C	mg/kg	174	2.5	1	0.16			10,000
T Range	SSTRNG004_OCT19	Soil	Lead	SW6010C	mg/kg	113	0.51	0.41	0.089			3,000
T Range	SSTRNG004_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,760	10	8.1	0.69			
T Range	SSTRNG004_OCT19	Soil	pH	SW9045D	pH units	7	0.1	--	0.1			
T Range	SSTRNG004_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	700	40	20	10			
T Range	SSTRNG004_OCT19	Soil	Potassium	SW6010C	mg/kg	702	100	51	3			
T Range	SSTRNG004_OCT19	Soil	Sodium	SW6010C	mg/kg	50.9	100	51	1.5	J	TR	
T Range	SSTRNG004_OCT19	Soil	Sulfate	SW9056A	mg/L	6.4	10	5.0	0.64	J	TR	
T Range	SSTRNG005_OCT19	Soil	Antimony	SW6010C	mg/kg	0.24	0.41	0.26	0.036	J	TR	300
T Range	SSTRNG005_OCT19	Soil	Calcium	SW6010C	mg/kg	2,940	5.1	4.1	0.92			
T Range	SSTRNG005_OCT19	Soil	Chloride	SW9056A	mg/L	26	20	10	0.993			
T Range	SSTRNG005_OCT19	Soil	Copper	SW6010C	mg/kg	29.1	1.3	0.51	0.082			10,000
T Range	SSTRNG005_OCT19	Soil	Lead	SW6010C	mg/kg	119	0.26	0.2	0.045			3,000
T Range	SSTRNG005_OCT19	Soil	Magnesium	SW6010C	mg/kg	1,560	5.1	4.1	0.35			
T Range	SSTRNG005_OCT19	Soil	pH	SW9045D	pH units	7.1	0.1	--	0.1			
T Range	SSTRNG005_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	720	40	20	10			
T Range	SSTRNG005_OCT19	Soil	Potassium	SW6010C	mg/kg	634	51	26	1.5			
T Range	SSTRNG005_OCT19	Soil	Sodium	SW6010C	mg/kg	43.2	51	26	0.77	J		
T Range	SSTRNG005_OCT19	Soil	Sulfate	SW9056A	mg/L	2.6	10	5.0	0.637	J	TR	
T Range	SSTRNG006_OCT19	Soil	Antimony	SW6010C	mg/kg	0.22	0.73	0.46	0.064	J		300
T Range	SSTRNG006_OCT19	Soil	Calcium	SW6010C	mg/kg	5,020	9.2	7.3	1.7			
T Range	SSTRNG006_OCT19	Soil	Chloride	SW9056A	mg/L	16	20	10	0.993	J		
T Range	SSTRNG006_OCT19	Soil	Copper	SW6010C	mg/kg	33.3	2.3	0.92	0.15			10,000
T Range	SSTRNG006_OCT19	Soil	Lead	SW6010C	mg/kg	178	0.46	0.37	0.08			3,000
T Range	SSTRNG006_OCT19	Soil	Magnesium	SW6010C	mg/kg	2,620	9.2	7.3	0.62			
T Range	SSTRNG006_OCT19	Soil	pH	SW9045D	pH units	7.3	0.1	--	0.1			
T Range	SSTRNG006_OCT19	Soil	Phosphorus, total	E365.4	mg/kg	920	76	38	20			
T Range	SSTRNG006_OCT19	Soil	Potassium	SW6010C	mg/kg	1,040	92	46	2.7			
T Range	SSTRNG006_OCT19	Soil	Sodium	SW6010C	mg/kg	88.9	92	46	1.4	J	TR	
T Range	SSTRNG006_OCT19	Soil	Sulfate	SW9056A	mg/L	9.4	10	5.0	0.637	J	TR	

Notes:

µg/L = microgram(s) per liter

ND = nondetectable

**CAMP EDWARDS SMALL ARMS RANGE BASELINE SOIL MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (mg/kg)
DL = detection limit			LOQ = limit of quantitation									
ID = identifier			TR = trace result (<LOQ and >DL)									
J = estimated value			U = not detected									

## **Small Arms Range Sampling Reports**

Soil Sampling Results

Spring 2020

Soil Sample Results Spring 2020

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSERNG001_APR20A	Soil	N	Antimony	SW6010C	0.61	0.43	1.3	1.7	mg/kg	300	2	J	TR
SSERNG001_APR20A	Soil	N	Calcium	SW6010C	310	130	390	430	mg/kg		2	J	TR
SSERNG001_APR20A	Soil	N	Chloride	SW9056A	9.0	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG001_APR20A	Soil	N	Copper	SW6010C	3.3	1.3	3.9	4.3	mg/kg	10,000	2	J	TR
SSERNG001_APR20A	Soil	N	Iron	SW6010C	8,200	4.3	13	17	mg/kg		2		
SSERNG001_APR20A	Soil	N	Lead	SW6010C	10	0.43	1.3	1.7	mg/kg	3,000	2		
SSERNG001_APR20A	Soil	N	Magnesium	SW6010C	1,200	43	130	170	mg/kg		2		
SSERNG001_APR20A	Soil	N	pH	SW9045D	5.6	0.10	0.10	0.10	pH units		1		
SSERNG001_APR20A	Soil	N	Phosphorus, total	E365.4	220	11	19	19	mg/kg		1		
SSERNG001_APR20A	Soil	N	Potassium	SW6010C	780	260	780	870	mg/kg		2	U	ND
SSERNG001_APR20A	Soil	N	Sodium	SW6010C	130	43	130	170	mg/kg		2	U	ND
SSERNG001_APR20A	Soil	N	Sulfate	SW9056A	4.2	1.5	4.5	5	mg/kg		1	J	TR,H
SSERNG001_APR20A_EB	FIELDQC	EB	Antimony	SW6020A	4.0	2	4	5	µg/L	300	2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Calcium	SW6020A	180	96	180	200	µg/L		2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Chloride	SW9056A	0.15	0.060	0.15	0.20	mg/L		1	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Copper	SW6020A	2.5	1.9	2.5	3.0	µg/L	10,000	2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Iron	SW6020A	40	20	40	50	µg/L		2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Lead	SW6020A	2.0	1.0	2.0	3.0	µg/L	3,000	2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Magnesium	SW6020A	40	20	40	50	µg/L		2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Phosphorus, total	E365.4	1.6	0.82	1.1	2	mg/L		1	J	TR
SSERNG001_APR20A_EB	FIELDQC	EB	Potassium	SW6020A	90	45	90	100	µg/L		2	U	ND
SSERNG001_APR20A_EB	FIELDQC	EB	Sodium	SW6020A	57	50	90	100	µg/L		2	J	TR
SSERNG001_APR20A_EB	FIELDQC	EB	Sulfate	SW9056A	0.15	0.050	0.15	0.50	mg/L		1	U	ND
SSERNG001_APR20B	Soil	FR	Antimony	SW6010C	1.0	0.45	1.3	1.8	mg/kg	300	2	J	TR
SSERNG001_APR20B	Soil	FR	Calcium	SW6010C	350	130	400	450	mg/kg		2	J	TR
SSERNG001_APR20B	Soil	FR	Chloride	SW9056A	10	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG001_APR20B	Soil	FR	Copper	SW6010C	3.1	1.3	4.0	4.5	mg/kg	10,000	2	J	TR
SSERNG001_APR20B	Soil	FR	Iron	SW6010C	7,000	4.5	13	18	mg/kg		2		
SSERNG001_APR20B	Soil	FR	Lead	SW6010C	11	0.45	1.3	1.8	mg/kg	3,000	2		
SSERNG001_APR20B	Soil	FR	Magnesium	SW6010C	570	45	130	180	mg/kg		2		
SSERNG001_APR20B	Soil	FR	pH	SW9045D	5.5	0.10	0.10	0.10	pH units		1		
SSERNG001_APR20B	Soil	FR	Phosphorus, total	E365.4	260	11	20	20	mg/kg		1		
SSERNG001_APR20B	Soil	FR	Potassium	SW6010C	320	270	800	890	mg/kg		2	J	TR
SSERNG001_APR20B	Soil	FR	Sodium	SW6010C	130	45	130	180	mg/kg		2	U	ND
SSERNG001_APR20B	Soil	FR	Sulfate	SW9056A	6.1	1.5	4.5	5	mg/kg		1	J	H
SSERNG001_APR20C	Soil	FR	Antimony	SW6010C	0.62	0.44	1.3	1.8	mg/kg	300	2	J	TR
SSERNG001_APR20C	Soil	FR	Calcium	SW6010C	350	130	400	440	mg/kg		2	J	TR
SSERNG001_APR20C	Soil	FR	Chloride	SW9056A	12	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG001_APR20C	Soil	FR	Copper	SW6010C	3.7	1.3	4.0	4.4	mg/kg	10,000	2	J	TR
SSERNG001_APR20C	Soil	FR	Iron	SW6010C	7,500	4.4	13	18	mg/kg		2		
SSERNG001_APR20C	Soil	FR	Lead	SW6010C	11	0.44	1.3	1.8	mg/kg	3,000	2		
SSERNG001_APR20C	Soil	FR	Magnesium	SW6010C	620	44	130	180	mg/kg		2		
SSERNG001_APR20C	Soil	FR	pH	SW9045D	5.6	0.10	0.10	0.10	pH units		1		
SSERNG001_APR20C	Soil	FR	Phosphorus, total	E365.4	280	11	19	19	mg/kg		1		
SSERNG001_APR20C	Soil	FR	Potassium	SW6010C	300	270	800	890	mg/kg		2	J	TR,MS%R



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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSERNG001_APR20C	Soil	FR	Sodium	SW6010C	130	44	130	180	mg/kg		2	U	ND
SSERNG001_APR20C	Soil	FR	Sulfate	SW9056A	5.3	1.5	4.5	5	mg/kg		1	J	H
SSERNG002_APR20	Soil	N	Antimony	SW6010C	0.64	0.44	1.3	1.8	mg/kg	300	2	J	TR
SSERNG002_APR20	Soil	N	Calcium	SW6010C	330	130	400	440	mg/kg		2	J	TR
SSERNG002_APR20	Soil	N	Chloride	SW9056A	12	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG002_APR20	Soil	N	Copper	SW6010C	3.1	1.3	4.0	4.4	mg/kg	10,000	2	J	TR
SSERNG002_APR20	Soil	N	Iron	SW6010C	6,000	4.4	13	18	mg/kg		2		
SSERNG002_APR20	Soil	N	Lead	SW6010C	11	0.44	1.3	1.8	mg/kg	3,000	2		
SSERNG002_APR20	Soil	N	Magnesium	SW6010C	530	44	130	180	mg/kg		2		
SSERNG002_APR20	Soil	N	pH	SW9045D	5.6	0.10	0.10	0.10	pH units		1		
SSERNG002_APR20	Soil	N	Phosphorus, total	E365.4	350	11	20	20	mg/kg		1		
SSERNG002_APR20	Soil	N	Potassium	SW6010C	280	270	800	890	mg/kg		2	J	TR
SSERNG002_APR20	Soil	N	Sodium	SW6010C	130	44	130	180	mg/kg		2	U	ND
SSERNG002_APR20	Soil	N	Sulfate	SW9056A	5.8	1.5	4.5	5	mg/kg		1	J	H
SSERNG003_APR20	Soil	N	Antimony	SW6010C	0.89	0.46	1.4	1.9	mg/kg	300	2	J	TR
SSERNG003_APR20	Soil	N	Calcium	SW6010C	390	140	420	460	mg/kg		2	J	TR
SSERNG003_APR20	Soil	N	Chloride	SW9056A	11	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG003_APR20	Soil	N	Copper	SW6010C	3.9	1.4	4.2	4.6	mg/kg	10,000	2	J	TR
SSERNG003_APR20	Soil	N	Iron	SW6010C	7,100	4.6	14	19	mg/kg		2		
SSERNG003_APR20	Soil	N	Lead	SW6010C	11	0.46	1.4	1.9	mg/kg	3,000	2		
SSERNG003_APR20	Soil	N	Magnesium	SW6010C	620	46	140	190	mg/kg		2		
SSERNG003_APR20	Soil	N	pH	SW9045D	5.6	0.10	0.10	0.10	pH units		1		
SSERNG003_APR20	Soil	N	Phosphorus, total	E365.4	360	11	20	20	mg/kg		1		
SSERNG003_APR20	Soil	N	Potassium	SW6010C	300	280	840	930	mg/kg		2	J	TR
SSERNG003_APR20	Soil	N	Sodium	SW6010C	140	46	140	190	mg/kg		2	U	ND
SSERNG003_APR20	Soil	N	Sulfate	SW9056A	4.9	1.5	4.5	5	mg/kg		1	J	TR,H
SSERNG004_APR20	Soil	N	Antimony	SW6010C	0.80	0.48	1.4	1.9	mg/kg	300	2	J	TR
SSERNG004_APR20	Soil	N	Calcium	SW6010C	350	140	430	480	mg/kg		2	J	TR
SSERNG004_APR20	Soil	N	Chloride	SW9056A	11	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG004_APR20	Soil	N	Copper	SW6010C	8.0	1.4	4.3	4.8	mg/kg	10,000	2		
SSERNG004_APR20	Soil	N	Iron	SW6010C	6,300	4.8	14	19	mg/kg		2		
SSERNG004_APR20	Soil	N	Lead	SW6010C	11	0.48	1.4	1.9	mg/kg	3,000	2		
SSERNG004_APR20	Soil	N	Magnesium	SW6010C	580	48	140	190	mg/kg		2		
SSERNG004_APR20	Soil	N	pH	SW9045D	5.7	0.10	0.10	0.10	pH units		1		
SSERNG004_APR20	Soil	N	Phosphorus, total	E365.4	220	11	19	19	mg/kg		1		
SSERNG004_APR20	Soil	N	Potassium	SW6010C	860	290	860	960	mg/kg		2	U	ND
SSERNG004_APR20	Soil	N	Sodium	SW6010C	140	48	140	190	mg/kg		2	U	ND
SSERNG004_APR20	Soil	N	Sulfate	SW9056A	5.1	1.5	4.5	5	mg/kg		1	J	H
SSERNG005_APR20	Soil	N	Antimony	SW6010C	0.49	0.45	1.4	1.8	mg/kg	300	2	J	TR
SSERNG005_APR20	Soil	N	Calcium	SW6010C	340	140	410	450	mg/kg		2	J	TR
SSERNG005_APR20	Soil	N	Chloride	SW9056A	11	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG005_APR20	Soil	N	Copper	SW6010C	3.7	1.4	4.1	4.5	mg/kg	10,000	2	J	TR
SSERNG005_APR20	Soil	N	Iron	SW6010C	7,300	4.5	14	18	mg/kg		2		
SSERNG005_APR20	Soil	N	Lead	SW6010C	11	0.45	1.4	1.8	mg/kg	3,000	2		
SSERNG005_APR20	Soil	N	Magnesium	SW6010C	650	45	140	180	mg/kg		2		



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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSERNG005_APR20	Soil	N	pH	SW9045D	5.7	0.10	0.10	0.10	pH units		1		
SSERNG005_APR20	Soil	N	Phosphorus, total	E365.4	340	11	20	20	mg/kg		1		
SSERNG005_APR20	Soil	N	Potassium	SW6010C	810	270	810	900	mg/kg		2	U	ND
SSERNG005_APR20	Soil	N	Sodium	SW6010C	140	45	140	180	mg/kg		2	U	ND
SSERNG005_APR20	Soil	N	Sulfate	SW9056A	4.2	1.5	4.5	5	mg/kg		1	J	TR,H
SSERNG006_APR20	Soil	N	Antimony	SW6010C	0.87	0.45	1.4	1.8	mg/kg	300	2	J	TR
SSERNG006_APR20	Soil	N	Calcium	SW6010C	390	140	410	450	mg/kg		2	J	TR
SSERNG006_APR20	Soil	N	Chloride	SW9056A	13	0.20	0.20	2.0	mg/kg		1	J	H
SSERNG006_APR20	Soil	N	Copper	SW6010C	3.6	1.4	4.1	4.5	mg/kg	10,000	2	J	TR
SSERNG006_APR20	Soil	N	Iron	SW6010C	7,600	4.5	14	18	mg/kg		2		
SSERNG006_APR20	Soil	N	Lead	SW6010C	13	0.45	1.4	1.8	mg/kg	3,000	2		
SSERNG006_APR20	Soil	N	Magnesium	SW6010C	630	45	140	180	mg/kg		2		
SSERNG006_APR20	Soil	N	pH	SW9045D	5.7	0.10	0.10	0.10	pH units		1		
SSERNG006_APR20	Soil	N	Phosphorus, total	E365.4	350	11	19	19	mg/kg		1		
SSERNG006_APR20	Soil	N	Potassium	SW6010C	820	270	820	910	mg/kg		2	U	ND
SSERNG006_APR20	Soil	N	Sodium	SW6010C	140	45	140	180	mg/kg		2	U	ND
SSERNG006_APR20	Soil	N	Sulfate	SW9056A	6.5	1.5	4.5	5	mg/kg		1	J	H
SSIRNG001_APR20	Soil	N	Antimony	SW6010C	1.5	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSIRNG001_APR20	Soil	N	Calcium	SW6010C	570	140	410	460	mg/kg		2		
SSIRNG001_APR20	Soil	N	Chloride	SW9056A	7.9	0.20	0.20	2.0	mg/kg		1	J	H
SSIRNG001_APR20	Soil	N	Copper	SW6010C	26	1.4	4.1	4.6	mg/kg	10,000	2		
SSIRNG001_APR20	Soil	N	Iron	SW6010C	8,000	4.6	14	18	mg/kg		2		
SSIRNG001_APR20	Soil	N	Lead	SW6010C	62	0.46	1.4	1.8	mg/kg	3,000	2		
SSIRNG001_APR20	Soil	N	Magnesium	SW6010C	920	46	140	180	mg/kg		2		
SSIRNG001_APR20	Soil	N	pH	SW9045D	5.4	0.10	0.10	0.10	pH units		1		
SSIRNG001_APR20	Soil	N	Phosphorus, total	E365.4	580	11	19	19	mg/kg		1		
SSIRNG001_APR20	Soil	N	Potassium	SW6010C	330	280	830	920	mg/kg		2	J	TR
SSIRNG001_APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSIRNG001_APR20	Soil	N	Sulfate	SW9056A	3.1	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG001_APR20A	Soil	N	Antimony	SW6010C	1.0	0.48	1.4	1.9	mg/kg	300	2	J	TR
SSJRNG001_APR20A	Soil	N	Calcium	SW6010C	4,800	140	430	480	mg/kg		2		
SSJRNG001_APR20A	Soil	N	Chloride	SW9056A	6.7	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG001_APR20A	Soil	N	Copper	SW6010C	31	1.4	4.3	4.8	mg/kg	10,000	2		
SSJRNG001_APR20A	Soil	N	Iron	SW6010C	15,000	4.8	14	19	mg/kg		2		
SSJRNG001_APR20A	Soil	N	Lead	SW6010C	18	0.48	1.4	1.9	mg/kg	3,000	2		
SSJRNG001_APR20A	Soil	N	Magnesium	SW6010C	8,500	48	140	190	mg/kg		2		
SSJRNG001_APR20A	Soil	N	pH	SW9045D	7.3	0.10	0.10	0.10	pH units		1		
SSJRNG001_APR20A	Soil	N	Phosphorus, total	E365.4	370	11	19	19	mg/kg		1		
SSJRNG001_APR20A	Soil	N	Potassium	SW6010C	3,600	290	860	960	mg/kg		2		
SSJRNG001_APR20A	Soil	N	Sodium	SW6010C	110	48	140	190	mg/kg		2	J	TR
SSJRNG001_APR20A	Soil	N	Sulfate	SW9056A	3.4	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG001_APR20B	Soil	FR	Antimony	SW6010C	1.4	0.46	1.4	1.9	mg/kg	300	2	J	TR
SSJRNG001_APR20B	Soil	FR	Calcium	SW6010C	4,700	140	420	460	mg/kg		2		
SSJRNG001_APR20B	Soil	FR	Chloride	SW9056A	6.4	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG001_APR20B	Soil	FR	Copper	SW6010C	31	1.4	4.2	4.6	mg/kg	10,000	2		

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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSJRNG001_APR20B	Soil	FR	Iron	SW6010C	15,000	4.6	14	19	mg/kg		2		
SSJRNG001_APR20B	Soil	FR	Lead	SW6010C	20	0.46	1.4	1.9	mg/kg	3,000	2		
SSJRNG001_APR20B	Soil	FR	Magnesium	SW6010C	8,000	46	140	190	mg/kg		2		
SSJRNG001_APR20B	Soil	FR	pH	SW9045D	7.3	0.10	0.10	0.10	pH units		1		
SSJRNG001_APR20B	Soil	FR	Phosphorus, total	E365.4	370	11	19	19	mg/kg		1		
SSJRNG001_APR20B	Soil	FR	Potassium	SW6010C	3,100	280	840	930	mg/kg		2		
SSJRNG001_APR20B	Soil	FR	Sodium	SW6010C	97	46	140	190	mg/kg		2	J	TR
SSJRNG001_APR20B	Soil	FR	Sulfate	SW9056A	3.2	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG001_APR20C	Soil	FR	Antimony	SW6010C	1.2	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSJRNG001_APR20C	Soil	FR	Calcium	SW6010C	4,400	140	410	460	mg/kg		2		
SSJRNG001_APR20C	Soil	FR	Chloride	SW9056A	7.7	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG001_APR20C	Soil	FR	Copper	SW6010C	28	1.4	4.1	4.6	mg/kg	10,000	2		
SSJRNG001_APR20C	Soil	FR	Iron	SW6010C	13,000	4.6	14	18	mg/kg		2		
SSJRNG001_APR20C	Soil	FR	Lead	SW6010C	22	0.46	1.4	1.8	mg/kg	3,000	2		
SSJRNG001_APR20C	Soil	FR	Magnesium	SW6010C	7,500	46	140	180	mg/kg		2		
SSJRNG001_APR20C	Soil	FR	pH	SW9045D	7.3	0.10	0.10	0.10	pH units		1		
SSJRNG001_APR20C	Soil	FR	Phosphorus, total	E365.4	390	11	20	20	mg/kg		1		
SSJRNG001_APR20C	Soil	FR	Potassium	SW6010C	2,800	270	820	920	mg/kg		2		
SSJRNG001_APR20C	Soil	FR	Sodium	SW6010C	80	46	140	180	mg/kg		2	J	TR
SSJRNG001_APR20C	Soil	FR	Sulfate	SW9056A	3.9	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG002_APR20	Soil	N	Antimony	SW6010C	1.4	0.47	1.4	1.9	mg/kg	300	2	J	TR
SSJRNG002_APR20	Soil	N	Calcium	SW6010C	1,800	140	420	470	mg/kg		2		
SSJRNG002_APR20	Soil	N	Chloride	SW9056A	10	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG002_APR20	Soil	N	Copper	SW6010C	12	1.4	4.2	4.7	mg/kg	10,000	2		
SSJRNG002_APR20	Soil	N	Iron	SW6010C	7,700	4.7	14	19	mg/kg		2		
SSJRNG002_APR20	Soil	N	Lead	SW6010C	42	0.47	1.4	1.9	mg/kg	3,000	2		
SSJRNG002_APR20	Soil	N	Magnesium	SW6010C	1,500	47	140	190	mg/kg		2		
SSJRNG002_APR20	Soil	N	pH	SW9045D	6.9	0.10	0.10	0.10	pH units		1		
SSJRNG002_APR20	Soil	N	Phosphorus, total	E365.4	240	11	20	20	mg/kg		1		
SSJRNG002_APR20	Soil	N	Potassium	SW6010C	380	280	850	940	mg/kg		2	J	TR
SSJRNG002_APR20	Soil	N	Sodium	SW6010C	140	47	140	190	mg/kg		2	U	ND
SSJRNG002_APR20	Soil	N	Sulfate	SW9056A	2.9	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG003_APR20	Soil	N	Antimony	SW6010C	1.1	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSJRNG003_APR20	Soil	N	Calcium	SW6010C	1,500	140	410	460	mg/kg		2		
SSJRNG003_APR20	Soil	N	Chloride	SW9056A	12	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG003_APR20	Soil	N	Copper	SW6010C	11	1.4	4.1	4.6	mg/kg	10,000	2		
SSJRNG003_APR20	Soil	N	Iron	SW6010C	7,200	4.6	14	18	mg/kg		2		
SSJRNG003_APR20	Soil	N	Lead	SW6010C	63	0.46	1.4	1.8	mg/kg	3,000	2		
SSJRNG003_APR20	Soil	N	Magnesium	SW6010C	1,600	46	140	180	mg/kg		2		
SSJRNG003_APR20	Soil	N	pH	SW9045D	6.7	0.10	0.10	0.10	pH units		1		
SSJRNG003_APR20	Soil	N	Phosphorus, total	E365.4	260	11	19	19	mg/kg		1		
SSJRNG003_APR20	Soil	N	Potassium	SW6010C	310	280	830	920	mg/kg		2	J	TR
SSJRNG003_APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSJRNG003_APR20	Soil	N	Sulfate	SW9056A	3.5	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG004_APR20	Soil	N	Antimony	SW6010C	1.4	0.46	1.4	1.8	mg/kg	300	2	J	TR



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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSJRNG004_APR20	Soil	N	Calcium	SW6010C	1,600	140	420	460	mg/kg		2		
SSJRNG004_APR20	Soil	N	Chloride	SW9056A	11	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG004_APR20	Soil	N	Copper	SW6010C	12.0	1.4	4.2	4.6	mg/kg	10,000	2		
SSJRNG004_APR20	Soil	N	Iron	SW6010C	7,500	4.6	14	18	mg/kg		2		
SSJRNG004_APR20	Soil	N	Lead	SW6010C	55	0.46	1.4	1.8	mg/kg	3,000	2		
SSJRNG004_APR20	Soil	N	Magnesium	SW6010C	1,400	46	140	180	mg/kg		2		
SSJRNG004_APR20	Soil	N	pH	SW9045D	6.3	0.10	0.10	0.10	pH units		1		
SSJRNG004_APR20	Soil	N	Phosphorus, total	E365.4	200	11	20	20	mg/kg		1		
SSJRNG004_APR20	Soil	N	Potassium	SW6010C	290	280	830	920	mg/kg		2	J	TR
SSJRNG004_APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSJRNG004_APR20	Soil	N	Sulfate	SW9056A	3.7	1.5	4.5	5	mg/kg		1	J	TR,H
SSJRNG005_APR20	Soil	N	Antimony	SW6010C	1.1	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSJRNG005_APR20	Soil	N	Calcium	SW6010C	1,300	140	410	460	mg/kg		2		
SSJRNG005_APR20	Soil	N	Chloride	SW9056A	8.3	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG005_APR20	Soil	N	Copper	SW6010C	9.6	1.4	4.1	4.6	mg/kg	10,000	2		
SSJRNG005_APR20	Soil	N	Iron	SW6010C	6,200	4.6	14	18	mg/kg		2		
SSJRNG005_APR20	Soil	N	Lead	SW6010C	43	0.46	1.4	1.8	mg/kg	3,000	2		
SSJRNG005_APR20	Soil	N	Magnesium	SW6010C	1,100	46	140	180	mg/kg		2		
SSJRNG005_APR20	Soil	N	pH	SW9045D	6.5	0.10	0.10	0.10	pH units		1		
SSJRNG005_APR20	Soil	N	Phosphorus, total	E365.4	250	11	20	20	mg/kg		1		
SSJRNG005_APR20	Soil	N	Potassium	SW6010C	830	280	830	920	mg/kg		2	U	ND
SSJRNG005_APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSJRNG005_APR20	Soil	N	Sulfate	SW9056A	4.5	1.5	4.5	5	mg/kg		1	UJ	ND,H
SSJRNG006_APR20	Soil	N	Antimony	SW6010C	1.0	0.44	1.3	1.7	mg/kg	300	2	J	TR
SSJRNG006_APR20	Soil	N	Calcium	SW6010C	960	130	390	440	mg/kg		2		
SSJRNG006_APR20	Soil	N	Chloride	SW9056A	11	0.20	0.20	2.0	mg/kg		1	J	H
SSJRNG006_APR20	Soil	N	Copper	SW6010C	10	1.3	3.9	4.4	mg/kg	10,000	2		
SSJRNG006_APR20	Soil	N	Iron	SW6010C	6,200	4.4	13	17	mg/kg		2		
SSJRNG006_APR20	Soil	N	Lead	SW6010C	57	0.44	1.3	1.7	mg/kg	3,000	2		
SSJRNG006_APR20	Soil	N	Magnesium	SW6010C	830	44	130	170	mg/kg		2		
SSJRNG006_APR20	Soil	N	pH	SW9045D	6.3	0.10	0.10	0.10	pH units		1		
SSJRNG006_APR20	Soil	N	Phosphorus, total	E365.4	260	11	20	20	mg/kg		1		
SSJRNG006_APR20	Soil	N	Potassium	SW6010C	300	260	780	870	mg/kg		2	J	TR
SSJRNG006_APR20	Soil	N	Sodium	SW6010C	130	44	130	170	mg/kg		2	U	ND
SSJRNG006_APR20	Soil	N	Sulfate	SW9056A	1.7	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG001_APR20A	Soil	N	Antimony	SW6010C	1.6	0.47	1.4	1.9	mg/kg	300	2	J	TR
SSKRNG001_APR20A	Soil	N	Calcium	SW6010C	3,800	140	420	470	mg/kg		2		
SSKRNG001_APR20A	Soil	N	Chloride	SW9056A	5.8	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG001_APR20A	Soil	N	Copper	SW6010C	39	1.4	4.2	4.7	mg/kg	10,000	2		
SSKRNG001_APR20A	Soil	N	Iron	SW6010C	14,000	4.7	14	19	mg/kg		2		
SSKRNG001_APR20A	Soil	N	Lead	SW6010C	20	0.47	1.4	1.9	mg/kg	3,000	2		
SSKRNG001_APR20A	Soil	N	Magnesium	SW6010C	7,400	47	140	190	mg/kg		2		
SSKRNG001_APR20A	Soil	N	pH	SW9045D	7.0	0.10	0.10	0.10	pH units		1		
SSKRNG001_APR20A	Soil	N	Phosphorus, total	E365.4	400	11	20	20	mg/kg		1		
SSKRNG001_APR20A	Soil	N	Potassium	SW6010C	2,700	280	840	930	mg/kg		2		

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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSKRNG001_APR20A	Soil	N	Sodium	SW6010C	100	47	140	190	mg/kg		2	J	TR
SSKRNG001_APR20A	Soil	N	Sulfate	SW9056A	3.0	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG001_APR20B	Soil	FR	Antimony	SW6010C	1.7	0.48	1.5	1.9	mg/kg	300	2	J	TR
SSKRNG001_APR20B	Soil	FR	Calcium	SW6010C	4,700	150	440	480	mg/kg		2		
SSKRNG001_APR20B	Soil	FR	Chloride	SW9056A	5.9	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG001_APR20B	Soil	FR	Copper	SW6010C	47	1.5	4.4	4.8	mg/kg	10,000	2		
SSKRNG001_APR20B	Soil	FR	Iron	SW6010C	16,000	4.8	15	19	mg/kg		2		
SSKRNG001_APR20B	Soil	FR	Lead	SW6010C	22	0.48	1.5	1.9	mg/kg	3,000	2		
SSKRNG001_APR20B	Soil	FR	Magnesium	SW6010C	8,600	48	150	190	mg/kg		2		
SSKRNG001_APR20B	Soil	FR	pH	SW9045D	7.0	0.10	0.10	0.10	pH units		1		
SSKRNG001_APR20B	Soil	FR	Phosphorus, total	E365.4	340	11	20	20	mg/kg		1		
SSKRNG001_APR20B	Soil	FR	Potassium	SW6010C	2,900	290	870	970	mg/kg		2		
SSKRNG001_APR20B	Soil	FR	Sodium	SW6010C	93	48	150	190	mg/kg		2	J	TR
SSKRNG001_APR20B	Soil	FR	Sulfate	SW9056A	2.8	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG001_APR20C	Soil	FR	Antimony	SW6010C	1	0.48	1.4	1.9	mg/kg	300	2	J	TR
SSKRNG001_APR20C	Soil	FR	Calcium	SW6010C	3,800	140	430	480	mg/kg		2		
SSKRNG001_APR20C	Soil	FR	Chloride	SW9056A	6.5	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG001_APR20C	Soil	FR	Copper	SW6010C	41	1.4	4.3	4.8	mg/kg	10,000	2		
SSKRNG001_APR20C	Soil	FR	Iron	SW6010C	14,000	4.8	14	19	mg/kg		2		
SSKRNG001_APR20C	Soil	FR	Lead	SW6010C	20	0.48	1.4	1.9	mg/kg	3,000	2		
SSKRNG001_APR20C	Soil	FR	Magnesium	SW6010C	8,000	48	140	190	mg/kg		2		
SSKRNG001_APR20C	Soil	FR	pH	SW9045D	7.2	0.10	0.10	0.10	pH units		1		
SSKRNG001_APR20C	Soil	FR	Phosphorus, total	E365.4	450	11	20	20	mg/kg		1		
SSKRNG001_APR20C	Soil	FR	Potassium	SW6010C	2,700	290	870	960	mg/kg		2		
SSKRNG001_APR20C	Soil	FR	Sodium	SW6010C	87	48	140	190	mg/kg		2	J	TR
SSKRNG001_APR20C	Soil	FR	Sulfate	SW9056A	2.8	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG002_APR20	Soil	N	Antimony	SW6010C	1	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSKRNG002_APR20	Soil	N	Calcium	SW6010C	2,400	140	420	460	mg/kg		2		
SSKRNG002_APR20	Soil	N	Chloride	SW9056A	6.6	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG002_APR20	Soil	N	Copper	SW6010C	14	1.4	4.2	4.6	mg/kg	10,000	2		
SSKRNG002_APR20	Soil	N	Iron	SW6010C	8,600	4.6	14	18	mg/kg		2		
SSKRNG002_APR20	Soil	N	Lead	SW6010C	25	0.46	1.4	1.8	mg/kg	3,000	2		
SSKRNG002_APR20	Soil	N	Magnesium	SW6010C	2,000	46	140	180	mg/kg		2		
SSKRNG002_APR20	Soil	N	pH	SW9045D	6.8	0.10	0.10	0.10	pH units		1		
SSKRNG002_APR20	Soil	N	Phosphorus, total	E365.4	260	11	19	19	mg/kg		1		
SSKRNG002_APR20	Soil	N	Potassium	SW6010C	410	280	830	920	mg/kg		2	J	TR
SSKRNG002_APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSKRNG002_APR20	Soil	N	Sulfate	SW9056A	2.3	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG003_APR20	Soil	N	Antimony	SW6010C	1.1	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSKRNG003_APR20	Soil	N	Calcium	SW6010C	1,400	140	410	460	mg/kg		2		
SSKRNG003_APR20	Soil	N	Chloride	SW9056A	6.1	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG003_APR20	Soil	N	Copper	SW6010C	10	1.4	4.1	4.6	mg/kg	10,000	2		
SSKRNG003_APR20	Soil	N	Iron	SW6010C	8,800	4.6	14	18	mg/kg		2		
SSKRNG003_APR20	Soil	N	Lead	SW6010C	24	0.46	1.4	1.8	mg/kg	3,000	2		
SSKRNG003_APR20	Soil	N	Magnesium	SW6010C	1,500	46	140	180	mg/kg		2		



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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSKRNG003 APR20	Soil	N	pH	SW9045D	6.7	0.10	0.10	0.10	pH units		1		
SSKRNG003 APR20	Soil	N	Phosphorus, total	E365.4	210	11	19	19	mg/kg		1		
SSKRNG003 APR20	Soil	N	Potassium	SW6010C	360	280	830	920	mg/kg		2	J	TR
SSKRNG003 APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSKRNG003 APR20	Soil	N	Sulfate	SW9056A	3.4	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG004 APR20	Soil	N	Antimony	SW6010C	1.8	0.47	1.4	1.9	mg/kg	300	2	J	TR
SSKRNG004 APR20	Soil	N	Calcium	SW6010C	1,500	140	420	470	mg/kg		2		
SSKRNG004 APR20	Soil	N	Chloride	SW9056A	7.0	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG004 APR20	Soil	N	Copper	SW6010C	10	1.4	4.2	4.7	mg/kg	10,000	2		
SSKRNG004 APR20	Soil	N	Iron	SW6010C	8,700	4.7	14	19	mg/kg		2		
SSKRNG004 APR20	Soil	N	Lead	SW6010C	140	0.47	1.4	1.9	mg/kg	3,000	2		
SSKRNG004 APR20	Soil	N	Magnesium	SW6010C	1,500	47	140	190	mg/kg		2		
SSKRNG004 APR20	Soil	N	pH	SW9045D	6.8	0.10	0.10	0.10	pH units		1		
SSKRNG004 APR20	Soil	N	Phosphorus, total	E365.4	220	11	19	19	mg/kg		1		
SSKRNG004 APR20	Soil	N	Potassium	SW6010C	370	280	840	930	mg/kg		2	J	TR
SSKRNG004 APR20	Soil	N	Sodium	SW6010C	140	47	140	190	mg/kg		2	U	ND
SSKRNG004 APR20	Soil	N	Sulfate	SW9056A	2.9	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG005 APR20	Soil	N	Antimony	SW6010C	0.94	0.47	1.4	1.9	mg/kg	300	2	J	TR
SSKRNG005 APR20	Soil	N	Calcium	SW6010C	1,700	140	420	470	mg/kg		2		
SSKRNG005 APR20	Soil	N	Chloride	SW9056A	9.1	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG005 APR20	Soil	N	Copper	SW6010C	10	1.4	4.2	4.7	mg/kg	10,000	2		
SSKRNG005 APR20	Soil	N	Iron	SW6010C	8,200	4.7	14	19	mg/kg		2		
SSKRNG005 APR20	Soil	N	Lead	SW6010C	32	0.47	1.4	1.9	mg/kg	3,000	2		
SSKRNG005 APR20	Soil	N	Magnesium	SW6010C	1,600	47	140	190	mg/kg		2		
SSKRNG005 APR20	Soil	N	pH	SW9045D	6.8	0.10	0.10	0.10	pH units		1		
SSKRNG005 APR20	Soil	N	Phosphorus, total	E365.4	210	11	20	20	mg/kg		1		
SSKRNG005 APR20	Soil	N	Potassium	SW6010C	390	280	850	940	mg/kg		2	J	TR
SSKRNG005 APR20	Soil	N	Sodium	SW6010C	140	47	140	190	mg/kg		2	U	ND
SSKRNG005 APR20	Soil	N	Sulfate	SW9056A	2.4	1.5	4.5	5	mg/kg		1	J	TR,H
SSKRNG006 APR20	Soil	N	Antimony	SW6010C	1.1	0.45	1.3	1.8	mg/kg	300	2	J	TR
SSKRNG006 APR20	Soil	N	Calcium	SW6010C	1,100	130	400	450	mg/kg		2		
SSKRNG006 APR20	Soil	N	Chloride	SW9056A	8.8	0.20	0.20	2.0	mg/kg		1	J	H
SSKRNG006 APR20	Soil	N	Copper	SW6010C	11	1.3	4.0	4.5	mg/kg	10,000	2		
SSKRNG006 APR20	Soil	N	Iron	SW6010C	8,000	4.5	13	18	mg/kg		2		
SSKRNG006 APR20	Soil	N	Lead	SW6010C	27	0.45	1.3	1.8	mg/kg	3,000	2		
SSKRNG006 APR20	Soil	N	Magnesium	SW6010C	910	45	130	180	mg/kg		2		
SSKRNG006 APR20	Soil	N	pH	SW9045D	6.3	0.10	0.10	0.10	pH units		1		
SSKRNG006 APR20	Soil	N	Phosphorus, total	E365.4	210	11	20	20	mg/kg		1		
SSKRNG006 APR20	Soil	N	Potassium	SW6010C	350	270	810	900	mg/kg		2	J	TR
SSKRNG006 APR20	Soil	N	Sodium	SW6010C	130	45	130	180	mg/kg		2	U	ND
SSKRNG006 APR20	Soil	N	Sulfate	SW9056A	3.5	1.5	4.5	5	mg/kg		1	J	TR,H
SSLRNG001 APR20	Soil	N	Antimony	SW6010C	0.75	0.43	1.3	1.7	mg/kg	300	2	J	TR
SSLRNG001 APR20	Soil	N	Calcium	SW6010C	870.00	130	390	430	mg/kg		2		
SSLRNG001 APR20	Soil	N	Chloride	SW9056A	12	0.20	0.20	2.0	mg/kg		1	J	H
SSLRNG001 APR20	Soil	N	Copper	SW6010C	9.5	1.3	3.9	4.3	mg/kg	10,000	2		



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Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSLRNG001 APR20	Soil	N	Iron	SW6010C	8,900	4.3	13	17	mg/kg		2		
SSLRNG001 APR20	Soil	N	Lead	SW6010C	9.4	0.43	1.3	1.7	mg/kg	3,000	2		
SSLRNG001 APR20	Soil	N	Magnesium	SW6010C	1,300	43	130	170	mg/kg		2		
SSLRNG001 APR20	Soil	N	pH	SW9045D	5.3	0.10	0.10	0.10	pH units		1		
SSLRNG001 APR20	Soil	N	Phosphorus, total	E365.4	270	11	19	19	mg/kg		1		
SSLRNG001 APR20	Soil	N	Potassium	SW6010C	450	260	770	860	mg/kg		2	J	TR
SSLRNG001 APR20	Soil	N	Sodium	SW6010C	130	43	130	170	mg/kg		2	U	ND
SSLRNG001 APR20	Soil	N	Sulfate	SW9056A	4.6	1.5	4.5	5	mg/kg		1	J	TR,H
SSLRNG002 APR20	Soil	N	Antimony	SW6010C	0.74	0.47	1.4	1.9	mg/kg	300	2	J	TR,MS%R
SSLRNG002 APR20	Soil	N	Calcium	SW6010C	4,600	140	430	470	mg/kg		2		
SSLRNG002 APR20	Soil	N	Chloride	SW9056A	19	0.20	0.20	2.0	mg/kg		1	J	H
SSLRNG002 APR20	Soil	N	Copper	SW6010C	12	1.4	4.3	4.7	mg/kg	10,000	2		
SSLRNG002 APR20	Soil	N	Iron	SW6010C	10,000	4.7	14	19	mg/kg		2		
SSLRNG002 APR20	Soil	N	Lead	SW6010C	10	0.47	1.4	1.9	mg/kg	3,000	2		
SSLRNG002 APR20	Soil	N	Magnesium	SW6010C	1,200	47	140	190	mg/kg		2		
SSLRNG002 APR20	Soil	N	pH	SW9045D	7.3	0.10	0.10	0.10	pH units		1		
SSLRNG002 APR20	Soil	N	Phosphorus, total	E365.4	220	11	19	19	mg/kg		1		
SSLRNG002 APR20	Soil	N	Potassium	SW6010C	410	280	850	950	mg/kg		2	J	TR,MS%R
SSLRNG002 APR20	Soil	N	Sodium	SW6010C	140	47	140	190	mg/kg		2	U	ND
SSLRNG002 APR20	Soil	N	Sulfate	SW9056A	5.9	1.5	4.5	5	mg/kg		1	J	H
SSSRNG001 APR20	Soil	N	Antimony	SW6010C	0.93	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSSRNG001 APR20	Soil	N	Calcium	SW6010C	790.00	140	410	460	mg/kg		2		
SSSRNG001 APR20	Soil	N	Chloride	SW9056A	17	0.20	0.20	2.0	mg/kg		1		
SSSRNG001 APR20	Soil	N	Copper	SW6010C	23.00	1.4	4.1	4.6	mg/kg	10,000	2		
SSSRNG001 APR20	Soil	N	Iron	SW6010C	7,300	4.6	14	18	mg/kg		2		
SSSRNG001 APR20	Soil	N	Lead	SW6010C	16	0.46	1.4	1.8	mg/kg	3,000	2		
SSSRNG001 APR20	Soil	N	Magnesium	SW6010C	860	46	140	180	mg/kg		2		
SSSRNG001 APR20	Soil	N	pH	SW9045D	6.2	0.10	0.10	0.10	pH units		1		
SSSRNG001 APR20	Soil	N	Phosphorus, total	E365.4	380	11	20	20	mg/kg		1		
SSSRNG001 APR20	Soil	N	Potassium	SW6010C	310	270	820	920	mg/kg		2	J	TR
SSSRNG001 APR20	Soil	N	Sodium	SW6010C	140	46	140	180	mg/kg		2	U	ND
SSSRNG001 APR20	Soil	N	Sulfate	SW9056A	3.7	1.5	4.5	5	mg/kg		1	J	TR
SSTRNG001 APR20A	Soil	N	Antimony	SW6010C	1.4	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSTRNG001 APR20A	Soil	N	Calcium	SW6010C	2,900	140	420	460	mg/kg		2		
SSTRNG001 APR20A	Soil	N	Chloride	SW9056A	18	0.20	0.20	2.0	mg/kg		1		
SSTRNG001 APR20A	Soil	N	Copper	SW6010C	14	1.4	4.2	4.6	mg/kg	10,000	2		
SSTRNG001 APR20A	Soil	N	Iron	SW6010C	14,000	4.6	14	18	mg/kg		2		
SSTRNG001 APR20A	Soil	N	Lead	SW6010C	16	0.46	1.4	1.8	mg/kg	3,000	2		
SSTRNG001 APR20A	Soil	N	Magnesium	SW6010C	3,000	46	140	180	mg/kg		2		
SSTRNG001 APR20A	Soil	N	pH	SW9045D	6.9	0.10	0.10	0.10	pH units		1		
SSTRNG001 APR20A	Soil	N	Phosphorus, total	E365.4	420	11	20	20	mg/kg		1		
SSTRNG001 APR20A	Soil	N	Potassium	SW6010C	1,000	280	830	920	mg/kg		2		
SSTRNG001 APR20A	Soil	N	Sodium	SW6010C	100	46	140	180	mg/kg		2	J	TR
SSTRNG001 APR20A	Soil	N	Sulfate	SW9056A	14	1.5	4.5	5	mg/kg		1		
SSTRNG001 APR20B	Soil	FR	Antimony	SW6010C	1.6	0.47	1.4	1.9	mg/kg	300	2	J	TR

Soil Sample Results Spring 2020

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/kg)	Dilution Factor	Qualifier	Reason
SSTRNG001 APR20B	Soil	FR	Calcium	SW6010C	2,700	140	420	470	mg/kg		2		
SSTRNG001 APR20B	Soil	FR	Chloride	SW9056A	16	0.20	0.20	2.0	mg/kg		1		
SSTRNG001 APR20B	Soil	FR	Copper	SW6010C	16	1.4	4.2	4.7	mg/kg	10,000	2		
SSTRNG001 APR20B	Soil	FR	Iron	SW6010C	15,000	4.7	14	19	mg/kg		2		
SSTRNG001 APR20B	Soil	FR	Lead	SW6010C	17	0.47	1.4	1.9	mg/kg	3,000	2		
SSTRNG001 APR20B	Soil	FR	Magnesium	SW6010C	2,800	47	140	190	mg/kg		2		
SSTRNG001 APR20B	Soil	FR	pH	SW9045D	6.8	0.10	0.10	0.10	pH units		1		
SSTRNG001 APR20B	Soil	FR	Phosphorus, total	E365.4	450	11	20	20	mg/kg		1		
SSTRNG001 APR20B	Soil	FR	Potassium	SW6010C	1,100	280	840	930	mg/kg		2		
SSTRNG001 APR20B	Soil	FR	Sodium	SW6010C	94	47	140	190	mg/kg		2	J	TR
SSTRNG001 APR20B	Soil	FR	Sulfate	SW9056A	12	1.5	4.5	5	mg/kg		1		
SSTRNG001 APR20C	Soil	FR	Antimony	SW6010C	1.3	0.43	1.3	1.7	mg/kg	300	2	J	TR
SSTRNG001 APR20C	Soil	FR	Calcium	SW6010C	2,700	130	380	430	mg/kg		2		
SSTRNG001 APR20C	Soil	FR	Chloride	SW9056A	21	0.20	0.20	2.0	mg/kg		1		
SSTRNG001 APR20C	Soil	FR	Copper	SW6010C	15	1.3	3.8	4.3	mg/kg	10,000	2		
SSTRNG001 APR20C	Soil	FR	Iron	SW6010C	14,000	4.3	13	17	mg/kg		2		
SSTRNG001 APR20C	Soil	FR	Lead	SW6010C	17	0.43	1.3	1.7	mg/kg	3,000	2		
SSTRNG001 APR20C	Soil	FR	Magnesium	SW6010C	2,800	43	130	170	mg/kg		2		
SSTRNG001 APR20C	Soil	FR	pH	SW9045D	6.8	0.10	0.10	0.10	pH units		1		
SSTRNG001 APR20C	Soil	FR	Phosphorus, total	E365.4	380	11	19	19	mg/kg		1		
SSTRNG001 APR20C	Soil	FR	Potassium	SW6010C	1,100	260	770	850	mg/kg		2		
SSTRNG001 APR20C	Soil	FR	Sodium	SW6010C	93	43	130	170	mg/kg		2	J	TR
SSTRNG001 APR20C	Soil	FR	Sulfate	SW9056A	12	1.5	4.5	5	mg/kg		1		
SSTRNG002 APR20	Soil	N	Antimony	SW6010C	0.73	0.47	1.4	1.9	mg/kg	300	2	J	TR
SSTRNG002 APR20	Soil	N	Calcium	SW6010C	1,800	140	420	470	mg/kg		2		
SSTRNG002 APR20	Soil	N	Chloride	SW9056A	29	0.20	0.20	2.0	mg/kg		1		
SSTRNG002 APR20	Soil	N	Copper	SW6010C	11	1.4	4.2	4.7	mg/kg	10,000	2		
SSTRNG002 APR20	Soil	N	Iron	SW6010C	7,900	4.7	14	19	mg/kg		2		
SSTRNG002 APR20	Soil	N	Lead	SW6010C	26	0.47	1.4	1.9	mg/kg	3,000	2		
SSTRNG002 APR20	Soil	N	Magnesium	SW6010C	1,300	47	140	190	mg/kg		2		
SSTRNG002 APR20	Soil	N	pH	SW9045D	6.7	0.10	0.10	0.10	pH units		1		
SSTRNG002 APR20	Soil	N	Phosphorus, total	E365.4	380	11	20	20	mg/kg		1		
SSTRNG002 APR20	Soil	N	Potassium	SW6010C	530	280	840	940	mg/kg		2	J	TR
SSTRNG002 APR20	Soil	N	Sodium	SW6010C	140	47	140	190	mg/kg		2	U	ND
SSTRNG002 APR20	Soil	N	Sulfate	SW9056A	6.8	1.5	4.5	5	mg/kg		1		
SSTRNG003 APR20	Soil	N	Antimony	SW6010C	1.5	0.46	1.4	1.8	mg/kg	300	2	J	TR
SSTRNG003 APR20	Soil	N	Calcium	SW6010C	2,700	140	410	460	mg/kg		2		
SSTRNG003 APR20	Soil	N	Chloride	SW9056A	25	0.20	0.20	2.0	mg/kg		1		
SSTRNG003 APR20	Soil	N	Copper	SW6010C	56	1.4	4.1	4.6	mg/kg	10,000	2		
SSTRNG003 APR20	Soil	N	Iron	SW6010C	11,000	4.6	14	18	mg/kg		2		
SSTRNG003 APR20	Soil	N	Lead	SW6010C	180	0.46	1.4	1.8	mg/kg	3,000	2		
SSTRNG003 APR20	Soil	N	Magnesium	SW6010C	1,500	46	140	180	mg/kg		2		
SSTRNG003 APR20	Soil	N	pH	SW9045D	6.6	0.10	0.10	0.10	pH units		1		
SSTRNG003 APR20	Soil	N	Phosphorus, total	E365.4	1,100	110	200	200	mg/kg		10		
SSTRNG003 APR20	Soil	N	Potassium	SW6010C	420	270	820	910	mg/kg		2	J	TR





## **Small Arms Range Sampling Reports**

### Lysimeter Sampling Results

Fall 2019

**CAMP EDWARDS SMALL ARMS RANGE BASELINE POREWATER MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
I Range	LYIRNG001_OCT19	Water	Alkalinity, total	SM2320B	mg/L	4.0	5.0	4.0	0.23	U	ND	
I Range	LYIRNG001_OCT19	Water	Antimony	SW6020A	µg/L	3.1	1.0	0.055	0.50			6
I Range	LYIRNG001_OCT19	Water	Calcium	SW6020A	µg/L	2,140	100	21	80			
I Range	LYIRNG001_OCT19	Water	Chloride	SW9056A	mg/L	2.3	2.0	1.0	0.0993			
I Range	LYIRNG001_OCT19	Water	Copper	SW6020A	µg/L	9.18	3.0	0.19	2.0			1300
I Range	LYIRNG001_OCT19	Water	Lead	SW6020A	µg/L	2.79	1.0	0.075	0.50			15
I Range	LYIRNG001_OCT19	Water	Magnesium	SW6020A	µg/L	596	100	8.0	80			
I Range	LYIRNG001_OCT19	Water	Potassium	SW6020A	µg/L	2,490	1,000	31	400			
I Range	LYIRNG001_OCT19	Water	Sodium	SW6020A	µg/L	1,700	1,000	19	400			
I Range	LYIRNG001_OCT19	Water	Sulfate	SW9056A	mg/L	32	1.0	0.50	0.064			
I Range	LYIRNG002_OCT19	Water	Alkalinity, total	SM2320B	mg/L	22	5.0	4.0	0.23			
<b>I Range</b>	<b>LYIRNG002_OCT19</b>	<b>Water</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>µg/L</b>	<b>8.04</b>	<b>1.0</b>	<b>0.055</b>	<b>0.50</b>			<b>6</b>
I Range	LYIRNG002_OCT19	Water	Calcium	SW6020A	µg/L	20400	100	21	80			
I Range	LYIRNG002_OCT19	Water	Chloride	SW9056A	mg/L	18	2.0	1.0	0.0993			
I Range	LYIRNG002_OCT19	Water	Copper	SW6020A	µg/L	262	3.0	0.19	2.0			1300
I Range	LYIRNG002_OCT19	Water	Lead	SW6020A	µg/L	0.30	1.0	0.075	0.50	J	TR	15
I Range	LYIRNG002_OCT19	Water	Magnesium	SW6020A	µg/L	4960	100	8.0	80			
I Range	LYIRNG002_OCT19	Water	Potassium	SW6020A	µg/L	2,560	1,000	31	400			
I Range	LYIRNG002_OCT19	Water	Sodium	SW6020A	µg/L	6,420	1,000	19	400			
I Range	LYIRNG002_OCT19	Water	Sulfate	SW9056A	mg/L	12	1.0	0.50	0.064			
J Range	LYJRNG001_OCT19	Water	Alkalinity, total	SM2320B	mg/L	45	5.0	4.0	0.23			
J Range	LYJRNG001_OCT19	Water	Antimony	SW6020A	µg/L	0.994	1.0	0.055	0.50	J	TR	6
J Range	LYJRNG001_OCT19	Water	Calcium	SW6020A	µg/L	9410	100	21	80			
J Range	LYJRNG001_OCT19	Water	Chloride	SW9056A	mg/L	2.4	2.0	1.0	0.0993			
J Range	LYJRNG001_OCT19	Water	Copper	SW6020A	µg/L	2.53	3.0	0.19	2.0	J	TR	1300
J Range	LYJRNG001_OCT19	Water	Lead	SW6020A	µg/L	0.14	1.0	0.075	0.50	J	TR	15
J Range	LYJRNG001_OCT19	Water	Magnesium	SW6020A	µg/L	4900	100	8.0	80			
J Range	LYJRNG001_OCT19	Water	Potassium	SW6020A	µg/L	3,630	1,000	31	400			
J Range	LYJRNG001_OCT19	Water	Sodium	SW6020A	µg/L	2,260	1,000	19	400			
J Range	LYJRNG001_OCT19	Water	Sulfate	SW9056A	mg/L	1.1	1.0	0.50	0.064			
J Range	LYJRNG002_OCT19	Water	Alkalinity, total	SM2320B	mg/L	64	5.0	4.0	0.23			
J Range	LYJRNG002_OCT19	Water	Antimony	SW6020A	µg/L	1.35	1.0	0.055	0.50			6
J Range	LYJRNG002_OCT19	Water	Calcium	SW6020A	µg/L	14,600	100	21	80			
J Range	LYJRNG002_OCT19	Water	Chloride	SW9056A	mg/L	3.4	2.0	1.0	0.0993			
J Range	LYJRNG002_OCT19	Water	Copper	SW6020A	µg/L	3.27	3.0	0.19	2.0			1300
J Range	LYJRNG002_OCT19	Water	Lead	SW6020A	µg/L	0.46	1.0	0.075	0.50	J	TR	15
J Range	LYJRNG002_OCT19	Water	Magnesium	SW6020A	µg/L	7830	100	8.0	80			
J Range	LYJRNG002_OCT19	Water	Potassium	SW6020A	µg/L	2,910	1,000	31	400			



**CAMP EDWARDS SMALL ARMS RANGE BASELINE POREWATER MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
J Range	LYJ RNG002_OCT19	Water	Sodium	SW6020A	µg/L	2,200	1,000	19	400			
J Range	LYJ RNG002_OCT19	Water	Sulfate	SW9056A	mg/L	1.6	1.0	0.50	0.064			
J Range	LYJ RNG003_OCT19	Water	Alkalinity, total	SM2320B	mg/L	130	5.0	4.0	0.23			
<b>J Range</b>	<b>LYJ RNG003_OCT19</b>	<b>Water</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>µg/L</b>	<b>46</b>	<b>1.0</b>	<b>0.055</b>	<b>0.50</b>			<b>6</b>
J Range	LYJ RNG003_OCT19	Water	Calcium	SW6020A	µg/L	47700	100	21	80			
J Range	LYJ RNG003_OCT19	Water	Chloride	SW9056A	mg/L	2.6	2.0	1.0	0.0993			
J Range	LYJ RNG003_OCT19	Water	Copper	SW6020A	µg/L	4.15	3.0	0.19	2.0			1300
J Range	LYJ RNG003_OCT19	Water	Lead	SW6020A	µg/L	0.23	1.0	0.075	0.50	J	TR	15
J Range	LYJ RNG003_OCT19	Water	Magnesium	SW6020A	µg/L	3380	100	8.0	80			
J Range	LYJ RNG003_OCT19	Water	Potassium	SW6020A	µg/L	91	1,000	31	400	J	TR	
J Range	LYJ RNG003_OCT19	Water	Sodium	SW6020A	µg/L	3,660	1,000	19	400			
J Range	LYJ RNG003_OCT19	Water	Sulfate	SW9056A	mg/L	3.5	1.0	0.50	0.064			
K Range	LYK RNG001_OCT19	Water	Alkalinity, total	SM2320B	mg/L	40	5.0	4.0	0.23			
K Range	LYK RNG001_OCT19	Water	Antimony	SW6020A	µg/L	0.574	1.0	0.055	0.50	J	TR	6
K Range	LYK RNG001_OCT19	Water	Calcium	SW6020A	µg/L	9,020	100	21	80			
K Range	LYK RNG001_OCT19	Water	Chloride	SW9056A	mg/L	3.8	2.0	1.0	0.0993			
K Range	LYK RNG001_OCT19	Water	Copper	SW6020A	µg/L	1.2	3.0	0.19	2.0	J	TR	1300
K Range	LYK RNG001_OCT19	Water	Lead	SW6020A	µg/L	0.50	1.0	0.075	0.50	U	ND	15
K Range	LYK RNG001_OCT19	Water	Magnesium	SW6020A	µg/L	4900	100	8.0	80			
K Range	LYK RNG001_OCT19	Water	Potassium	SW6020A	µg/L	727	1,000	31	400	J	TR	
K Range	LYK RNG001_OCT19	Water	Sodium	SW6020A	µg/L	3,840	1,000	19	400			
K Range	LYK RNG001_OCT19	Water	Sulfate	SW9056A	mg/L	2.7	1.0	0.50	0.064			
K Range	LYK RNG002_OCT19	Water	Alkalinity, total	SM2320B	mg/L	35	5.0	4.0	0.23			
K Range	LYK RNG002_OCT19	Water	Antimony	SW6020A	µg/L	0.25	1.0	0.055	0.50	J	TR	6
K Range	LYK RNG002_OCT19	Water	Calcium	SW6020A	µg/L	7200	100	21	80			
K Range	LYK RNG002_OCT19	Water	Chloride	SW9056A	mg/L	2.6	2.0	1.0	0.0993			
K Range	LYK RNG002_OCT19	Water	Copper	SW6020A	µg/L	1.0	3.0	0.19	2.0	J	TR	1300
K Range	LYK RNG002_OCT19	Water	Lead	SW6020A	µg/L	0.090	1.0	0.075	0.50			15
K Range	LYK RNG002_OCT19	Water	Magnesium	SW6020A	µg/L	4840	100	8.0	80			
K Range	LYK RNG002_OCT19	Water	Potassium	SW6020A	µg/L	419	1,000	31	400	J	TR	
K Range	LYK RNG002_OCT19	Water	Sodium	SW6020A	µg/L	2,400	1,000	19	400			
K Range	LYK RNG002_OCT19	Water	Sulfate	SW9056A	mg/L	0.88	1.0	0.50	0.064	J	TR	
K Range	LYK RNG003_OCT19	Water	Alkalinity, total	SM2320B	mg/L	9.7	5.0	4.0	0.23			
<b>K Range</b>	<b>LYK RNG003_OCT19</b>	<b>Water</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>µg/L</b>	<b>6.57</b>	<b>1.0</b>	<b>0.055</b>	<b>0.50</b>			<b>6</b>
K Range	LYK RNG003_OCT19	Water	Calcium	SW6020A	µg/L	3,100	100	21	80			
K Range	LYK RNG003_OCT19	Water	Chloride	SW9056A	mg/L	3.5	2.0	1.0	0.0993			
K Range	LYK RNG003_OCT19	Water	Copper	SW6020A	µg/L	14.1	3.0	0.19	2.0			1300
K Range	LYK RNG003_OCT19	Water	Lead	SW6020A	µg/L	0.65	1.0	0.075	0.50	J	TR	15



**CAMP EDWARDS SMALL ARMS RANGE BASELINE POREWATER MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
K Range	LYKRNG003_OCT19	Water	Magnesium	SW6020A	µg/L	498	100	8.0	80			
K Range	LYKRNG003_OCT19	Water	Potassium	SW6020A	µg/L	785	1,000	31	400	J	TR	
K Range	LYKRNG003_OCT19	Water	Sodium	SW6020A	µg/L	2,810	1,000	19	400			
K Range	LYKRNG003_OCT19	Water	Sulfate	SW9056A	mg/L	1.3	1.0	0.50	0.064			
L Range	LYLRNG001_OCT19	Water	Alkalinity, total	SM2320B	mg/L	6.5	5.0	4.0	0.23			
L Range	LYLRNG001_OCT19	Water	Antimony	SW6020A	µg/L	0.076	1.0	0.50	0.055	J	TR	6
L Range	LYLRNG001_OCT19	Water	Calcium	SW6020A	µg/L	1550	100	80	21			
L Range	LYLRNG001_OCT19	Water	Chloride	SW9056A	mg/L	1.9	2.0	1.0	0.0993	J	TR	
L Range	LYLRNG001_OCT19	Water	Copper	SW6020A	µg/L	12	3.0	2.0	0.19			1300
L Range	LYLRNG001_OCT19	Water	Lead	SW6020A	µg/L	1.12	1.0	0.50	0.075			15
L Range	LYLRNG001_OCT19	Water	Magnesium	SW6020A	µg/L	323	100	80	8			
L Range	LYLRNG001_OCT19	Water	Phosphorus, total	E365.4	mg/L	0.080	0.10	0.080	0.0461	U	ND	
L Range	LYLRNG001_OCT19	Water	Potassium	SW6020A	µg/L	1,880	1,000	400	31			
L Range	LYLRNG001_OCT19	Water	Sodium	SW6020A	µg/L	1,300	1,000	400	19			
L Range	LYLRNG001_OCT19	Water	Sulfate	SW9056A	mg/L	1.6	1.0	0.50	0.064			
L Range	LYLRNG001_OCT19	Water	Sulfate	SW9056A	mg/L	1.6	1.0	0.50	0.064			
L Range	LYLRNG002_OCT19	Water	Alkalinity, total	SM2320B	mg/L	100	5.0	4.0	0.23			
L Range	LYLRNG002_OCT19	Water	Antimony	SW6020A	µg/L	0.14	1	0.5	0.055	J	TR	6
L Range	LYLRNG002_OCT19	Water	Calcium	SW6020A	µg/L	43,900	100	80	21			
L Range	LYLRNG002_OCT19	Water	Chloride	SW9056A	mg/L	2.0	2.0	1.0	0.0993	J	TR	
L Range	LYLRNG002_OCT19	Water	Copper	SW6020A	µg/L	1.8	3.0	2.0	0.19	J	TR	1300
L Range	LYLRNG002_OCT19	Water	Lead	SW6020A	µg/L	0.50	1.0	0.50	0.075	U	ND	15
L Range	LYLRNG002_OCT19	Water	Magnesium	SW6020A	µg/L	488	100	80	8			
L Range	LYLRNG002_OCT19	Water	Phosphorus, total	E365.4	mg/L	0.080	0.10	0.080	0.0461	U	ND	
L Range	LYLRNG002_OCT19	Water	Potassium	SW6020A	µg/L	697	1,000	400	31	J	TR	
L Range	LYLRNG002_OCT19	Water	Sodium	SW6020A	µg/L	2,090	1,000	400	19			
L Range	LYLRNG002_OCT19	Water	Sulfate	SW9056A	mg/L	0.13	1.0	0.50	0.064	J	TR	
L Range	LYLRNG002_OCT19	Water	Sulfate	SW9056A	mg/L	0.13	1.0	0.50	0.064	J	TR	
S Range	LYSBGD01_OCT19	Water	Alkalinity, total	SM2320B	mg/L	2.9	5.0	4.0	0.23	J	TR, Background Sample	
S Range	LYSBGD01_OCT19	Water	Antimony	SW6020A	µg/L	0.39	1.0	0.055	0.50	J	TR, Background Sample	6
S Range	LYSBGD01_OCT19	Water	Calcium	SW6020A	µg/L	12400	100	21	80		Background Sample	
S Range	LYSBGD01_OCT19	Water	Chloride	SW9056A	mg/L	59	10	5.0	0.50		Background Sample	
S Range	LYSBGD01_OCT19	Water	Copper	SW6020A	µg/L	1.8	3.0	0.19	2.0	J	TR, Background Sample	1300
S Range	LYSBGD01_OCT19	Water	Lead	SW6020A	µg/L	0.21	1.0	0.075	0.50	J	TR, Background Sample	15
S Range	LYSBGD01_OCT19	Water	Magnesium	SW6020A	µg/L	3050	100	8	80		Background Sample	
S Range	LYSBGD01_OCT19	Water	Potassium	SW6020A	µg/L	2,080	1,000	31	400		Background Sample	
S Range	LYSBGD01_OCT19	Water	Sodium	SW6020A	µg/L	24,700	1,000	19	400		Background Sample	
S Range	LYSBGD01_OCT19	Water	Sulfate	SW9056A	mg/L	12	1.0	0.50	0.064		Background Sample	



**CAMP EDWARDS SMALL ARMS RANGE BASELINE POREWATER MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
S Range	LYSRNG001_OCT19	Water	Alkalinity, total	SM2320B	mg/L	71	5.0	4.0	0.23			
S Range	LYSRNG001_OCT19	Water	Antimony	SW6020A	µg/L	1.29	1.0	0.055	0.5			6
S Range	LYSRNG001_OCT19	Water	Calcium	SW6020A	µg/L	27,400	100	21	80			
S Range	LYSRNG001_OCT19	Water	Chloride	SW9056A	mg/L	5.4	2.0	1.0	0.0993			
S Range	LYSRNG001_OCT19	Water	Copper	SW6020A	µg/L	4.33	3.0	0.19	2.0			1300
S Range	LYSRNG001_OCT19	Water	Lead	SW6020A	µg/L	0.13	1.0	0.075	0.50	J	TR	15
S Range	LYSRNG001_OCT19	Water	Magnesium	SW6020A	µg/L	2480	100	8.0	80			
S Range	LYSRNG001_OCT19	Water	Potassium	SW6020A	µg/L	861	1,000	31	400	J	TR	
S Range	LYSRNG001_OCT19	Water	Sodium	SW6020A	µg/L	5,800	1,000	19	400			
S Range	LYSRNG001_OCT19	Water	Sulfate	SW9056A	mg/L	3.0	1.0	0.50	0.064			
S Range	LYSRNG002_OCT19	Water	Alkalinity, total	SM2320B	mg/L	3.6	5.0	4.0	0.23	J	TR	
S Range	LYSRNG002_OCT19	Water	Antimony	SW6020A	µg/L	0.14	1.0	0.055	0.50	J	TR	6
S Range	LYSRNG002_OCT19	Water	Calcium	SW6020A	µg/L	912	100	21	80			
S Range	LYSRNG002_OCT19	Water	Chloride	SW9056A	mg/L	3.1	2.0	1.0	0.0993			
S Range	LYSRNG002_OCT19	Water	Copper	SW6020A	µg/L	1.2	3.0	0.19	2.0	J	TR	1300
S Range	LYSRNG002_OCT19	Water	Lead	SW6020A	µg/L	0.22	1.0	0.075	0.50	J	TR	15
S Range	LYSRNG002_OCT19	Water	Magnesium	SW6020A	µg/L	228	100	8.0	80			
S Range	LYSRNG002_OCT19	Water	Potassium	SW6020A	µg/L	2,480	1,000	31	400			
S Range	LYSRNG002_OCT19	Water	Sodium	SW6020A	µg/L	1,560	1,000	19	400			
S Range	LYSRNG002_OCT19	Water	Sulfate	SW9056A	mg/L	0.93	1.0	0.50	0.064	J	TR	
T Range	LYTBGD01_OCT19	Water	Alkalinity, total	SM2320B	mg/L	3.6	5.0	4.0	0.23	J	TR, Background Sample	
T Range	LYTBGD01_OCT19	Water	Antimony	SW6020A	µg/L	0.080	1.0	0.055	0.50	J	TR, Background Sample	6
T Range	LYTBGD01_OCT19	Water	Calcium	SW6020A	µg/L	633	100	21	80		Background Sample	
T Range	LYTBGD01_OCT19	Water	Chloride	SW9056A	mg/L	9.5	2.0	1.0	0.0993		Background Sample	
T Range	LYTBGD01_OCT19	Water	Copper	SW6020A	µg/L	1.3	3.0	0.19	2.0	J	TR, Background Sample	1300
T Range	LYTBGD01_OCT19	Water	Lead	SW6020A	µg/L	0.11	1.0	0.075	0.50	J	TR, Background Sample	15
T Range	LYTBGD01_OCT19	Water	Magnesium	SW6020A	µg/L	1240	100	8.0	80		Background Sample	
T Range	LYTBGD01_OCT19	Water	Potassium	SW6020A	µg/L	180	1,000	31	400	J	TR, Background Sample	
T Range	LYTBGD01_OCT19	Water	Sodium	SW6020A	µg/L	6,000	1,000	19	400		Background Sample	
T Range	LYTBGD01_OCT19	Water	Sulfate	SW9056A	mg/L	4.7	1.0	0.50	0.064		Background Sample	
T Range	LYTRNG012_OCT19	Water	Alkalinity, total	SM2320B	mg/L	6.1	5.0	4.0	0.23			
T Range	LYTRNG012_OCT19	Water	Antimony	SW6020A	µg/L	0.22	1.0	0.055	0.50	J	TR	6
T Range	LYTRNG012_OCT19	Water	Calcium	SW6020A	µg/L	706	100	21	80			
T Range	LYTRNG012_OCT19	Water	Chloride	SW9056A	mg/L	0.42	2.0	1.0	0.0993	J	TR	
T Range	LYTRNG012_OCT19	Water	Copper	SW6020A	µg/L	4.68	3.0	0.19	2.0			1300
T Range	LYTRNG012_OCT19	Water	Lead	SW6020A	µg/L	0.39	1.0	0.075	0.50	J	TR	15
T Range	LYTRNG012_OCT19	Water	Magnesium	SW6020A	µg/L	420	100	8.0	80			
T Range	LYTRNG012_OCT19	Water	Potassium	SW6020A	µg/L	300	1,000	31	400	J	TR	

**CAMP EDWARDS SMALL ARMS RANGE BASELINE POREWATER MONITORING RESULTS 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
T Range	LYTRNG012_OCT19	Water	Sodium	SW6020A	µg/L	1,100	1,000	19	400			
T Range	LYTRNG012_OCT19	Water	Sulfate	SW9056A	mg/L	0.076	1.0	0.50	0.064	J	TR	
T Range	LYTRNG013_OCT19	Water	Alkalinity, total	SM2320B	mg/L	39	5.0	4.0	0.23			
<b>T Range</b>	<b>LYTRNG013_OCT19</b>	<b>Water</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>µg/L</b>	<b>98.1</b>	<b>1.0</b>	<b>0.055</b>	<b>0.50</b>			<b>6</b>
T Range	LYTRNG013_OCT19	Water	Calcium	SW6020A	µg/L	10,200	100	21	80			
T Range	LYTRNG013_OCT19	Water	Chloride	SW9056A	mg/L	4.0	2.0	1.0	0.0993			
T Range	LYTRNG013_OCT19	Water	Copper	SW6020A	µg/L	29.4	3.0	0.19	2.0			1300
T Range	LYTRNG013_OCT19	Water	Lead	SW6020A	µg/L	0.17	1.0	0.075	0.50	J	TR	15
T Range	LYTRNG013_OCT19	Water	Magnesium	SW6020A	µg/L	2700	100	8.0	80			
T Range	LYTRNG013_OCT19	Water	Potassium	SW6020A	µg/L	11,000	1,000	31	400			
T Range	LYTRNG013_OCT19	Water	Sodium	SW6020A	µg/L	5,430	1,000	19	400			
T Range	LYTRNG013_OCT19	Water	Sulfate	SW9056A	mg/L	8.8	1.0	0.50	0.064			
T Range	LYTRNG013_OCT19 FD	Water	Alkalinity, total	SM2320B	mg/L	40	5.0	4.0	0.23			
<b>T Range</b>	<b>LYTRNG013_OCT19 FD</b>	<b>Water</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>µg/L</b>	<b>93.7</b>	<b>1.0</b>	<b>0.055</b>	<b>0.50</b>			<b>6</b>
T Range	LYTRNG013_OCT19 FD	Water	Calcium	SW6020A	µg/L	9460	100	21	80			
T Range	LYTRNG013_OCT19 FD	Water	Chloride	SW9056A	mg/L	4.0	2.0	1.0	0.0993			
T Range	LYTRNG013_OCT19 FD	Water	Copper	SW6020A	µg/L	28.5	3.0	0.19	2.0			1300
T Range	LYTRNG013_OCT19 FD	Water	Lead	SW6020A	µg/L	0.18	1.0	0.075	0.50	J	TR	15
T Range	LYTRNG013_OCT19 FD	Water	Magnesium	SW6020A	µg/L	2590	100	8.0	80			
T Range	LYTRNG013_OCT19 FD	Water	Potassium	SW6020A	µg/L	10,600	1,000	31	400			
T Range	LYTRNG013_OCT19 FD	Water	Sodium	SW6020A	µg/L	5,210	1,000	19	400			
T Range	LYTRNG013_OCT19 FD	Water	Sulfate	SW9056A	mg/L	9.0	1.0	0.50	0.064			

Notes:

µg/L = microgram(s) per liter	ND = nondetectable
DL = detection limit	LOQ = limit of quantitation
ID = identifier	TR = trace result (<LOQ and >DL)
J = estimated value	U = not detected

## **Small Arms Range Sampling Reports**

Lysimeter Sampling Results

Spring 2020



Porewater Sample Results Spring 2020

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
LYIRNG001_APR20	GW	N	Alkalinity, total	SM2320B	Total	9	5	5	5	mg/L		1		
LYIRNG001_APR20	GW	N	Antimony	SW6020A	Dissolved	3	2	4	5	µg/L	6	2	J	TR
LYIRNG001_APR20	GW	N	Calcium	SW6020A	Dissolved	2,400	96	180	200	µg/L		2		
LYIRNG001_APR20	GW	N	Chloride	SW9056A	Total	2.6	0.060	0.15	0.20	mg/L		1		
LYIRNG001_APR20	GW	N	Copper	SW6020A	Dissolved	12	1.9	2.5	3	µg/L	1300	2		
LYIRNG001_APR20	GW	N	Iron	SW6020A	Dissolved	51	20	40	50	µg/L		2		
LYIRNG001_APR20	GW	N	Lead	SW6020A	Dissolved	3	1	2	3	µg/L	15	2	J	TR
LYIRNG001_APR20	GW	N	Magnesium	SW6020A	Dissolved	720	20	40	50	µg/L		2		
LYIRNG001_APR20	GW	N	Phosphorus, total	E365.4	Total	0.048	0.041	0.057	0.10	mg/L		1	J	TR
LYIRNG001_APR20	GW	N	Potassium	SW6020A	Dissolved	1,800	45	90	100	µg/L		2		
LYIRNG001_APR20	GW	N	Sodium	SW6020A	Dissolved	2,200	50	90	100	µg/L		2		
LYIRNG001_APR20	GW	N	Sulfate	SW9056A	Total	0.63	0.050	0.15	0.50	mg/L		1		
LYIRNG001_APR20	GW	N	Total Carbon	E415.1	Dissolved	3.0	0.50	0.50	1.0	mg/L		1		
LYIRNG002_APR20	GW	N	Alkalinity, total	SM2320B	Total	16	5	5	5	mg/L		1		
<b>LYIRNG002_APR20</b>	<b>GW</b>	<b>N</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>Dissolved</b>	<b>8</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>µg/L</b>	<b>6</b>	<b>1</b>		
LYIRNG002_APR20	GW	N	Calcium	SW6020A	Dissolved	11,000	96	180	200	µg/L		1		
LYIRNG002_APR20	GW	N	Chloride	SW9056A	Total	6.5	0.30	0.75	1.0	mg/L		1		
LYIRNG002_APR20	GW	N	Copper	SW6020A	Dissolved	420	1.9	2.5	3	µg/L	1300	1		
LYIRNG002_APR20	GW	N	Iron	SW6020A	Dissolved	93	20	40	50	µg/L		1		
LYIRNG002_APR20	GW	N	Lead	SW6020A	Dissolved	1	1	2	3	µg/L	15	1	J	TR
LYIRNG002_APR20	GW	N	Magnesium	SW6020A	Dissolved	2,700	20	40	50	µg/L		1		
LYIRNG002_APR20	GW	N	Phosphorus, total	E365.4	Total	7.1	0.41	0.57	1.0	mg/L		10		
LYIRNG002_APR20	GW	N	Potassium	SW6020A	Dissolved	1,900	45	90	100	µg/L		1		
LYIRNG002_APR20	GW	N	Sodium	SW6020A	Dissolved	4,000	50	90	100	µg/L		1		
LYIRNG002_APR20	GW	N	Sulfate	SW9056A	Total	4.6	0.050	0.15	0.50	mg/L		1		
LYIRNG002_APR20	GW	N	Total Carbon	E415.1	Dissolved	16	0.50	0.50	1.0	mg/L		1		
LYJRNG001_APR20	GW	N	Alkalinity, total	SM2320B	Total	41	5	5	5	mg/L		1		
LYJRNG001_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYJRNG001_APR20	GW	N	Calcium	SW6020A	Dissolved	9,500	96	180	200	µg/L		2		
LYJRNG001_APR20	GW	N	Chloride	SW9056A	Total	3.2	0.060	0.15	0.20	mg/L		1		
LYJRNG001_APR20	GW	N	Copper	SW6020A	Dissolved	2	1.9	2.5	3	µg/L	1300	2	J	TR
LYJRNG001_APR20	GW	N	Iron	SW6020A	Dissolved	42	20	40	50	µg/L		2	J	TR
LYJRNG001_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYJRNG001_APR20	GW	N	Magnesium	SW6020A	Dissolved	4,600	20	40	50	µg/L		2		
LYJRNG001_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYJRNG001_APR20	GW	N	Potassium	SW6020A	Dissolved	2,900	45	90	100	µg/L		2		
LYJRNG001_APR20	GW	N	Sodium	SW6020A	Dissolved	3,200	50	90	100	µg/L		2		

**Porewater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMIP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
LYJRNG001_APR20	GW	N	Sulfate	SW9056A	Total	0.98	0.050	0.15	0.50	mg/L		1		
LYJRNG001_APR20	GW	N	Total Carbon	E415.1	Dissolved	2.8	0.50	0.50	1.0	mg/L		1		
LYJRNG002_APR20	GW	N	Alkalinity, total	SM2320B	Total	14	5	5	5	mg/L		1		
LYJRNG002_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYJRNG002_APR20	GW	N	Calcium	SW6020A	Dissolved	3,400	96	180	200	µg/L		2		
LYJRNG002_APR20	GW	N	Chloride	SW9056A	Total	1.1	0.060	0.15	0.20	mg/L		1		
LYJRNG002_APR20	GW	N	Copper	SW6020A	Dissolved	3	1.9	2.5	3	µg/L	1300	2		
LYJRNG002_APR20	GW	N	Iron	SW6020A	Dissolved	75	20	40	50	µg/L		2		
LYJRNG002_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYJRNG002_APR20	GW	N	Magnesium	SW6020A	Dissolved	2,000	20	40	50	µg/L		2		
LYJRNG002_APR20	GW	N	Phosphorus, total	E365.4	Total	0.072	0.041	0.057	0.10	mg/L		1	J	TR
LYJRNG002_APR20	GW	N	Potassium	SW6020A	Dissolved	1,000	45	90	100	µg/L		2		
LYJRNG002_APR20	GW	N	Sodium	SW6020A	Dissolved	1,000	50	90	100	µg/L		2		
LYJRNG002_APR20	GW	N	Sulfate	SW9056A	Total	0.43	0.050	0.15	0.50	mg/L		1	J	TR
LYJRNG002_APR20	GW	N	Total Carbon	E415.1	Dissolved	3.5	0.50	0.50	1.0	mg/L		1		
LYJRNG003_APR20	GW	N	Alkalinity, total	SM2320B	Total	90	5	5	5	mg/L		1		
<b>LYJRNG003_APR20</b>	<b>GW</b>	<b>N</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>Dissolved</b>	<b>32</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>µg/L</b>	<b>6</b>	<b>2</b>		
LYJRNG003_APR20	GW	N	Calcium	SW6020A	Dissolved	30,000	96	180	200	µg/L		2		
LYJRNG003_APR20	GW	N	Chloride	SW9056A	Total	1.9	0.060	0.15	0.20	mg/L		1		
LYJRNG003_APR20	GW	N	Copper	SW6020A	Dissolved	5	1.9	2.5	3	µg/L	1300	2		
LYJRNG003_APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
LYJRNG003_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYJRNG003_APR20	GW	N	Magnesium	SW6020A	Dissolved	2,000	20	40	50	µg/L		2		
LYJRNG003_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYJRNG003_APR20	GW	N	Potassium	SW6020A	Dissolved	1,100	45	90	100	µg/L		2		
LYJRNG003_APR20	GW	N	Sodium	SW6020A	Dissolved	3,400	50	90	100	µg/L		2		
LYJRNG003_APR20	GW	N	Sulfate	SW9056A	Total	2.1	0.050	0.15	0.50	mg/L		1		
LYJRNG003_APR20	GW	N	Total Carbon	E415.1	Dissolved	2.8	0.50	0.50	1.0	mg/L		1		
LYKRNG001_APR20	GW	N	Alkalinity, total	SM2320B	Total	55	5	5	5	mg/L		1		
LYKRNG001_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYKRNG001_APR20	GW	N	Calcium	SW6020A	Dissolved	12,000	96	180	200	µg/L		2		
LYKRNG001_APR20	GW	N	Chloride	SW9056A	Total	4.4	0.060	0.15	0.20	mg/L		1		
LYKRNG001_APR20	GW	N	Copper	SW6020A	Dissolved	3	1.9	2.5	3	µg/L	1300	2	U	ND
LYKRNG001_APR20	GW	N	Iron	SW6020A	Dissolved	32	20	40	50	µg/L		2	J	TR
LYKRNG001_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYKRNG001_APR20	GW	N	Magnesium	SW6020A	Dissolved	6,300	20	40	50	µg/L		2		
LYKRNG001_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND



**Porewater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMIP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
LYKRNG001_APR20	GW	N	Potassium	SW6020A	Dissolved	890	45	90	100	µg/L		2		
LYKRNG001_APR20	GW	N	Sodium	SW6020A	Dissolved	3,600	50	90	100	µg/L		2		
LYKRNG001_APR20	GW	N	Sulfate	SW9056A	Total	4.1	0.050	0.15	0.50	mg/L		1		
LYKRNG001_APR20	GW	N	Total Carbon	E415.1	Dissolved	2.7	0.50	0.50	1.0	mg/L		1		
LYKRNG002_APR20	GW	N	Alkalinity, total	SM2320B	Total	44	5	5	5	mg/L		1		
LYKRNG002_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYKRNG002_APR20	GW	N	Calcium	SW6020A	Dissolved	8,900	96	180	200	µg/L		2		
LYKRNG002_APR20	GW	N	Chloride	SW9056A	Total	3.1	0.060	0.15	0.20	mg/L		1		
LYKRNG002_APR20	GW	N	Copper	SW6020A	Dissolved	3	1.9	2.5	3	µg/L	1300	2	U	ND
LYKRNG002_APR20	GW	N	Iron	SW6020A	Dissolved	22	20	40	50	µg/L		2	J	TR
LYKRNG002_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYKRNG002_APR20	GW	N	Magnesium	SW6020A	Dissolved	5,900	20	40	50	µg/L		2		
LYKRNG002_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYKRNG002_APR20	GW	N	Potassium	SW6020A	Dissolved	390	45	90	100	µg/L		2		
LYKRNG002_APR20	GW	N	Sodium	SW6020A	Dissolved	2,100	50	90	100	µg/L		2		
LYKRNG002_APR20	GW	N	Sulfate	SW9056A	Total	0.62	0.050	0.15	0.50	mg/L		1		
LYKRNG002_APR20	GW	N	Total Carbon	E415.1	Dissolved	1.3	0.50	0.50	1.0	mg/L		1		
LYKRNG003_APR20	GW	N	Alkalinity, total	SM2320B	Total	8	5	5	5	mg/L		1		
LYKRNG003_APR20	GW	N	Antimony	SW6020A	Dissolved	3	2	4	5	µg/L	6	2	J	TR
LYKRNG003_APR20	GW	N	Calcium	SW6020A	Dissolved	3,900	96	180	200	µg/L		2		
LYKRNG003_APR20	GW	N	Chloride	SW9056A	Total	8	0.12	0.30	0.40	mg/L		2		
LYKRNG003_APR20	GW	N	Copper	SW6020A	Dissolved	10	1.9	2.5	3	µg/L	1300	2		
LYKRNG003_APR20	GW	N	Iron	SW6020A	Dissolved	58	20	40	50	µg/L		2		
LYKRNG003_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYKRNG003_APR20	GW	N	Magnesium	SW6020A	Dissolved	530	20	40	50	µg/L		2		
LYKRNG003_APR20	GW	N	Phosphorus, total	E365.4	Total	0.049	0.041	0.057	0.10	mg/L		1	J	TR
LYKRNG003_APR20	GW	N	Potassium	SW6020A	Dissolved	500	45	90	100	µg/L		2		
LYKRNG003_APR20	GW	N	Sodium	SW6020A	Dissolved	4,200	50	90	100	µg/L		2		
LYKRNG003_APR20	GW	N	Sulfate	SW9056A	Total	0.88	0.050	0.15	0.50	mg/L		1		
LYKRNG003_APR20	GW	N	Total Carbon	E415.1	Dissolved	1.6	0.50	0.50	1.0	mg/L		1		
<b>LYKRNG004_APR20</b>	<b>GW</b>	<b>N</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>Dissolved</b>	<b>20</b>	<b>2.0</b>	<b>4.0</b>	<b>5.0</b>	<b>µg/L</b>	<b>6</b>	<b>2</b>		
LYKRNG004_APR20	GW	N	Calcium	SW6020A	Dissolved	5,800	96	180	200	µg/L		2	Q	Q
LYKRNG004_APR20	GW	N	Chloride	SW9056A	Total	1.9	0.060	0.15	0.20	mg/L		1		
LYKRNG004_APR20	GW	N	Copper	SW6020A	Dissolved	5.2	1.9	2.5	3.0	µg/L	1300	2	UJ	B
LYKRNG004_APR20	GW	N	Iron	SW6020A	Dissolved	25	20	40	50	µg/L		2	J	TR
LYKRNG004_APR20	GW	N	Lead	SW6020A	Dissolved	1	1	2	3	µg/L	15	2	J	TR
LYKRNG004_APR20	GW	N	Magnesium	SW6020A	Dissolved	490	20	40	50	µg/L		2		

**Porewater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
LYKRNG004_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYKRNG004_APR20	GW	N	Potassium	SW6020A	Dissolved	93	45	90	100	µg/L		2	J	TR
LYKRNG004_APR20	GW	N	Sodium	SW6020A	Dissolved	1,800	50	90	100	µg/L		2		
LYKRNG004_APR20	GW	N	Sulfate	SW9056A	Total	1.2	0.050	0.15	0.50	mg/L		1		
LYLRNG001_APR20	GW	N	Alkalinity, total	SM2320B	Total	5	5	5	5	mg/L		1	U	ND
LYLRNG001_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYLRNG001_APR20	GW	N	Calcium	SW6020A	Dissolved	1,800	96	180	200	µg/L		2		
LYLRNG001_APR20	GW	N	Chloride	SW9056A	Total	4.8	0.060	0.15	0.20	mg/L		1		
LYLRNG001_APR20	GW	N	Copper	SW6020A	Dissolved	6	1.9	2.5	3	µg/L	1300	2		
LYLRNG001_APR20	GW	N	Iron	SW6020A	Dissolved	31	20	40	50	µg/L		2	J	TR
LYLRNG001_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYLRNG001_APR20	GW	N	Magnesium	SW6020A	Dissolved	390	20	40	50	µg/L		2		
LYLRNG001_APR20	GW	N	Phosphorus, total	E365.4	Total	0.053	0.041	0.057	0.10	mg/L		1	J	TR
LYLRNG001_APR20	GW	N	Potassium	SW6020A	Dissolved	1,500	45	90	100	µg/L		2		
LYLRNG001_APR20	GW	N	Sodium	SW6020A	Dissolved	2,200	50	90	100	µg/L		2		
LYLRNG001_APR20	GW	N	Sulfate	SW9056A	Total	2.8	0.050	0.15	0.50	mg/L		1		
LYLRNG001_APR20	GW	N	Total Carbon	E415.1	Dissolved	2.7	0.50	0.50	1.0	mg/L		1		
LYLRNG002_APR20	GW	N	Alkalinity, total	SM2320B	Total	70	5	5	5	mg/L		1		
LYLRNG002_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYLRNG002_APR20	GW	N	Calcium	SW6020A	Dissolved	26,000	96	180	200	µg/L		2		
LYLRNG002_APR20	GW	N	Chloride	SW9056A	Total	7.6	0.12	0.30	0.40	mg/L		2		
LYLRNG002_APR20	GW	N	Copper	SW6020A	Dissolved	3	1.9	2.5	3	µg/L	1300	2	U	ND
LYLRNG002_APR20	GW	N	Iron	SW6020A	Dissolved	23	20	40	50	µg/L		2	J	TR
LYLRNG002_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYLRNG002_APR20	GW	N	Magnesium	SW6020A	Dissolved	960	20	40	50	µg/L		2		
LYLRNG002_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYLRNG002_APR20	GW	N	Potassium	SW6020A	Dissolved	1,500	45	90	100	µg/L		2		
LYLRNG002_APR20	GW	N	Sodium	SW6020A	Dissolved	4,200	50	90	100	µg/L		2		
LYLRNG002_APR20	GW	N	Sulfate	SW9056A	Total	0.12	0.050	0.15	0.50	mg/L		1	J	TR
LYLRNG002_APR20	GW	N	Total Carbon	E415.1	Dissolved	4.5	0.50	0.50	1.0	mg/L		1		
LYSBGD01_APR20	GW	N	Alkalinity, total	SM2320B	Total	5	5	5	5	mg/L		1	U	ND
LYSBGD01_APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	6	2	U	ND
LYSBGD01_APR20	GW	N	Calcium	SW6020A	Dissolved	9,200	96	180	200	µg/L		2	J	TR
LYSBGD01_APR20	GW	N	Chloride	SW9056A	Total	50	1.2	3.0	4.0	mg/L		20		
LYSBGD01_APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	1300	2	U	ND
LYSBGD01_APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
LYSBGD01_APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	15	2	U	ND



**Porewater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMVIP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
LYSBGD01_APR20	GW	N	Magnesium	SW6020A	Dissolved	2,300	20	40	50	µg/L		2		
LYSBGD01_APR20	GW	N	Phosphorus, total	E365.4	Total	0.045	0.041	0.057	0.10	mg/L		1	J	TR
LYSBGD01_APR20	GW	N	Potassium	SW6020A	Dissolved	2,200	45	90	100	µg/L		2		
LYSBGD01_APR20	GW	N	Sodium	SW6020A	Dissolved	21,000	50	90	100	µg/L		2		
LYSBGD01_APR20	GW	N	Sodium	SW6020A	Dissolved	7,200	50	90	100	µg/L		2		
LYSBGD01_APR20	GW	N	Sulfate	SW9056A	Total	8.1	0.050	0.15	0.50	mg/L		1		
LYSBGD01_APR20	GW	N	Total Carbon	E415.1	Dissolved	3.7	0.50	0.50	1.0	mg/L		1		
LYSRNG001_APR20	GW	N	Alkalinity, total	SM2320B	Total	60	5	5	5	mg/L		1		
LYSRNG001_APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	6	2	U	ND
LYSRNG001_APR20	GW	N	Calcium	SW6020A	Dissolved	25,000	96	180	200	µg/L		2		
LYSRNG001_APR20	GW	N	Chloride	SW9056A	Total	12	0.30	0.75	1.0	mg/L		5		
LYSRNG001_APR20	GW	N	Copper	SW6020A	Dissolved	4.2	1.9	2.5	3.0	µg/L	1300	2		
LYSRNG001_APR20	GW	N	Iron	SW6020A	Dissolved	230	20	40	50	µg/L		2		
LYSRNG001_APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	15	2	U	ND
LYSRNG001_APR20	GW	N	Magnesium	SW6020A	Dissolved	2,300	20	40	50	µg/L		2		
LYSRNG001_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYSRNG001_APR20	GW	N	Potassium	SW6020A	Dissolved	790	45	90	100	µg/L		2		
LYSRNG001_APR20	GW	N	Sodium	SW6020A	Dissolved	4,500	50	90	100	µg/L		2		
LYSRNG001_APR20	GW	N	Sulfate	SW9056A	Total	4.0	0.050	0.15	0.50	mg/L		1		
LYSRNG001_APR20	GW	N	Total Carbon	E415.1	Dissolved	6.6	0.50	0.50	1.0	mg/L		1		
LYSRNG002_APR20	GW	N	Alkalinity, total	SM2320B	Total	5	5	5	5	mg/L		1	U	ND
LYSRNG002_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYSRNG002_APR20	GW	N	Calcium	SW6020A	Dissolved	870	96	180	200	µg/L		2		
LYSRNG002_APR20	GW	N	Chloride	SW9056A	Total	7.1	0.12	0.30	0.40	mg/L		2		
LYSRNG002_APR20	GW	N	Copper	SW6020A	Dissolved	3	1.9	2.5	3	µg/L	1300	2		
LYSRNG002_APR20	GW	N	Iron	SW6020A	Dissolved	27	20	40	50	µg/L		2	J	TR
LYSRNG002_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYSRNG002_APR20	GW	N	Magnesium	SW6020A	Dissolved	450	20	40	50	µg/L		2		
LYSRNG002_APR20	GW	N	Phosphorus, total	E365.4	Total	0.057	0.041	0.057	0.10	mg/L		1	U	ND
LYSRNG002_APR20	GW	N	Potassium	SW6020A	Dissolved	4,000	45	90	100	µg/L		2		
LYSRNG002_APR20	GW	N	Sodium	SW6020A	Dissolved	3,000	50	90	100	µg/L		2		
LYSRNG002_APR20	GW	N	Sulfate	SW9056A	Total	1.1	0.050	0.15	0.50	mg/L		1		
LYSRNG002_APR20	GW	N	Total Carbon	E415.1	Dissolved	2.4	0.50	0.50	1.0	mg/L		1		
LYTBGD01_APR20	GW	N	Alkalinity, total	SM2320B	Total	5	5	5	5	mg/L		1	U	ND
LYTBGD01_APR20	GW	N	Antimony	SW6020A	Dissolved	4	2	4	5	µg/L	6	2	U	ND
LYTBGD01_APR20	GW	N	Calcium	SW6020A	Dissolved	540	96	180	200	µg/L		2		
LYTBGD01_APR20	GW	N	Chloride	SW9056A	Total	12	0.30	0.75	1.0	mg/L		5		

Porewater Sample Results Spring 2020

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMIP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
LYTBGD01_APR20	GW	N	Copper	SW6020A	Dissolved	3	1.9	2.5	3	µg/L	1300	2	U	ND
LYTBGD01_APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
LYTBGD01_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	U	ND
LYTBGD01_APR20	GW	N	Magnesium	SW6020A	Dissolved	1,600	20	40	50	µg/L		2		
LYTBGD01_APR20	GW	N	Phosphorus, total	E365.4	Total	0.064	0.041	0.057	0.10	mg/L		1	J	TR
LYTBGD01_APR20	GW	N	Potassium	SW6020A	Dissolved	92	45	90	100	µg/L		2	J	TR
LYTBGD01_APR20	GW	N	Sulfate	SW9056A	Total	3.9	0.050	0.15	0.50	mg/L		1		
LYTBGD01_APR20	GW	N	Total Carbon	E415.1	Dissolved	2.2	0.50	0.50	1.0	mg/L		1		
LYTRNG013_APR20	GW	N	Alkalinity, total	SM2320B	Total	44	5	5	5	mg/L		1		
<b>LYTRNG013_APR20</b>	<b>GW</b>	<b>N</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>Dissolved</b>	<b>50</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>µg/L</b>	<b>6</b>	<b>2</b>		
LYTRNG013_APR20	GW	N	Calcium	SW6020A	Dissolved	13,000	96	180	200	µg/L		2		
LYTRNG013_APR20	GW	N	Chloride	SW9056A	Total	3.8	0.060	0.15	0.20	mg/L		1		
LYTRNG013_APR20	GW	N	Copper	SW6020A	Dissolved	22	1.9	2.5	3	µg/L	1300	2		
LYTRNG013_APR20	GW	N	Iron	SW6020A	Dissolved	930	20	40	50	µg/L		2		
LYTRNG013_APR20	GW	N	Lead	SW6020A	Dissolved	2	1	2	3	µg/L	15	2	J	TR
LYTRNG013_APR20	GW	N	Magnesium	SW6020A	Dissolved	2,600	20	40	50	µg/L		2		
LYTRNG013_APR20	GW	N	Phosphorus, total	E365.4	Total	0.059	0.041	0.057	0.10	mg/L		1	J	TR
LYTRNG013_APR20	GW	N	Potassium	SW6020A	Dissolved	5,600	45	90	100	µg/L		2		
LYTRNG013_APR20	GW	N	Sodium	SW6020A	Dissolved	2,600	50	90	100	µg/L		2		
LYTRNG013_APR20	GW	N	Sulfate	SW9056A	Total	3.9	0.050	0.15	0.50	mg/L		1		
LYTRNG013_APR20	GW	N	Total Carbon	E415.1	Dissolved	7.2	0.50	0.50	1.0	mg/L		1		
LYTRNG013_APR20 FD	GW	FD	Alkalinity, total	SM2320B	Total	46	5	5	5	mg/L		1		
<b>LYTRNG013_APR20 FD</b>	<b>GW</b>	<b>FD</b>	<b>Antimony</b>	<b>SW6020A</b>	<b>Dissolved</b>	<b>52</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>µg/L</b>		<b>2</b>		
LYTRNG013_APR20 FD	GW	FD	Calcium	SW6020A	Dissolved	13,000	96	180	200	µg/L		2		
LYTRNG013_APR20 FD	GW	FD	Chloride	SW9056A	Total	3.8	0.060	0.15	0.20	mg/L		1		
LYTRNG013_APR20 FD	GW	FD	Copper	SW6020A	Dissolved	22	1.9	2.5	3	µg/L		2		
LYTRNG013_APR20 FD	GW	FD	Iron	SW6020A	Dissolved	860	20	40	50	µg/L		2		
LYTRNG013_APR20 FD	GW	FD	Lead	SW6020A	Dissolved	2	1	2	3	µg/L		2	J	TR
LYTRNG013_APR20 FD	GW	FD	Magnesium	SW6020A	Dissolved	2,600	20	40	50	µg/L		2		
LYTRNG013_APR20 FD	GW	FD	Phosphorus, total	E365.4	Total	0.080	0.041	0.057	0.10	mg/L		1	J	TR
LYTRNG013_APR20 FD	GW	FD	Potassium	SW6020A	Dissolved	5,600	45	90	100	µg/L		2		
LYTRNG013_APR20 FD	GW	FD	Sodium	SW6020A	Dissolved	2,600	50	90	100	µg/L		2		
LYTRNG013_APR20 FD	GW	FD	Sulfate	SW9056A	Total	3.9	0.050	0.15	0.50	mg/L		1		
LYTRNG013_APR20 FD	GW	FD	Total Carbon	E415.1	Dissolved	7.1	0.50	0.50	1.0	mg/L		1		

Notes:

µg/L = microgram(s) per lit; MDL = method detection limit  
 ID = identifier                      mg/L = milligram(s) per liter

ND = nondetectable  
 LOQ = limit of quantitation

U = not detected



**Porewater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMIP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
B = method blank detection    MS%R = matrix spike % recovery    LOD = limit of detection J = estimated value                N = normal (primary) sample                TR = trace result (<LOQ and >MDL)														



Juliet and Kilo Ranges, STAPP bullet catcher system, Camp Edwards, Massachusetts  
LY=Lysimeter, MW=Monitoring Well, SS=Soil Sample



Tango Range with STAPP bullet catcher system, Camp Edwards, Massachusetts  
LY=Lysimeter, MW=Monitoring Well, SS=Soil Sample





India Range, Copper Ammunition Only, Camp Edwards, Massachusetts.  
LY=Lysimeter, MW=Monitoring Well, SS=Soil Sample

## **Small Arms Range Sampling Reports**

Groundwater Sampling Results

Fall 2019



**CAMP EDWARDS SMALL ARMS RANGE BASELINE GROUNDWATER MONITORING RESULTS OCTOBER 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
E Range	MW-468S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	9.0	5.0	4.0	0.23			
E Range	MW-468S_OCT19	Water	Antimony	SW6020A	µg/L	0.5	1.0	0.055	0.50	U	ND	3
E Range	MW-468S_OCT19	Water	Calcium	SW6020A	µg/L	3,970	100	21	80			
E Range	MW-468S_OCT19	Water	Chloride	SW9056A	mg/L	10	2.0	1.0	0.0993			
E Range	MW-468S_OCT19	Water	Copper	SW6020A	µg/L	1.2	3.0	0.19	2.0	J	TR	650
E Range	MW-468S_OCT19	Water	Lead	SW6020A	µg/L	0.18	1.0	0.075	0.50	J	TR	7.5
E Range	MW-468S_OCT19	Water	Magnesium	SW6020A	µg/L	2870	100	8.0	80			
E Range	MW-468S_OCT19	Water	Potassium	SW6020A	µg/L	1,010	1,000	31	400			
E Range	MW-468S_OCT19	Water	Sodium	SW6020A	µg/L	8,460	1,000	19	400			
E Range	MW-468S_OCT19	Water	Sulfate	SW9056A	mg/L	9.3	1.0	0.50	0.064			
I Range	MW-639S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	7.3	5.0	4.0	0.23			
I Range	MW-639S_OCT19	Water	Antimony	SW6020A	µg/L	0.50	1.0	0.055	0.50	U	ND	3
I Range	MW-639S_OCT19	Water	Calcium	SW6020A	µg/L	2,350	100	21	80			
I Range	MW-639S_OCT19	Water	Chloride	SW9056A	mg/L	9.1	2.0	1.0	0.0993			
I Range	MW-639S_OCT19	Water	Copper	SW6020A	µg/L	0.74	3.0	0.19	2.0	J	TR	650
I Range	MW-639S_OCT19	Water	Lead	SW6020A	µg/L	0.50	1.0	0.075	0.50	U	ND	7.5
I Range	MW-639S_OCT19	Water	Magnesium	SW6020A	µg/L	1810	100	8.0	80			
I Range	MW-639S_OCT19	Water	Potassium	SW6020A	µg/L	628	1,000	31	400	J	TR	
I Range	MW-639S_OCT19	Water	Sodium	SW6020A	µg/L	6,800	1,000	19	400			
I Range	MW-639S_OCT19	Water	Sulfate	SW9056A	mg/L	6.4	1.0	0.50	0.064			
J Range	MW-471S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	12	5.0	4.0	0.23			
J Range	MW-471S_OCT19	Water	Antimony	SW6020A	µg/L	0.089	1.0	0.055	0.50	J	TR	3
J Range	MW-471S_OCT19	Water	Calcium	SW6020A	µg/L	3280	100	21	80			
J Range	MW-471S_OCT19	Water	Chloride	SW9056A	mg/L	6.4	2.0	1.0	0.0993			
J Range	MW-471S_OCT19	Water	Copper	SW6020A	µg/L	1.2	3.0	0.19	2.0	J	TR	650
J Range	MW-471S_OCT19	Water	Lead	SW6020A	µg/L	0.23	1.0	0.075	0.50	J	TR	7.5
J Range	MW-471S_OCT19	Water	Magnesium	SW6020A	µg/L	2240	100	8.0	80			
J Range	MW-471S_OCT19	Water	Potassium	SW6020A	µg/L	770	1,000	31	400	J	TR	
J Range	MW-471S_OCT19	Water	Sodium	SW6020A	µg/L	4,870	1,000	19	400			
J Range	MW-471S_OCT19	Water	Sulfate	SW9056A	mg/L	4.8	1.0	0.50	0.064			
J Range	MW-471S_OCT19 FD	Water	Alkalinity, total	SM2320B	mg/L	12	5.0	4.0	0.23			
J Range	MW-471S_OCT19 FD	Water	Antimony	SW6020A	µg/L	0.08	1.0	0.055	0.50	J	TR	3
J Range	MW-471S_OCT19 FD	Water	Calcium	SW6020A	µg/L	3180	100	21	80			
J Range	MW-471S_OCT19 FD	Water	Chloride	SW9056A	mg/L	6.5	2.0	1.0	0.0993			
J Range	MW-471S_OCT19 FD	Water	Copper	SW6020A	µg/L	0.99	3.0	0.19	2.0	J	TR	650
J Range	MW-471S_OCT19 FD	Water	Lead	SW6020A	µg/L	0.20	1.0	0.075	0.50	J	TR	7.5



**CAMP EDWARDS SMALL ARMS RANGE BASELINE GROUNDWATER MONITORING RESULTS OCTOBER 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
J Range	MW-471S_OCT19 FD	Water	Magnesium	SW6020A	µg/L	2290	100	8.0	80			
J Range	MW-471S_OCT19 FD	Water	Potassium	SW6020A	µg/L	771	1,000	31	400	J	TR	
J Range	MW-471S_OCT19 FD	Water	Sodium	SW6020A	µg/L	4,850	1,000	19	400			
J Range	MW-471S_OCT19 FD	Water	Sulfate	SW9056A	mg/L	4.9	1.0	0.50	0.064			
J Range	MW-472S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	9.7	5.0	4.0	0.23			
J Range	MW-472S_OCT19	Water	Chloride	SW9056A	mg/L	8.9	2.0	1.0	0.0993			
J Range	MW-472S_OCT19	Water	Magnesium	SW6020A	µg/L	2710	100	8	80			
J Range	MW-472S_OCT19	Water	Potassium	SW6020A	µg/L	688	1,000	31	400	J	TR	
J Range	MW-472S_OCT19	Water	Sodium	SW6020A	µg/L	4,800	1,000	19	400			
J Range	MW-472S_OCT19	Water	Sulfate	SW9056A	mg/L	5.0	1.0	0.50	0.064			
K Range	MW-474S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	9.0	5.0	4.0	0.23			
K Range	MW-474S_OCT19	Water	Antimony	SW6020A	µg/L	0.50	1.0	0.055	0.50	U	ND	3
K Range	MW-474S_OCT19	Water	Calcium	SW6020A	µg/L	2350	100	21	80			
K Range	MW-474S_OCT19	Water	Chloride	SW9056A	mg/L	9.4	2.0	1.0	0.0993			
K Range	MW-474S_OCT19	Water	Copper	SW6020A	µg/L	0.72	3.0	0.19	2.0	J	TR	650
K Range	MW-474S_OCT19	Water	Lead	SW6020A	µg/L	0.50	1.0	0.075	0.50	U	ND	7.5
K Range	MW-474S_OCT19	Water	Magnesium	SW6020A	µg/L	2630	100	8.0	80			
K Range	MW-474S_OCT19	Water	Potassium	SW6020A	µg/L	763	1,000	31	400	J	TR	
K Range	MW-474S_OCT19	Water	Sodium	SW6020A	µg/L	6,910	1,000	19	400			
K Range	MW-474S_OCT19	Water	Sulfate	SW9056A	mg/L	4.4	1.0	0.50	0.064			
S Range	MW-465S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	20	5.0	4.0	0.23			
S Range	MW-465S_OCT19	Water	Antimony	SW6020A	µg/L	0.50	1.0	0.055	0.50	U	ND	3
S Range	MW-465S_OCT19	Water	Calcium	SW6020A	µg/L	5150	100	21	80			
S Range	MW-465S_OCT19	Water	Chloride	SW9056A	mg/L	6.1	2.0	1.0	0.0993			
S Range	MW-465S_OCT19	Water	Copper	SW6020A	µg/L	0.60	3.0	0.19	2.0	J	TR	650
S Range	MW-465S_OCT19	Water	Lead	SW6020A	µg/L	0.20	1.0	0.075	0.50	J	TR	7.5
S Range	MW-465S_OCT19	Water	Magnesium	SW6020A	µg/L	2490	100	8	80			
S Range	MW-465S_OCT19	Water	Potassium	SW6020A	µg/L	678	1,000	31	400	J	TR	
S Range	MW-465S_OCT19	Water	Sodium	SW6020A	µg/L	6,250	1,000	19	400			
S Range	MW-465S_OCT19	Water	Sulfate	SW9056A	mg/L	6.6	1.0	0.50	0.064	J	FD RPD	
S Range	MW-465S_OCT19FD	Water	Alkalinity, total	SM2320B	mg/L	17	5.0	4.0	0.23			
S Range	MW-465S_OCT19FD	Water	Antimony	SW6020A	µg/L	0.089	1.0	0.055	0.50	J	TR	3
S Range	MW-465S_OCT19FD	Water	Calcium	SW6020A	µg/L	5,430	100	21	80			
S Range	MW-465S_OCT19FD	Water	Chloride	SW9056A	mg/L	6.2	2.0	1.0	0.0993			
S Range	MW-465S_OCT19FD	Water	Copper	SW6020A	µg/L	1.2	3.0	0.19	2.0	J	TR	650
S Range	MW-465S_OCT19FD	Water	Lead	SW6020A	µg/L	0.47	1.0	0.075	0.50	J	TR	7.5



**CAMP EDWARDS SMALL ARMS RANGE BASELINE GROUNDWATER MONITORING RESULTS OCTOBER 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
S Range	MW-465S_OCT19FD	Water	Magnesium	SW6020A	µg/L	2620	100	8	80			
S Range	MW-465S_OCT19FD	Water	Potassium	SW6020A	µg/L	719	1,000	31	400	J	TR	
S Range	MW-465S_OCT19FD	Water	Sodium	SW6020A	µg/L	6,550	1,000	19	400			
S Range	MW-465S_OCT19FD	Water	Sulfate	SW9056A	mg/L	11	1.0	0.50	0.064	J	FD RPD	
S Range	MW-466S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	23	5.0	4.0	0.23			
S Range	MW-466S_OCT19	Water	Antimony	SW6020A	µg/L	0.50	1.0	0.055	0.50	U	ND	3
S Range	MW-466S_OCT19	Water	Calcium	SW6020A	µg/L	5,610	100	21	80			
S Range	MW-466S_OCT19	Water	Chloride	SW9056A	mg/L	7.4	2.0	1.0	0.0993	J	MS%R	
S Range	MW-466S_OCT19	Water	Copper	SW6020A	µg/L	1.4	3.0	0.19	2.0	J	TR	650
S Range	MW-466S_OCT19	Water	Lead	SW6020A	µg/L	0.13	1.0	0.075	0.50	J	TR	7.5
S Range	MW-466S_OCT19	Water	Magnesium	SW6020A	µg/L	2640	100	8	80			
S Range	MW-466S_OCT19	Water	Potassium	SW6020A	µg/L	751	1,000	31	400	J	TR	
S Range	MW-466S_OCT19	Water	Sodium	SW6020A	µg/L	8,300	1,000	19	400			
S Range	MW-466S_OCT19	Water	Sulfate	SW9056A	mg/L	6.3	1.0	0.50	0.064			
T Range	MW-467S_OCT19	Water	Alkalinity, total	SM2320B	mg/L	11	5.0	4.0	0.23			
T Range	MW-467S_OCT19	Water	Antimony	SW6020A	µg/L	0.5	1.0	0.055	0.50	U	ND	3
T Range	MW-467S_OCT19	Water	Calcium	SW6020A	µg/L	7530	100	21	80			
T Range	MW-467S_OCT19	Water	Chloride	SW9056A	mg/L	6.1	2.0	1.0	0.0993			
T Range	MW-467S_OCT19	Water	Copper	SW6020A	µg/L	0.66	3.0	0.19	2.0	J	TR	650
T Range	MW-467S_OCT19	Water	Lead	SW6020A	µg/L	0.5	1.0	0.075	0.50	U	ND	7.5
T Range	MW-467S_OCT19	Water	Magnesium	SW6020A	µg/L	3070	100	8	80			
T Range	MW-467S_OCT19	Water	Potassium	SW6020A	µg/L	703	1,000	31	400	J	TR	
T Range	MW-467S_OCT19	Water	Sodium	SW6020A	µg/L	8,990	1,000	19	400			
T Range	MW-467S_OCT19	Water	Sulfate	SW9056A	mg/L	21	1.0	0.50	0.064			
T Range	MW-467S_OCT19 EB	FIELDQC	Alkalinity, total	SM2320B	mg/L	1.8	5.0	4.0	0.23	J	TR	
T Range	MW-467S_OCT19 EB	Water	Antimony	SW6020A	µg/L	0.096	1.0	0.055	0.50	J	TR	3
T Range	MW-467S_OCT19 EB	Water	Calcium	SW6020A	µg/L	82	100	21	80	J	TR	
T Range	MW-467S_OCT19 EB	FIELDQC	Chloride	SW9056A	mg/L	0.10	2.0	1.0	0.0993	J	TR	
T Range	MW-467S_OCT19 EB	Water	Copper	SW6020A	µg/L	0.94	3.0	0.19	2.0	J	TR	650
T Range	MW-467S_OCT19 EB	Water	Lead	SW6020A	µg/L	0.15	1.0	0.075	0.50	J	TR	7.5
T Range	MW-467S_OCT19 EB	Water	Magnesium	SW6020A	µg/L	22	100	8.0	80	J	TR	
T Range	MW-467S_OCT19 EB	Water	Potassium	SW6020A	µg/L	48	1,000	31	400	J	TR	
T Range	MW-467S_OCT19 EB	Water	Sodium	SW6020A	µg/L	249	1,000	19	400	J	TR	
T Range	MW-467S_OCT19 EB	FIELDQC	Sulfate	SW9056A	mg/L	0.50	1.0	0.50	0.064	U	ND	

Notes:

µg/L = microgram(s) per liter

ND = nondetectable

**CAMP EDWARDS SMALL ARMS RANGE BASELINE GROUNDWATER MONITORING RESULTS OCTOBER 2019**

Site List	Field Sample ID	Matrix	Analyte	Analytical Method	Units	Lab Result	LOQ	LOD	DL	Qualifier	Reason	OMMP Action Levels (µg/L)
DL = detection limit			LOQ = limit of quantitation									
ID = identifier			TR = trace result (<LOQ and >DL)									
J = estimated value			U = not detected									

## **Small Arms Range Sampling Reports**

### Groundwater Sampling Results

Spring 2020



**Groundwater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
MW-465S APR20	GW	N	Alkalinity, total	SM2320B	Total	20	5.0	5.0	5.0	mg/L		1		
MW-465S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-465S APR20	GW	N	Calcium	SW6020A	Dissolved	5,000	96	180	200	µg/L		2		
MW-465S APR20	GW	N	Chloride	SW9056A	Total	6.0	0.12	0.30	0.40	mg/L		2		
MW-465S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-465S APR20	GW	N	Iron	SW6020A	Dissolved	24	20	40	50	µg/L		2	J	TR
MW-465S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-465S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,500	20	40	50	µg/L		2		
MW-465S APR20	GW	N	Phosphorus, total	E365.4	Total	2.6	0.82	1.1	2.0	mg/L		1		
MW-465S APR20	GW	N	Potassium	SW6020A	Dissolved	690	45	90	100	µg/L		2		
MW-465S APR20	GW	N	Sodium	SW6020A	Dissolved	6,500	50	90	100	µg/L		2		
MW-465S APR20	GW	N	Sulfate	SW9056A	Total	6.3	0.10	0.30	1.0	mg/L		2		
MW-465S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-465S APR20 FD	GW	FD	Alkalinity, total	SM2320B	Total	21	5.0	5.0	5.0	mg/L		1		
MW-465S APR20 FD	GW	FD	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-465S APR20 FD	GW	FD	Calcium	SW6020A	Dissolved	4,900	96	180	200	µg/L		2		
MW-465S APR20 FD	GW	FD	Chloride	SW9056A	Total	6.0	0.12	0.30	0.40	mg/L		2		
MW-465S APR20 FD	GW	FD	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-465S APR20 FD	GW	FD	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-465S APR20 FD	GW	FD	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-465S APR20 FD	GW	FD	Magnesium	SW6020A	Dissolved	2,400	20	40	50	µg/L		2		
MW-465S APR20 FD	GW	FD	Phosphorus, total	E365.4	Total	1.6	0.82	1.1	2.0	mg/L		1	J	TR
MW-465S APR20 FD	GW	FD	Potassium	SW6020A	Dissolved	620	45	90	100	µg/L		2		
MW-465S APR20 FD	GW	FD	Sodium	SW6020A	Dissolved	6,100	50	90	100	µg/L		2		
MW-465S APR20 FD	GW	FD	Sulfate	SW9056A	Total	6.3	0.10	0.30	1.0	mg/L		2		
MW-465S APR20 FD	GW	FD	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-466S APR20	GW	N	Alkalinity, total	SM2320B	Total	28	5.0	5.0	5.0	mg/L		1		
MW-466S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-466S APR20	GW	N	Calcium	SW6020A	Dissolved	6,300	96	180	200	µg/L		2		
MW-466S APR20	GW	N	Chloride	SW9056A	Total	7.5	0.12	0.30	0.40	mg/L		2		
MW-466S APR20	GW	N	Copper	SW6020A	Dissolved	8.6	1.9	2.5	3.0	µg/L	650	2		
MW-466S APR20	GW	N	Iron	SW6020A	Dissolved	30	20	40	50	µg/L		2	J	TR
MW-466S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-466S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,900	20	40	50	µg/L		2		
MW-466S APR20	GW	N	Phosphorus, total	E365.4	Total	1.5	0.82	1.1	2.0	mg/L		1	J	TR
MW-466S APR20	GW	N	Potassium	SW6020A	Dissolved	740	45	90	100	µg/L		2		
MW-466S APR20	GW	N	Sodium	SW6020A	Dissolved	8,200	50	90	100	µg/L		2		
MW-466S APR20	GW	N	Sulfate	SW9056A	Total	6.0	0.10	0.30	1.0	mg/L		2		
MW-466S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-467S APR20	GW	N	Alkalinity, total	SM2320B	Total	16	5.0	5.0	5.0	mg/L		1		
MW-467S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND



**Groundwater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
MW-467S APR20	GW	N	Calcium	SW6020A	Dissolved	5,900	96	180	200	µg/L		2		
MW-467S APR20	GW	N	Chloride	SW9056A	Total	6.2	0.12	0.30	0.40	mg/L		2		
MW-467S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-467S APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-467S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-467S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,500	20	40	50	µg/L		2		
MW-467S APR20	GW	N	Phosphorus, total	E365.4	Total	1.2	0.82	1.1	2.0	mg/L		1	J	TR
MW-467S APR20	GW	N	Potassium	SW6020A	Dissolved	620	45	90	100	µg/L		2		
MW-467S APR20	GW	N	Sodium	SW6020A	Dissolved	8,200	50	90	100	µg/L		2		
MW-467S APR20	GW	N	Sulfate	SW9056A	Total	9.6	0.10	0.30	1.0	mg/L		2		
MW-467S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-467S APR20 EB	FIELDQC	EB	Alkalinity, total	SM2320B	Total	5.0	5.0	5.0	5.0	mg/L		1	U	ND
MW-467S APR20 EB	FIELDQC	EB	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-467S APR20 EB	FIELDQC	EB	Calcium	SW6020A	Dissolved	180	96	180	200	µg/L		2	J	TR
MW-467S APR20 EB	FIELDQC	EB	Chloride	SW9056A	Total	0.15	0.060	0.15	0.20	mg/L		1	U	ND
MW-467S APR20 EB	FIELDQC	EB	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-467S APR20 EB	FIELDQC	EB	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-467S APR20 EB	FIELDQC	EB	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-467S APR20 EB	FIELDQC	EB	Magnesium	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-467S APR20 EB	FIELDQC	EB	Phosphorus, total	E365.4	Total	1.4	0.82	1.1	2.0	mg/L		1	J	TR
MW-467S APR20 EB	FIELDQC	EB	Potassium	SW6020A	Dissolved	90	45	90	100	µg/L		2	U	ND
MW-467S APR20 EB	FIELDQC	EB	Sodium	SW6020A	Dissolved	3,200	50	90	100	µg/L		2		
MW-467S APR20 EB	FIELDQC	EB	Sulfate	SW9056A	Total	0.15	0.050	0.15	0.50	mg/L		1	U	ND
MW-468S APR20	GW	N	Alkalinity, total	SM2320B	Total	7.9	5.0	5.0	5.0	mg/L		1		
MW-468S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-468S APR20	GW	N	Calcium	SW6020A	Dissolved	3,100	96	180	200	µg/L		2		
MW-468S APR20	GW	N	Chloride	SW9056A	Total	10	0.60	1.5	2.0	mg/L		10		
MW-468S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-468S APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-468S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-468S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,100	20	40	50	µg/L		2		
MW-468S APR20	GW	N	Phosphorus, total	E365.4	Total	1.6	0.82	1.1	2.0	mg/L		1	J	TR
MW-468S APR20	GW	N	Potassium	SW6020A	Dissolved	820	45	90	100	µg/L		2		
MW-468S APR20	GW	N	Sodium	SW6020A	Dissolved	7,500	50	90	100	µg/L		2		
MW-468S APR20	GW	N	Sulfate	SW9056A	Total	6.6	0.10	0.30	1.0	mg/L		2		
MW-468S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-471S APR20	GW	N	Alkalinity, total	SM2320B	Total	9.5	5.0	5.0	5.0	mg/L		1		
MW-471S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-471S APR20	GW	N	Calcium	SW6020A	Dissolved	2,900	96	180	200	µg/L		2		
MW-471S APR20	GW	N	Chloride	SW9056A	Total	6.4	0.12	0.30	0.40	mg/L		2		



**Groundwater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
MW-471S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-471S APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-471S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-471S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,100	20	40	50	µg/L		2		
MW-471S APR20	GW	N	Phosphorus, total	E365.4	Total	8.6	0.82	1.1	2.0	mg/L		1	J	D
MW-471S APR20	GW	N	Potassium	SW6020A	Dissolved	700	45	90	100	µg/L		2		
MW-471S APR20	GW	N	Sodium	SW6020A	Dissolved	5,500	50	90	100	µg/L		2		
MW-471S APR20	GW	N	Sulfate	SW9056A	Total	6.5	0.10	0.30	1.0	mg/L		2		
MW-471S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.51	0.50	0.50	1.0	mg/L		1	J	TR
MW-471S APR20 FD	GW	FD	Alkalinity, total	SM2320B	Total	9.9	5.0	5.0	5.0	mg/L		1		
MW-471S APR20 FD	GW	FD	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-471S APR20 FD	GW	FD	Calcium	SW6020A	Dissolved	2,800	96	180	200	µg/L		2		
MW-471S APR20 FD	GW	FD	Chloride	SW9056A	Total	6.6	0.12	0.30	0.40	mg/L		2		
MW-471S APR20 FD	GW	FD	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-471S APR20 FD	GW	FD	Iron	SW6020A	Dissolved	42	20	40	50	µg/L		2	J	TR
MW-471S APR20 FD	GW	FD	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-471S APR20 FD	GW	FD	Magnesium	SW6020A	Dissolved	2,100	20	40	50	µg/L		2		
MW-471S APR20 FD	GW	FD	Phosphorus, total	E365.4	Total	4.7	0.82	1.1	2.0	mg/L		1	J	D
MW-471S APR20 FD	GW	FD	Potassium	SW6020A	Dissolved	750	45	90	100	µg/L		2		
MW-471S APR20 FD	GW	FD	Sodium	SW6020A	Dissolved	5,700	50	90	100	µg/L		2		
MW-471S APR20 FD	GW	FD	Sulfate	SW9056A	Total	5.5	0.10	0.30	1.0	mg/L		2		
MW-471S APR20 FD	GW	FD	Total Carbon	E415.1	Dissolved	0.51	0.50	0.50	1.0	mg/L		1	J	TR
MW-472S APR20	GW	N	Alkalinity, total	SM2320B	Total	9.1	5.0	5.0	5.0	mg/L		1		
MW-472S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-472S APR20	GW	N	Calcium	SW6020A	Dissolved	2,700	96	180	200	µg/L		2		
MW-472S APR20	GW	N	Chloride	SW9056A	Total	8.3	0.12	0.30	0.40	mg/L		2		
MW-472S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-472S APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-472S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-472S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,800	20	40	50	µg/L		2		
MW-472S APR20	GW	N	Phosphorus, total	E365.4	Total	6.7	0.82	1.1	2.0	mg/L		1		
MW-472S APR20	GW	N	Potassium	SW6020A	Dissolved	690	45	90	100	µg/L		2		
MW-472S APR20	GW	N	Sodium	SW6020A	Dissolved	4,800	50	90	100	µg/L		2		
MW-472S APR20	GW	N	Sulfate	SW9056A	Total	5.4	0.10	0.30	1.0	mg/L		2		
MW-472S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-474S APR20	GW	N	Alkalinity, total	SM2320B	Total	7.2	5.0	5.0	5.0	mg/L		1		
MW-474S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-474S APR20	GW	N	Calcium	SW6020A	Dissolved	2,400	96	180	200	µg/L		2		
MW-474S APR20	GW	N	Chloride	SW9056A	Total	8.6	0.12	0.30	0.40	mg/L		2		
MW-474S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND

**Groundwater Sample Results Spring 2020**

Field Sample ID	Matrix	Sample Type	Analyte	Analytical Method	Extraction Method	Lab Result	MDL	LOD	LOQ	Units	OMMP Action Level (mg/L)	Dilution Factor	Qualifier	Reason
MW-474S APR20	GW	N	Iron	SW6020A	Dissolved	40	20	40	50	µg/L		2	U	ND
MW-474S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-474S APR20	GW	N	Magnesium	SW6020A	Dissolved	2,400	20	40	50	µg/L		2		
MW-474S APR20	GW	N	Phosphorus, total	E365.4	Total	2.4	0.82	1.1	2.0	mg/l.		1		
MW-474S APR20	GW	N	Potassium	SW6020A	Dissolved	740	45	90	100	µg/L		2		
MW-474S APR20	GW	N	Sodium	SW6020A	Dissolved	6,600	50	90	100	µg/L		2		
MW-474S APR20	GW	N	Sulfate	SW9056A	Total	4.6	0.10	0.30	1.0	mg/L		2		
MW-474S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND
MW-639S APR20	GW	N	Alkalinity, total	SM2320B	Total	6.1	5.0	5.0	5.0	mg/L		1		
MW-639S APR20	GW	N	Antimony	SW6020A	Dissolved	4.0	2.0	4.0	5.0	µg/L	3	2	U	ND
MW-639S APR20	GW	N	Calcium	SW6020A	Dissolved	2,200	96	180	200	µg/L		2		
MW-639S APR20	GW	N	Chloride	SW9056A	Total	9.6	0.12	0.30	0.40	mg/L		2		
MW-639S APR20	GW	N	Copper	SW6020A	Dissolved	2.5	1.9	2.5	3.0	µg/L	650	2	U	ND
MW-639S APR20	GW	N	Iron	SW6020A	Dissolved	85	20	40	50	µg/L		2		
MW-639S APR20	GW	N	Lead	SW6020A	Dissolved	2.0	1.0	2.0	3.0	µg/L	7.5	2	U	ND
MW-639S APR20	GW	N	Magnesium	SW6020A	Dissolved	1,700	20	40	50	µg/L		2		
MW-639S APR20	GW	N	Phosphorus, total	E365.4	Total	1.3	0.82	1.1	2.0	mg/L		1	J	TR
MW-639S APR20	GW	N	Potassium	SW6020A	Dissolved	600	45	90	100	µg/L		2		
MW-639S APR20	GW	N	Sodium	SW6020A	Dissolved	6,700	50	90	100	µg/L		2		
MW-639S APR20	GW	N	Sulfate	SW9056A	Total	6.1	0.10	0.30	1.0	mg/L		2		
MW-639S APR20	GW	N	Total Carbon	E415.1	Dissolved	0.50	0.50	0.50	1.0	mg/L		1	U	ND

Notes:

µg/L = microgram(s) per liter MDL = method detection limit LOQ = limit of quantitation  
 D = replicate and parent sample mg/L = milligram(s) per liter LOD = limit of detection  
 ID = identifier N = normal (primary) sample TR = trace result (<LOQ and >MDL)  
 J = estimated value ND = nondetectable U = not detected

## **Small Arms Range Sampling Reports**

XRF Results

Fall 2019 and Spring 2020



**Camp Edwards Small Arms Range XRF Results Fall 2019**

Site/SLX List	Location ID	Date Sampled	Time Sampled	Test Method	Analyte	Result Value (ppm)	OMMP Action Levels (mg/kg)
Sierra Range	50 m backstop, Lane 4	10/07/2019	1442	XRF	Copper	62	10,000
Sierra Range	50 m backstop, Lane 4	10/07/2019	1442	XRF	Copper	65	10,000
Sierra Range	50 m backstop, Lane 4	10/07/2019	1442	XRF	Copper	58	10,000
Sierra Range	100 m backstop, Lane 6	10/07/2019	1500	XRF	Copper	316	10,000
Sierra Range	100 m backstop, Lane 6	10/07/2019	1500	XRF	Copper	319	10,000
Sierra Range	100 m backstop, Lane 6	10/07/2019	1500	XRF	Copper	317	10,000
Sierra Range	320 m backstop, Lane 4	10/07/2019	1521	XRF	Copper	23	10,000
Sierra Range	320 m backstop, Lane 4	10/07/2019	1521	XRF	Copper	25	10,000
Sierra Range	320 m backstop, Lane 4	10/07/2019	1521	XRF	Copper	20	10,000

Notes:

m = meter

ppm = parts per million

XRF = X-ray Fluorescence

**Camp Edwards Small Arms Range XRF Results Spring 2020**

Site/SLX List	Location ID	Date Sampled	Time Sampled	Test Method	Analyte	Result Value (ppm)	OMMP Action Levels (mg/kg)
Sierra Range	50 m backstop, Lane 4	04/08/2020	1315	XRF	Copper	62	10,000
Sierra Range	50 m backstop, Lane 4	04/08/2020	1315	XRF	Copper	65	10,000
Sierra Range	50 m backstop, Lane 4	04/08/2020	1314	XRF	Copper	58	10,000
Sierra Range	100 m backstop, Lane 6	04/08/2020	1330	XRF	Copper	316	10,000
Sierra Range	100 m backstop, Lane 6	04/08/2020	1330	XRF	Copper	319	10,000
Sierra Range	100 m backstop, Lane 6	04/08/2020	1330	XRF	Copper	317	10,000
Sierra Range	320 m backstop, Lane 4	04/08/2020	1345	XRF	Copper	23	10,000
Sierra Range	320 m backstop, Lane 4	04/08/2020	1345	XRF	Copper	25	10,000
Sierra Range	320 m backstop, Lane 4	04/08/2020	1345	XRF	Copper	20	10,000

Notes:

m = meter

ppm = parts per million

XRF = X-ray Fluorescence

## **Soldier Validation Lane Annual Report**

**Camp Edwards --- Massachusetts Army National Guard**

**Soldier Validation Lane Annual Monitoring Report**

**February, 2021**

**(NHESP Tracking No.: 08-24210)**

**Soldier Validation Lane Use**

Five containers were moved out of soldier validation lanes (SVL) and placed in battle positions (BP) in 2020. All container movements were performed in accordance with the Container Placement Checklist in Appendix B of the MESA review application. BP will be treated as SVL so long as containers remain on site, though their names will not change. All maneuver activities associated with the sites were limited to established roads, road shoulders, and roadways within power line right of ways.

**SVL Assessments after 2020 Training Season**

All sites with containers were visited in February 2021 to evaluate training impacts during the 2020 training season. The assessment methodology matched the assessment performed in the Baseline Condition Assessment Report and FYs 12-19, to provide a means of comparison. The containers replicate buildings, and prop materials are utilized to create a more realistic setting, such as barrels, bicycles, grills, tires, wall sections, etc. SVL-1 and SVL-3 had no major changes for 2020. SVL-6 had no major changes, but the surrounding area was mechanically thinned during the fall. SVL-4 had pitch pine regen cut back (Fig. 1) and five containers removed. The remaining containers at SVL-21 pre-date military use of the site, and all military containers were removed prior to the 2019 training season. This site will no longer be monitored, barring future installation of containers.

The first new site, BP-24, was rehabbed over the last two years. The area was cleared of pine, graded, reseeded with cool and warm-season grasses, and had two containers placed there (Fig. 2 & 3). There were minimal tire tracks and no rutting, some boulders throughout the site that would affect helicopter maneuvers, a pile of gravel and a brush pile. The second new site, BP-20, had two containers placed into the rear west corner (Fig. 4). There were minor tire tracks and minimal erosion (Fig. 5), a small island of pitch pine and shrubs, and cool and warm-season grasses throughout. The third new site, BP-12, had minor ruts from vehicles and dirt bikes (Fig. 6 & 7), pitch pine saplings growing densely on one half of the site, and one container.

**Conclusion**

All regulatory conditions were followed during use of the SVL and BP for training. Most erosion and rutting impacts have remained static on the lanes as expected with regular levels of vehicle use and regular stormwater runoff on dirt roads. Based on a renewed LRAM emphasis on managing pitch pine before it can choke out training areas, all SVL and BP will be prioritized for removing juvenile pitch pine encroaching on training assets. The MAARNG will continue to strive to minimize environmental impacts from these lanes by following the established guidelines.



Figure 1: View of pitch pine regen cut back on the edges of SVL-4. Bare patches left from removed containers.





Figure 2: Containers and gravel pile viewed from the northerly entrance of BP-24.



Figure 3: View of southern and western corners of BP-24, with minor tire tracks.



Figure 4: View of containers and minor tire tracks at BP-20.



Figure 5: Minor erosion occurring where the gravel road ends at BP-20.



Figure 6: View of BP-12.



Figure 7: Tire tracks at BP-12.



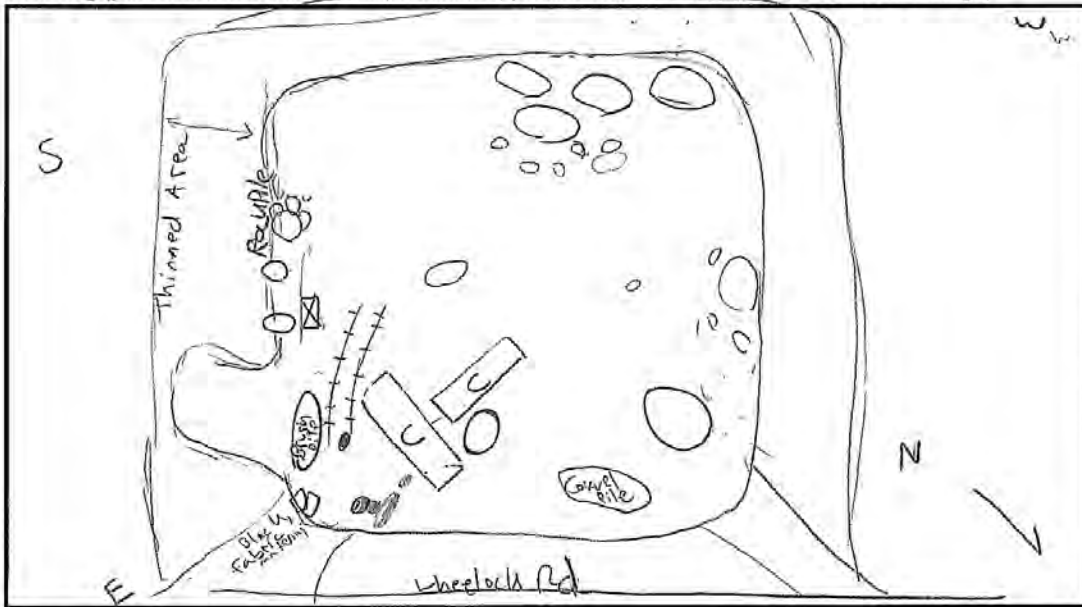
**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

Site BP24 Assessors RL, NM Date 2/5/2021

Damage	Description
<input checked="" type="checkbox"/> Tree scarring	Newly rehabbed sites. Tire tracks but not
<input checked="" type="checkbox"/> Standing deadwood	cutting.
<input checked="" type="checkbox"/> Felled trees	
<input checked="" type="checkbox"/> Brush piles	One snow fence piece along southern edge. Also rolls of black material.
<input type="checkbox"/> Erosion	
<input type="checkbox"/> Ditching/rutting	Very minor tire tracks visible near entrance.
<input checked="" type="checkbox"/> Trash	
<input type="checkbox"/> Spills	Gravel Pile by entrance & a large boulder. Boulder by conexes.
<input checked="" type="checkbox"/> Material piles	Brush/Dirt Pile by entrance (South), along southern border is a rock pile and a few portable boulders.
<input type="checkbox"/> Other	
<b>Percent Cover</b>	<b>Dominant Species</b>
<u>10</u> Trees	PPDF
<u>10</u> Shrubs	scrub oak
<u>75</u> Herbaceous	Grasses
<u>5</u> Bare	sandy dirt, some visible rocks

Any improvements made for training?  
Within past 2 years, cleared of pines, graded and  
reseeded with warm season grasses.

Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



- Snow fencing.
- Puddles
- Containers/Conex
- Rocks or Boulders
- Rutting/Air tracks



**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

Site BP20 Assessors NM Date 2/5/2021

Damage	Description
<input type="checkbox"/>	Tree scarring
<input type="checkbox"/>	Standing deadwood
<input type="checkbox"/>	Felled trees
<input type="checkbox"/>	Brush piles
<input checked="" type="checkbox"/>	Erosion
<input type="checkbox"/>	Ditching/rutting
<input type="checkbox"/>	Trash
<input type="checkbox"/>	Spills
<input type="checkbox"/>	Material piles
<input type="checkbox"/>	Other

In center of unit, past gravel road, open area with minor erosion.

Percent Cover	Dominant Species
<u>10</u> Trees	<u>Pitch Pine</u>
<u>5</u> Shrubs	<u>Scrub oakh</u>
<u>50</u> Herbaceous	<u>Grasses</u>
<u>35</u> Bare	<u>Bare Dirt / sand</u>

Any improvements made for training?

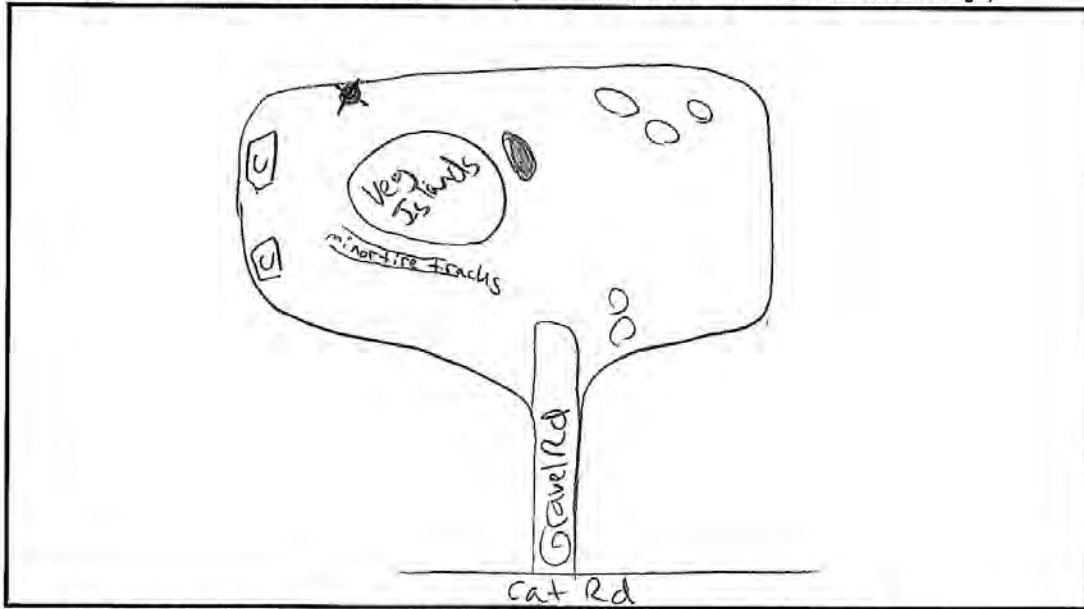
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Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

Site BP12 Assessors NJM Date 2/5/2021

Damage	Description
<input type="checkbox"/> Tree scarring	
<input type="checkbox"/> Standing deadwood	
<input type="checkbox"/> Felled trees	
<input type="checkbox"/> Brush piles	
<input type="checkbox"/> Erosion	
<input checked="" type="checkbox"/> Ditching/rutting	Minor ruts from vehicles
<input type="checkbox"/> Trash	
<input type="checkbox"/> Spills	
<input type="checkbox"/> Material piles	
<input type="checkbox"/> Other	

Percent Cover	Dominant Species
<input type="checkbox"/> Trees	
<u>40</u> Shrubs	Pitch Pine regen
<u>20</u> Herbaceous	
<u>40</u> Bare	

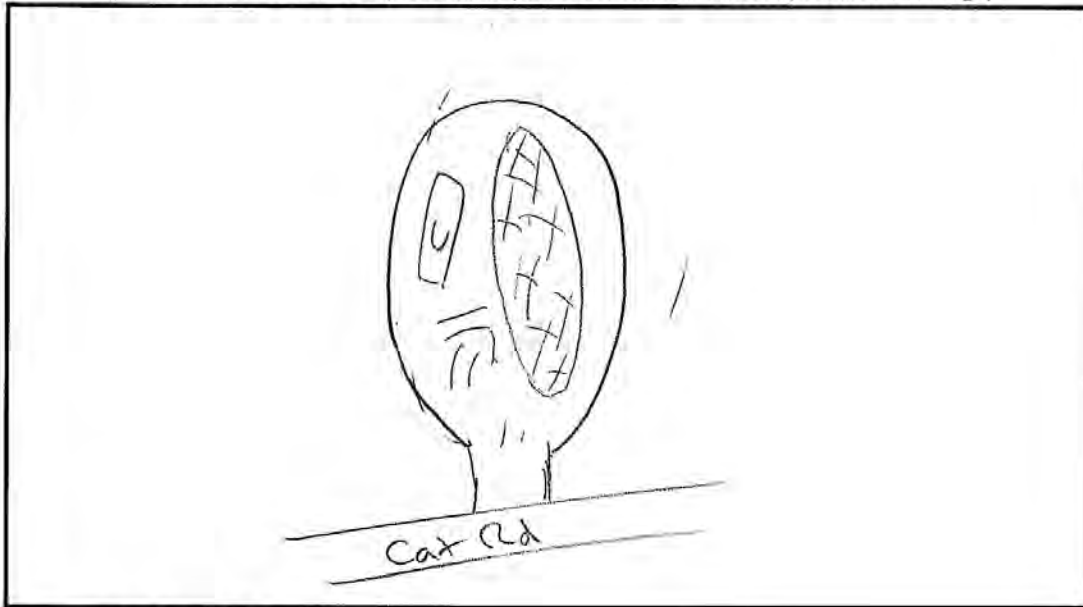
Any improvements made for training?

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\_\_\_\_\_

Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



Pitch Pine regen  
 Tire ruts

**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

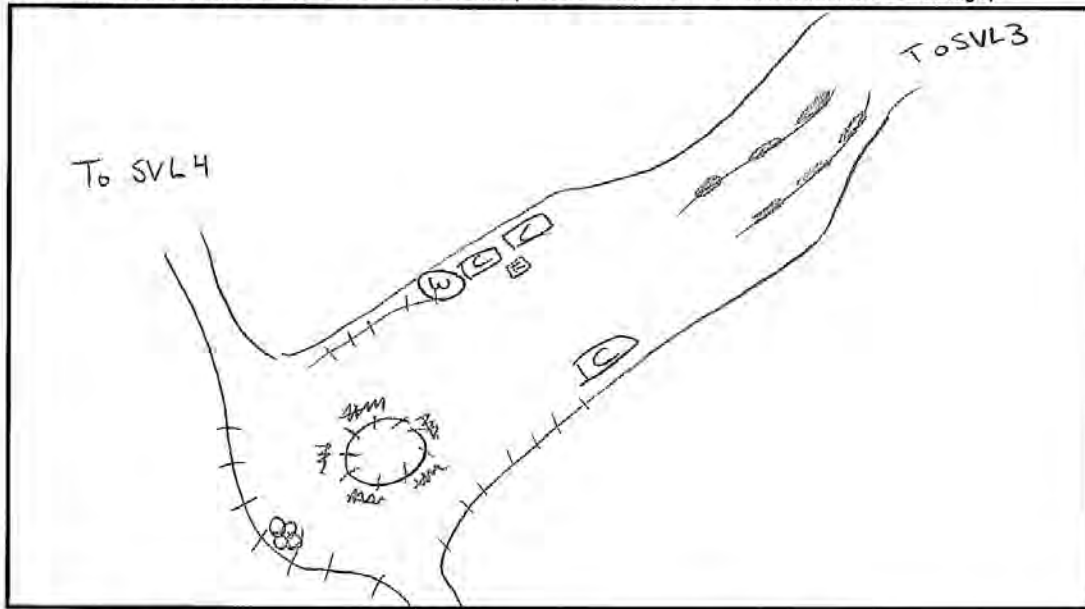
Site SVL1 Assessors N. Madder Date 2/5/2021

Damage	Description
<input type="checkbox"/> Tree scarring	
<input type="checkbox"/> Standing deadwood	
<input type="checkbox"/> Felled trees	
<input type="checkbox"/> Brush piles	
<input type="checkbox"/> Erosion	
<input checked="" type="checkbox"/> Ditching/rutting	<u>Some on way to SVL 3</u>
<input type="checkbox"/> Trash	
<input type="checkbox"/> Spills	
<input checked="" type="checkbox"/> Material piles	<u>Small pile of concrete slabs at rotary</u>
<input type="checkbox"/> Other	

Percent Cover	Dominant Species
<input type="checkbox"/> 0 Trees	<u>surrounded by PPOF, no trees within SVL boundary</u>
<input type="checkbox"/> 5 Shrubs	
<input type="checkbox"/> 5 Herbaceous	<u>grasses</u>
<input type="checkbox"/> 90 Bare	<u>sand &amp; dirt</u>

Any improvements made for training?  
Seems same as 2019 visit.

Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



- = rotary
- = rutting
- = concrete slabs
- = water tower
- = furniture





**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

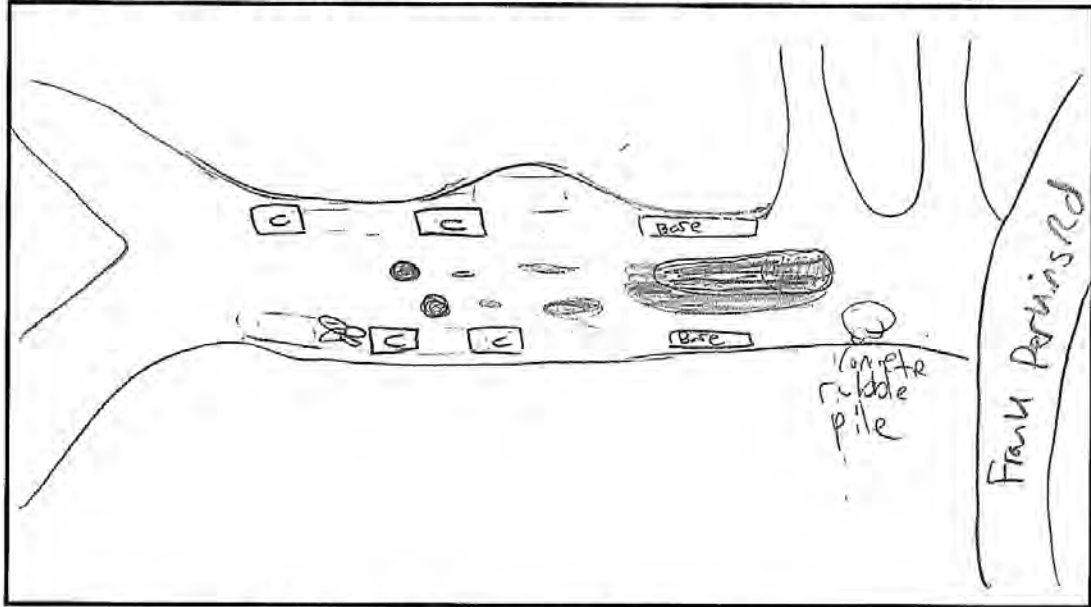
Site SVL4 Assessors NM Date 2/5/2021

Damage	Description
<input type="checkbox"/> Tree scarring	
<input type="checkbox"/> Standing deadwood	
<input checked="" type="checkbox"/> Felled trees	Pitch Pine regens cut back recently.
<input type="checkbox"/> Brush piles	
<input type="checkbox"/> Erosion	
<input type="checkbox"/> Ditching/rutting	
<input type="checkbox"/> Trash	
<input type="checkbox"/> Spills	
<input checked="" type="checkbox"/> Material piles	Pile of concrete road barriers.
<input type="checkbox"/> Other	

Percent Cover	Dominant Species
<u>0</u> Trees	
<u>0</u> Shrubs	
<u>5</u> Herbaceous	Grasses
<u>95</u> Bare	dirt sand

Any improvements made for training?  
Pitch Pine regens cut back. Two bare areas where cones used to be.

Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



☐ Cones    ○ Puddles    ⊞ Concrete road barriers

(large scale)

**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

Site SVL6 Assessors NM Date 2/16/2021

Damage	Description
<input type="checkbox"/>	Tree scarring
<input type="checkbox"/>	Standing deadwood
<input type="checkbox"/>	Felled trees
<input type="checkbox"/>	Brush piles
<input checked="" type="checkbox"/>	Erosion
<input checked="" type="checkbox"/>	Ditching/rutting
<input type="checkbox"/>	Trash
<input type="checkbox"/>	Spills
<input checked="" type="checkbox"/>	Material piles
<input type="checkbox"/>	Other

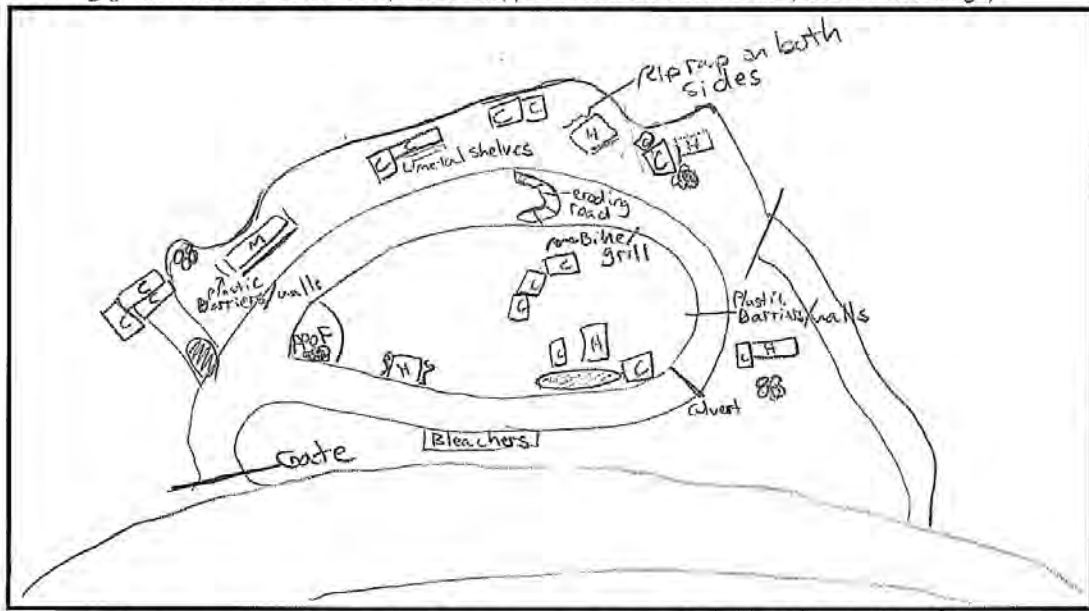
edges of road have slight erosion occurring

Sand bags & chunks of concrete  
Standing water

Percent Cover	Dominant Species
35 Trees	PIRT
10 Shrubs	Quil / COPE 80
40 Herbaceous	grasses
15 Bare	gravel / compacted dirt

Any improvements made for training?  
Not much has changed in site from 2019 to now.  
Surrounding area outside SVL was mechanically thinned  
and mastication machine used.

Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



C Conex     M Mosque     H Hanger/Metal Building  
 Sand bags & concrete rubble     Puddle/standing water

**Joint Base Cape Cod - Soldier Validation Lane  
Post Assessment of Container Locations**

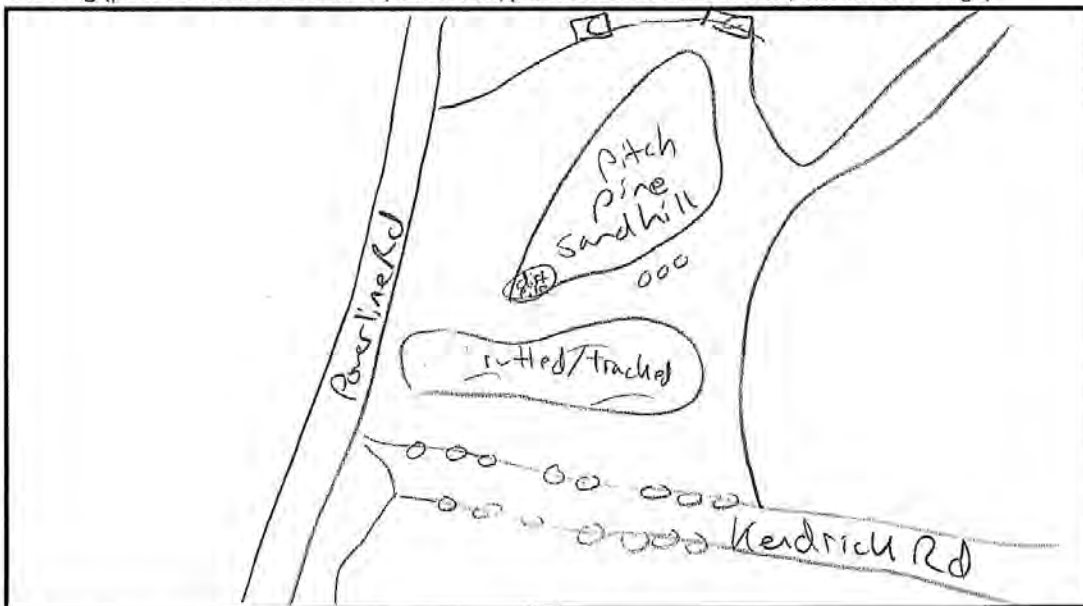
Site SVL 21 Assessors N. Madden Date 2/5/2021

Damage	Description
<input type="checkbox"/>	Tree scarring
<input type="checkbox"/>	Standing deadwood
<input type="checkbox"/>	Felled trees
<input type="checkbox"/>	Brush piles
<input type="checkbox"/>	Erosion
<input checked="" type="checkbox"/>	Ditching/rutting <u>Not too bad, minor</u>
<input type="checkbox"/>	Trash
<input type="checkbox"/>	Spills
<input checked="" type="checkbox"/>	Material piles <u>Dirt pile</u>
<input type="checkbox"/>	Other

Percent Cover	Dominant Species
<u>3</u> Trees	<u>PIRE</u>
<u>2</u> Shrubs	<u>DT RE Fegen, Owl</u>
<u>2</u> Herbaceous	<u>grasses</u>
<u>93</u> Bare	<u>sand / sandy loam</u>

Any improvements made for training?  
N/A  
No changes from pilot survey

Drawing (please include a north arrow, landmarks, photo locations and direction, location of damage)



⊙⊙⊙ rock barrier w/ Fegen pitch pine.  
 ⊙⊙ rocks

# APPENDIX D

## ENVIRONMENTAL LAWS AND REGULATIONS



**ENVIRONMENTAL LAWS AND REGULATIONS  
GOVERNING MAARNG ACTIVITIES IN THE TRAINING AREA/RESERVE**

<b>Reserve EPS</b>	<b>Federal Law / Regulation</b>	<b>State Law / Regulation</b>	<b>DoD Regulation</b>
Groundwater Resources	Clean Water Act	Drinking Water Quality Standards (310 CMR 22.00)	AR 200-1
	Safe Drinking Water Act	State Wellhead Protection (310 CMR 22.21) Water Management Act (310 CMR 36.00)	AR 200-2 Camp Edwards Regulation (CER) 385-63
Wetlands and Surface Water	Clean Water Act	Massachusetts Wetlands Protection Act	AR 200-2
	Coastal Zone Management Act Floodplains Management (EO 11988) Protection of Wetlands (EO 11990) Rivers and Harbors Act of 1899 Sikes Act Wetlands Management (EO 11990)	(M.G.L. c. 131, s40; 310 CMR 100.00 )	CER 385-63
Rare Species	Federal Endangered Species Act Sikes Act	Massachusetts Endangered Species Act (M.G.L. c. 131A, 321 CMR 10.00)	AR 200-1 AR 200-2 AR 200-3 CER 385-63
Soil Conservation	Sikes Act		AR 200-1
	Soils and Water Conservation Act Use of Off-Road Vehicles on Public Lands (EO 11989)		AR 200-2 AR 200-3 CER 385-63
Vegetation Management	American Indian Religious Freedom Act		AR 200-1
	Environmental Justice (EO 12898) Exotic Organisms (EO 11987) Sikes Act		AR 200-2 AR 200-3 CER 385-63
Habitat Management	Sikes Act	Massachusetts Endangered Species Act (M.G.L. c. 131A, 321 CMR 10.00)	AR 200-1 AR 200-2 AR 200-3 CER 385-63
Wildlife Management	Fish and Wildlife Conservation Act		AR 200-1
	Migratory Bird Conservation Act Migratory Bird Treaty Act Sikes Act		AR 200-2 AR 200-3 CER 385-63
Air Quality	Clean Air Act	State Air Quality Regulations (310 CMR 4.00)	AR 200-1 AR 200-2 CER 385-63

**ENVIRONMENTAL LAWS AND REGULATIONS  
GOVERNING MAARNG ACTIVITIES IN THE TRAINING AREA/RESERVE**

<b>Reserve EPS</b>	<b>Federal Law / Regulation</b>	<b>State Law / Regulation</b>	<b>DoD Regulation</b>
Noise Management	Federal Interagency Committee		AR 200-1
	Land Noise Control Act Occupational Safety & Health Act Use Planning Standards on Urban Noise, Guidelines for Considering Noise in Land Planning and Control (June 1990)		AR 200-2
Pest Management	Animal Damage Control Act		DoD 4150.7
	Federal Insecticide, Fungicide, and Rodenticide Act		AR 200-1
	Noxious Weed Act		AR 200-2
	Resource Conservation and Recovery Act		AR 200-5
	Sikes Act		AR 420-47
	Toxic Substances Control Act		
Fire Management	Clean Air Act	State Air Quality Regulations	AR 200-1
	Sikes Act	(310 CMR 4.00)	AR 200-2
	The National Fire Code		AR 200-3
	Uniform Fire Code		AR 420-90 CER 385-63
Storm Water Management	Clean Water Act	Massachusetts Wetlands Protection Act	AR 200-1
	NPDES discharge permitting and limitations	(M.G.L. c. 131 s.40, 310 CMR 10.00.)	AR 200-2
Wastewater	Clean Water Act	Title V (310 CMR 15.00)	AR 200-1 CER 385-63
Solid Waste	Resource Conservation and Recovery Act	State Solid Waste Handling and Disposal	AR 200-1
	Toxic Substances Control Act	(310 CMR 16.00/19.00)	AR 200-2
			AR 420-47 CER 385-63
Hazardous Materials	Asbestos Hazard Emergency Response (40 CFR 763)	Hazardous Substances Labeling Law (105 CMR 650.00)	AR 200-1
	Federal Insecticide, Fungicide and Rodenticide Act		AR 200-2
	Hazard Communication Standard Program (29 CFR 1910.1200)		CER 385-63
	Lead Contamination Control Act OSHA (29 CFR 1910, 29 USC 91-596)		
	Poison Prevention Packaging Act		
	Toxic Substances Control Act		

**ENVIRONMENTAL LAWS AND REGULATIONS  
GOVERNING MAARNG ACTIVITIES IN THE TRAINING AREA/RESERVE**

<b>Reserve EPS</b>	<b>Federal Law / Regulation</b>	<b>State Law / Regulation</b>	<b>DoD Regulation</b>
Hazardous Waste	Clean Air Act	Department of Transportation	AR 200-1
	Clean Water Act	regulations regarding shipping	AR 200-2
	Emergency Preparedness and Community Right-To-Know Act	and transportation, Hazardous Waste Management and	AR 420-47 CER 385-63
	Federal Facilities Compliance Act	Transportation (310 CMR	
	Hazardous Waste Operations and Emergency Response	30.000)	
	Medical Waste Tracking	Management of Medical Waste (105 CMR 480)	
	National Fire Code	Pesticide use (333 CMR 1.00 –	
	Oil Pollution Act	12.00)	
	Pollution Prevention Act	Solid waste facilities	
	Resource Conservation and Recovery Act	management (310 CMR	
	The National Contingency Plan	16.00/19.00)	
	Underground Storage Tank Program (RCRA, Title I)	State right-to-know requirements (105 CMR 670.00)	
	Uniform Building and Fire Codes	Title V (310 CMR 15.00)	
	Comprehensive Environmental Response, Compensation, and Liability Act	Toxic use reduction (310 CMR 5.00)	
		Underground storage tanks standards (527 CMR 4.00 and 9.0)	
	Massachusetts Contingency Plan (310 CMR 40.00)		
Vehicle	Use of Off-Road Vehicles on Public Lands (EO 11989)		AR 200-2 CER 385-63
General Use And Access	Use of Off-Road Vehicles on Public Lands (EO 11989)		AR 200-1 AR 200-2 CER 385-63

**ENVIRONMENTAL LAWS AND REGULATIONS  
GOVERNING MAARNG ACTIVITIES IN THE TRAINING AREA/RESERVE**

<b>Reserve EPS</b>	<b>Federal Law / Regulation</b>	<b>State Law / Regulation</b>	<b>DoD Regulation</b>
Cultural Resources  (This EPS refers to archeological resources only; the list of regulations cited here has therefore been restricted to those that pertain to protection of archeological resources)	Antiquities Act of 1906 Archeological and Historic Preservation Act of 1974 Archeological Resources Protection Act of 1979 Consultation and Coordination with Indian Tribal Governments (Executive Order 13175) Curation of Federally Owned/Administered Archeological Collections Executive Memorandum of April 19, 1994 – Government-to-Government Relations with American Tribal Governments National Environmental Policy Act of 1966, as amended Native American Graves Protection and Repatriation Act of 1990	Massachusetts General Laws, Chapter 9, sections 26-27C as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00)  Massachusetts Environmental Policy Act (MEPA) Massachusetts General Laws Chapter 30, sections 61 through 62H, inclusive (301 CMR 11.00)  Massachusetts General Laws, Chapter 38, section 6B; Chapter 9, sections 26A and 27C; Chapter 7, section 38A; Chapter 114, section 17; as amended by Chapter 659 of the Acts of 1983 and Chapter 386 of the Acts of 1989	AR 200-2 AR 200-4 DA PAM 200-4 Office of the Secretary of Defense, Annotated Policy Document for the American Indian and Alaska Native Policy (27 October 1999)

DOD Regulations include all regulations and directives of the Department of Defense, Department of the Army, and National Guard Bureau.

AR = Army Regulation

CER – Camp Edwards Regulation

CFR – Code of Federal Regulations

CMR - Code of Massachusetts Regulations

DA PAM = Department of Army Pamphlet

EO – Executive Order

M.G.L – Massachusetts General Laws

RCRA – Resource Conservation and Recovery Act





# APPENDIX E

## WATER SUPPLY INFORMATION

2020 Consumer Confidence Report  
Upper Cape Regional Water Supply Cooperative

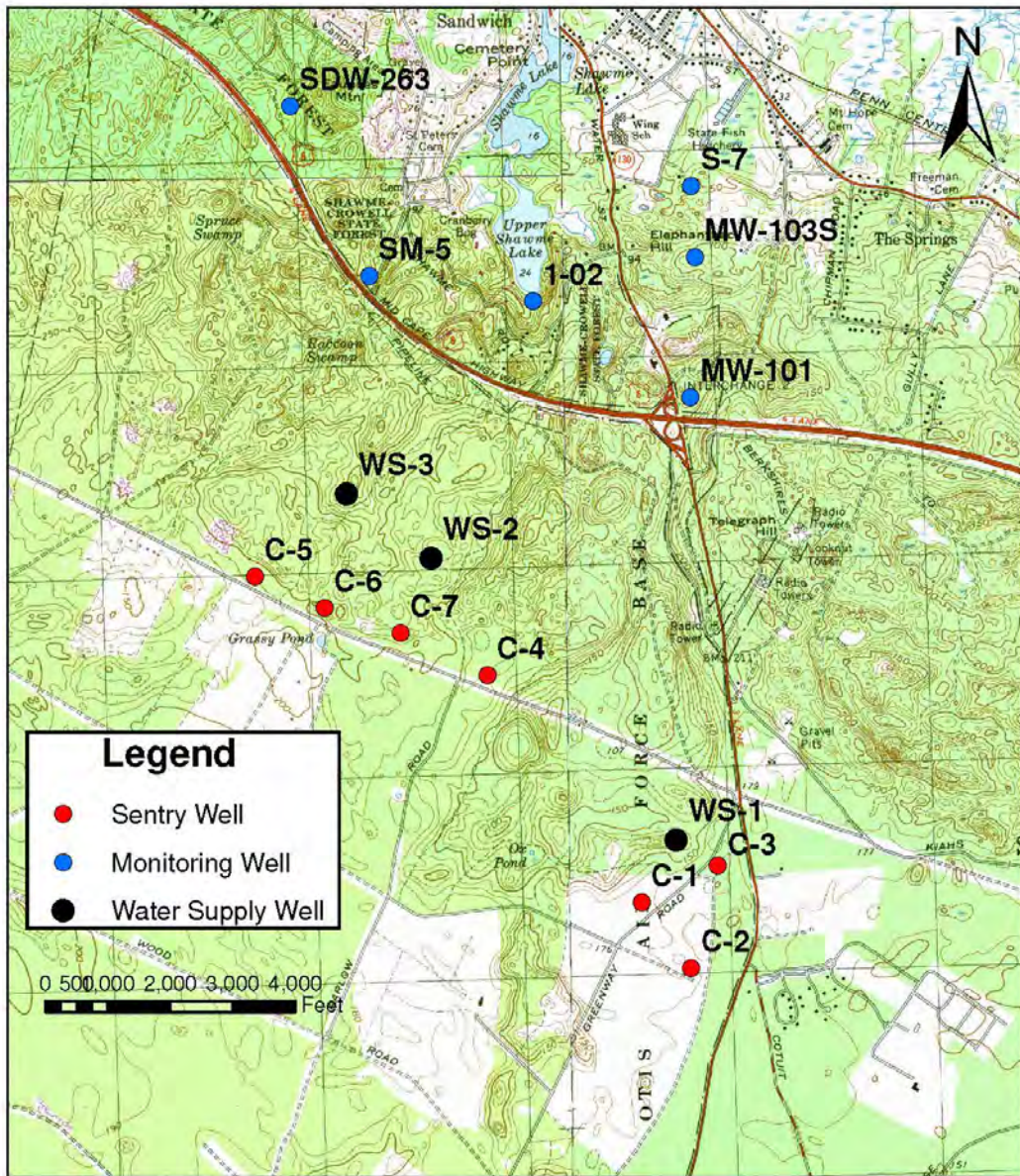


Figure 1  
Long-term Monitoring Well Network  
Upper Cape Regional Water Supply Cooperative  
Cape Cod, Massachusetts





Massachusetts Department of Environmental Protection  
Bureau of Resource Protection – Drinking Water Program

# Consumer Confidence Report Certification

For calendar year 2020

## A. PWS Information

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Upper Cape Regional Water Supply Cooperative  
4261024

Sandwich  
City/Town

56,250

Max population

The community water system named above hereby certifies that its Consumer Confidence Report (CCR) was distributed to customers, appropriate agencies, and notices of availability have been given in compliance with 310 CMR 22.16A. Furthermore, the system certifies that the information contained in the report is correct and consistent with the compliance monitoring data previously submitted to MassDEP.

Marisa Picone-Devine

Name

Operator

Title

508-888-7262

Phone

mdevine@sarianco.com

E-Mail

January 12, 2021

Date

*I certify under penalty of law that I am the person authorized to fill out this form and the information contained herein is true, accurate, and complete to the best of my knowledge and belief.*

Signature of Owner/Responsible Party or Certified Operator

## B. Public Notice Certification

VSS PWS note: if you deliver your CCR by newspaper or postings, that method will not meet PN requirements. You must directly deliver your PN by hand, land, or electronic.

Is this system using this CCR to provide **Tier 3** Public Notice to their customers?  Yes  No

The PN is for a: Violation  UCMR  Other

List other

Did you have a consultation with MassDEP?  Yes  No

Consultation date

The PN can be found on page \_\_\_\_ of the CCR.

Date of PN Occurrence NON Number

I am reporting multiple Tier 3 PNs. I have listed the additional PN information at the end of this form.

The public water system indicated above hereby affirms that a Tier 3 public notice has been provided within this CCR to consumers in accordance with 310 CMR 22.16(4) including: delivery, content, format requirements, notification deadlines, and that the public water system will meet future requirements for notifying new billing units and new customers of the violation.

If you did not sell water to another community PWS skip Section C.

## C. For Systems Selling Water to Other Community Water Systems

My system delivered the applicable information required at 310 CMR 22.16A(3), to the buying system(s) no later than April 1st of this year, or by the mutually agreed upon date specifically included in a written contract between the parties.

## D. Annual Cross Connection Education

Is this CCR being used for your system's annual cross-connection education?  Yes  No

If no, what methods did you use to meet your annual CCCP requirements (citation)?

Continued on next page



**Massachusetts Department of Environmental Protection**  
 Bureau of Resource Protection – Drinking Water Program

# Consumer Confidence Report Certification

For calendar year 2020

ALL distribution (posting, land mail, or e-delivery, publication, and good faith efforts) must be completed on or before July 1<sup>st</sup>.

Instructions for customers to request a hard copy must also be included in

When a URL is used it must be a direct link to the document; no other clicks allowed.

## E. Consumer Delivery Methods – Based on Population Served

**For systems serving fewer than 500 persons:**  
 (Choose #1 or #2)

Date of delivery/publication:

1. My system used one or more of the following methods to notify customers that their CCR would not be mailed directly to them but is available to them upon request. (the notice is attached)
- Land-mail     Door-to-door     Newspaper     eMail     Posted notices

Locations of posted notices

2. My system provided a CCR to each customer by the following method(s):
- Published the full CCR in a local newspaper (the published report from newspaper is attached).  
 eDelivered the CCR
- Land-mailed or hand-delivered the CCR to consumers.
- e-Mailed with the CCR either embedded in the email or attached as a PDF. (e-mail is attached)
- Posted the CCR on the web and sent the direct URL to customers by way of land-mail or email (notice/postcard is attached).

List URL

**For systems serving 500 to 9,999 persons:**  
 (Choose either #1 or #2)

Date of delivery/publication:

1. My system provided a copy of the CCR to each customer by:
- Land-mail     e-Mail with PDF of CCR     e-Mail with embedded CCR
- Sent a notice (by land or e-mail) containing a *direct* URL to customers (copy is attached)

List the URL if used.

2. My system provided the CCR to each customer by publishing the full report in a newspaper (a copy of the published CCR is attached) and provided notice to consumers of this action by either:
- Published a notice of this in a local newspaper  
 Land mailed a notice of this to consumers.  
 e-Mailed a notice of this to consumers.

**For systems serving 10,000 or more persons:**

Date of delivery/publication:

- My system provided a copy of the CCR to each customer by:
- Land mail     e-Mail with PDF     e-Mail with embedded CCR  
 Sent a notice (by land or e-mail) containing a *direct* URL to customers

List the URL if used.

- For systems serving greater than 100,000 population: In addition to one of the delivery methods checked above, we have posted the CCR on a publicly accessible Internet site as required.

www.  
 List the URL used

Continued on next page





Massachusetts Department of Environmental Protection  
Bureau of Resource Protection – Drinking Water Program

# Consumer Confidence Report Certification

For calendar year 2020

## F. Good Faith Delivery Methods (minimum of 3 is required for any sized systems)

Good Faith efforts are in addition to your primary method of delivery.

To reach people who drink our water but are not billed customers the following were conducted in addition to the required delivery:

- Posted the CCR on a publicly accessible Internet site at the following address. (Only for systems under 100,000 population who did not use this method as their primary method)

www. \_\_\_\_\_

List the URL used.

- Mailed the CCR to all postal patrons within the service area (list of zip codes used is attached).

- Mailed a postcard listing the URL where the CCR can be found, to all postal patrons within the service area (list of zip codes used is attached).

www. \_\_\_\_\_

List the URL used.

- Advertised availability of the CCR in the following news media (the announcement is attached):

- Radio     Newspaper     Television / cable     Social media     Digital signboard

- Published the CCR in local newspaper (attach the published CCR).

- Posted the CCR in public places i.e., post office, town hall, library (list of locations is attached).

- Delivered multiple CCR copies to single-bill addresses serving several persons i.e., apartments, businesses, large private employers (list of locations is attached).

- Delivered multiple CCR copies to community organizations ( list of organizations is attached.)

- Posted the CCR or a notice of availability at locations within the apartment/condo complex (list of the locations is attached).

- Deliver CCR to new residents when they move in.

- \_\_\_\_\_

Other

## G. Mandatory Agency Delivery Requirements

All systems must submit CCR to these three agencies

- 1. **Local Board of Health** 1-12-21  
Deliver 1 copy of CCR and the Certification Form (Contact your board of health as to whether they would prefer hardcopy or e-delivery of CCR.) Date completed

Agencies and consumers must receive CCR on or before July 1.

- 2. **MA Dept. of Public Health** 1-12-21  
Deliver 1-copy of CCR and the Certification Form Date completed  
 PDF emailed to: [dph.ccr@mass.gov](mailto:dph.ccr@mass.gov)  
or  
 Hardcopy to: 250 Washington St., Boston, MA 02108

For e-delivery, scan documents into 1 PDF file. Make sure Cert Form is first with CCR following it.

- 3. **MassDEP Boston Office** 1-12-21  
Deliver 1 copy of CCR, the Certification Form, and all needed attachments Date completed  
 PDF emailed to: [Program.Director-DWP@mass.gov](mailto:Program.Director-DWP@mass.gov).  
Label it [(PWSID)(PWS Name)(YEAR)CCR]  
or  
 Hardcopy to: MassDEP-CCR Program, 1 Winter St. -5<sup>th</sup> Fl., Boston, MA 02108

--Do not send to MassDEP regional offices--  
Only Boston is accepting CCRs

**UPPER CAPE REGIONAL WATER SUPPLY COOPERATIVE**

**2020 Consumer Confidence Report**

PWS ID # 4261024

The Upper Cape Regional Drinking Water Supply Cooperative consists of three groundwater supply wells located in Sandwich, MA on Joint Base Cape Cod (JBCC). A Board of Managers representing four-member public water supply systems manages the Cooperative. The Cooperative has the capacity to provide a supplemental supply of water to its member public water systems, which include the Town of Falmouth, the Bourne Water District, the Mashpee Water District and the Sandwich Water District. The Cooperative also supplies water to the Otis Air National Guard public water system on JBCC and the Barnstable County Jail.

Wells #1, #2 and #3 are located in a forested area of the northeastern portion of the JBCC. In July 2004, the Department of Environmental Protection completed a source water assessment (SWAP) report for the Cooperative water supply wells. A SWAP report is a planning tool to support local and state efforts to improve water supply protection by identifying land uses within water supply protection areas that may be potential sources of contamination. The report identifies potential sources of contamination including a gas station, a medical facility and a military facility, and helps focus protection efforts on appropriate Best Management Practices. A susceptibility ranking of high was assigned to the Cooperative using information that was collected during the assessment. A copy of the report is available, upon request, from the Cooperative. JBCC has adopted a Groundwater Protection Plan to prohibit inappropriate activities on JBCC property within the Zone II areas of community public water supply wells. In addition, the Environmental Management Commission provides oversight over activities on the northern portion of the JBCC. For questions regarding SWAP or other information contained within this document call Marisa Picone-Devine at 508-888-7262.

Our system, out of an abundance of caution and concerns about PFAS, sampled for PFAS compounds (PFBS, PFHpA, PFHxS, PFNA, PFOA, and PFOS) at all three wells in 2019 and 2020; there were no detections of any of the analytes in any of the samples.

**2020 WATER QUALITY DATA**

Listed below are the substances detected in water samples collected during the most recent sampling period from the three (3) wells that comprise the Upper Cape Drinking Water Supply Cooperative.



Inorganic Contaminants	Year Sampled	Highest Result	Range of Detections	MCL	MCLG	Violation (Y / N)	Possible Sources
Barium	2020	0.002 ppm	0.002 ppm	2 ppm	2 ppm	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Nitrate	2020	0.13 ppm	0.13 ppm	10 ppm	10 ppm	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Unregulated and Secondary Contaminants	Year Sampled	Amount Detected	Range of Detections	SMCL	ORSG	Violation	Possible Sources
Chloroform	2020	2.19 ppb	1.46 -2.19 ppb	NA	70 ppb	No	Trihalomethane: by-product of drinking water chlorination. In non-chlorinated sources, chloroform may be naturally occurring
Chloride	2020	8.6 ppm	8.6 ppm	250 ppm	--	NO	Runoff and leaching from natural deposits; seawater influence
Copper	2020	0.014 ppm	0.014 ppm	1 ppm	--	No	Internal corrosion of household plumbing; erosion of natural deposits
Sodium	2020	5.4 ppm	5.4 ppm	--	20 ppm	No	Natural erosion, road salt
Sulfate	2020	5.0 ppm	5.0 ppm	250 ppm	--	No	Runoff and leaching from natural deposits; industrial wastes

**Maximum Contaminant Level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Office of Research and Standards Guideline (ORSG):** This is the concentration of a chemical in drinking water, at or below which, adverse health effects are unlikely to occur after chronic (lifetime) exposure. If exceeded, it serves as an indicator of the potential need for further action

**Parts per million (ppm) or Milligrams per liter (mg/l):** One part per million corresponds to one minute in two years.

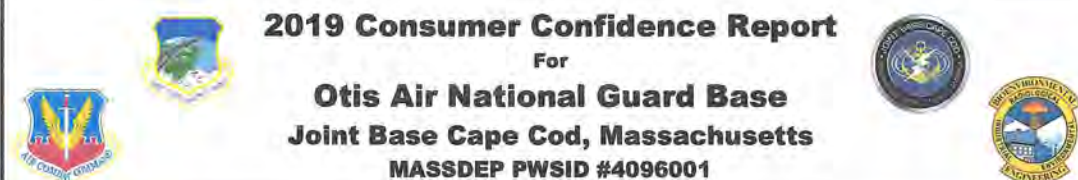
**Parts per billion (ppb) or Micrograms per liter (ug/l):** One part per billion corresponds to one minute in 2,000 years.

**Picocuries per liter (pCi/L):** A measure of radioactivity.

**Secondary Maximum Contaminant Level (SMCL):** These standards are developed to protect the aesthetic qualities of drinking water and are not health based.

**Unregulated Contaminants:** Substances for which EPA has not established drinking water standards. The purpose of unregulated monitoring is to assist EPA in determining their occurrence in drinking water and whether future regulation is warranted.

102<sup>nd</sup> Intelligence Wing  
Consumer Confidence Report



**2019 Consumer Confidence Report**  
 For  
**Otis Air National Guard Base**  
**Joint Base Cape Cod, Massachusetts**  
**MASSDEP PWSID #4096001**

This report is a snapshot of the drinking water quality that we provided between January 1 and December 31, 2019. Included are details about where your water comes from, what it contains, and how it compares to state and federal standards. We continually strive to adopt new methods for delivering the best-quality drinking water to you. We are committed to providing you with this information because informed customers are our best allies.

**PUBLIC WATER SYSTEM INFORMATION**

Address: Otis Air National Guard Base on Joint Base Cape Cod, Massachusetts  
 Contact Person: Mr. Richard Souza  
 Telephone #: (508) 968-4102

***Water System Improvements***

The Massachusetts Department of Environmental Protection (MassDEP) routinely inspects our water system. MassDEP inspects our system for its technical, financial, and managerial capacity to provide safe drinking water to you. To ensure that we provide the highest quality of water available, a Massachusetts certified operator who oversees the routine operations of our system operates your water system. As part of our ongoing commitment to service, the MassDEP Drinking Water Program has determined that the public water supply system at Otis Air National Guard Base is compliant with all national Primary Drinking Water Standards and MassDEP Drinking Water Regulations.

**DRINKING WATER SOURCE**

***Where Does My Drinking Water Come From?***

Our drinking water supply is provided entirely by groundwater. J-Well (4096001-01G), which is located on Herbert Road, is our primary pumping station. We are also connected to the Upper Cape Regional Water Supply Cooperative. The Cooperative’s water sources come from three wells located in the northeastern corner of Joint Base Cape Cod. On average, we provide up to 300,000 gallons of high-quality water every day. All of the Otis public water supply is drawn from the Sagamore Lens of the Cape Cod single-source aquifer. This lens runs from the Cape Cod Canal eastward into the town of Yarmouth. To learn more about our watershed on the Internet, go to the U.S. Environmental Protection Agency’s (EPA) “Surf Your Watershed” website at the following link:  
<http://cfpub.epa.gov/surf/locate/index.cfm>

Source Name	MassDEP Source ID#	Source Type	Location of Source
J-Well	4096001-01G	Groundwater	Herbert Road



***Is My Water Treated?***

Our drinking water is treated with potassium carbonate, sodium fluoride, and sodium hypochlorite. The water in this geographic area is naturally acidic, with an average pH of 5.9 (7.0 is neutral). Acidic water can be harmful to the distribution system. Potassium carbonate is used to buffer the water to as close to a neutral pH as possible. At the request of the U.S. Coast Guard, which is the owner and operator of the family housing area, sodium fluoride is added to the water. This compound has proven effective in strengthening teeth. Finally, sodium hypochlorite is used to disinfect the water supply by killing bacteria. We make every effort to provide you with safe and pure drinking water. To improve the quality of the water delivered to you, we treat it to remove several contaminants. The water quality of our system is constantly monitored by us and MassDEP to determine the effectiveness of existing water treatment and to determine if any additional treatment is required.

***How Are These Sources Protected?***

The Source Water Assessment and Protection (SWAP) Program, established under the federal Safe Drinking Water Act, requires every state to inventory land uses within the recharge areas of all public water supply sources; to assess the susceptibility of drinking water sources to contamination from these land uses; and to publicize the results to provide support for improved protection.

MassDEP has prepared a SWAP Report for the water supply source(s) serving this water system. The SWAP Report assesses the susceptibility of public water supplies.

***What is My System's Ranking?***

A susceptibility ranking of HIGH was assigned to this system due to the absence hydrogeological barriers (i.e., clay) that can prevent contaminant migration.

***Where Can I See The SWAP Report?***

Information on obtaining the complete SWAP Report is available by contacting the Water Supply Superintendent at (508) 968-4102. To access the SWAP Report on the Internet, go to the Source Water Assessment & Protection (SWAP) Program Website at the following link:

<https://www.mass.gov/service-details/the-source-water-assessment-protection-swap-program>

***What Are the Key Issues For Our Water Supply?***

We are all concerned about the quality of the water we drink. Our drinking water well may be threatened by many potential contaminant sources, including storm runoff, road salting, and improper disposal of hazardous materials. Also, being a military facility, Otis Air National Guard Base has the potential of having fuel, chemicals, and other material(s) as possible sources of contamination. Citizens and on base personnel can work together to better protect these drinking water sources.

***What Can Be Done To Improve Protection?***

Residents can help protect sources by:

- Practicing good septic system maintenance
- Supporting water supply protection initiatives when implemented
- Taking hazardous household chemicals to locally established hazardous materials collection days
- Limiting pesticide and fertilizer use, etc.



SUBSTANCES FOUND IN TAP WATER
-------------------------------

Sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals. In some cases, water travels over the surface of the land or through the ground and dissolves radioactive material. The water can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

Microbial contaminants – such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants – such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial, or domestic wastewater discharges, oil and gas production, mining, and farming.

Pesticides and herbicides – which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

Organic chemical contaminants – including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.

Radioactive contaminants – which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, MassDEP and U.S. EPA prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration (FDA) and Massachusetts Department of Public Health (DPH) regulations establish limits for contaminants in bottled water that must provide the same protection for public health.

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline at (800) 426-4791.

## IMPORTANT DEFINITIONS

**Maximum Contaminant Level (MCL)** – The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**Maximum Contaminant Level Goal (MCLG)** – The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Action Level (AL)** – The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

**90<sup>th</sup> Percentile** – Out of every 10 homes sampled, 9 were at or below this level.

**Secondary Maximum Contaminant Level (SMCL)** – These standards are developed to protect the aesthetic qualities of drinking water and are not health based.

**Unregulated Contaminants** – Unregulated contaminants are those for which EPA has not established drinking water standards. The purpose of unregulated monitoring is to assist EPA in determining their occurrence in drinking water and whether future regulation is warranted.

**Massachusetts Office of Research and Standards Guideline (ORSG)** – This is the concentration of a chemical in drinking water, at or below which, adverse health effects are unlikely to occur after chronic (lifetime) exposure. If exceeded, it serves as an indicator of the potential need for further action.

**Treatment Technique (TT)** – A required process intended to reduce the level of a contaminant in drinking water.

**Running Annual Average (RAA)** – The average of four consecutive quarter of data.

**Maximum Residual Disinfectant Level (MRDL)** – The highest level of a disinfectant (chlorine, chloramines, chlorine dioxide) allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

**Maximum Residual Disinfectant Level Goal (MRDLG)** -- The level of a drinking water disinfectant (chlorine, chloramines, chlorine dioxide) below which there is no known expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.

**Level 1 Assessment** – A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.

**Level 2 Assessment** – A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an *E. coli* MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions.



**UNITS OF MEASUREMENT**

- MFL = Million Fibers per Liter
- mrem/year = millirem per year (a measure of radiation absorbed by the body)
- N/A = Not Applicable
- ND = Not Detected
- pCi/L = picocuries per liter (a measure of radioactivity)
- ppb = parts per billion, or micrograms per liter (ug/L)
- ppm = parts per million, or milligrams per liter (mg/L)
- ppt = parts per trillion, or nanograms per liter (ng/L)

**WATER QUALITY TESTING RESULTS**

**What Does This Data Represent?**

The water quality information presented in the table is from the most recent round of testing done in accordance with the regulations. All data shown was collected during the last calendar year unless otherwise noted in the table.

Bacteria	MCL/TT	MCLG	Value	Date	Violation (Y/N)	Possible Source(s) of Contamination
Total Coliform Bacteria	0	0	0	2019	N	Human and animal fecal waste

**What About Lead Exposure?**

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Otis Air National Guard Base is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at (800) 426-4791 or on the Internet, at the following link: <http://www.epa.gov/safewater/lead>

Substance (unit of measurement)	Date(s) Collected	90 <sup>th</sup> Percentile	Action Level	MCLG	# of sites sampled	# of sites above Action Level	Possible Source(s) of Contamination
Lead (ppb)	2018	0.2	15	0	40	0	Corrosion of household plumbing systems; Erosion of natural deposits
Copper (ppm)	2018	0.448	1.3	1.3	40	0	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives

Regulated Contaminant	Date(s) Collected	Highest Result	Range Detected	MCL or MRDL	MCLG or MRDLG	Violation (Y/N)	Possible Source(s) of Contamination
<b>Inorganic Contaminants</b>							
Asbestos (MFL)	2013	N/A	ND	7	7	N	Decay of asbestos cement water mains; erosion of natural deposits
Barium (ppm)	2018	0.016	0.00-0.016	2	2	N	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Chromium (ppb)	2015	0.51	0.00-0.51	100	100	N	Discharge from pulp mills; erosion of natural deposits
Fluoride (ppm)*	2019	0.30	0.01-0.30	4	4	N	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
*Fluoride also has a secondary contaminant level (SMCL) of 2 ppm.							
Nitrate (ppm)	2019	1.78	0.08-1.78	10	10	N	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Nitrite (ppm)	2017	ND	N/A	1	1	N	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Perchlorate (ppb)	2019	ND	N/A	2	N/A	N	Rocket propellants, fireworks, munitions, flares, blasting agents
<b>Radioactive Contaminants</b>							
Radium 226 & 228 (pCi/L) (combined values)	2015	1.10	0.623-1.10	5	0	N	Erosion of natural deposits
<b>Disinfectants and Disinfection By-Products</b>							
Total Trihalomethanes (TTHMs) (ppb)	QTR3 (2019)	33.2	24.8-33.2	80	N/A	N	Byproduct of drinking water chlorination
Haloacetic Acids (HAA5) (ppb)	QTR3 (2019)	5.63	1.36-5.63	60	N/A	N	Byproduct of drinking water disinfection
Chlorine (ppm)	Monthly in (2019)	2.28	0.02-2.28	4	4	N	Water additive used to control microbes



**Unregulated and Secondary Contaminants**

Unregulated contaminants are those for which there are no established drinking water standards. The purpose of unregulated contaminant monitoring is to assist regulatory agencies in determining their occurrence in drinking water and whether future regulation is warranted.

Unregulated Contaminants	Date(s) Collected	Result or Range Detected	Average Detected	SMCL	ORSG	Possible Source(s) of Contamination
Bromodichloromethane	2019	6.73-8.64	7.67	N/A	N/A	Trihalomethane; by-product of drinking water chlorination
Bromoform	2019	2.24-2.92	2.58	N/A	N/A	Trihalomethane; by-product of drinking water chlorination
Chloroform (ppb)	2019	0.56-12.8	6.68	N/A	70	By-product of drinking water chlorination (In non-chlorinated sources it may be naturally occurring)
Chromium-6	2015	0.0-0.29	0.145	N/A	N/A	Discharge from steel and pulp mills; Erosion of natural deposits
Dibromodichloromethane	2019	6.83-8.82	7.83	N/A	N/A	Trihalomethane; By-product of drinking water chlorination
Manganese* (ppb)	2017	0.016	0.008	N/A	300	Erosion of natural deposits
*US EPA has established a lifetime health advisory (HA) value of 300 ppb for manganese to protect against concerns of potential neurological effects, and a one-day and 10-day HA of 1000 ppb for acute exposure.						
Methyl tertiary butyl ether* or MTBE (ppb)	2016	0.63	0.315	20-40	70	Fuel additive; leaks and spills from gasoline storage tanks
*EPA has established a lifetime Health Advisory (HA) of 0.3 mg/L and an acute HA at 1.0 mg/L						
Sodium (ppm)	2019	5.1-5.6	5.3	N/A	20	Discharge from the use and improper storage of sodium-containing de-icing compounds or in water-softening agents, natural erosion, road salt

### COMPLIANCE WITH DRINKING WATER REGULATIONS

***Does My Drinking Water Meet Current Health Standards?***

We failed to complete required sampling in a timely manner, which is a monitoring and reporting violation. Because we did not take the required number of samples, we did not know whether the contaminants were present in your drinking water, and we are unable to tell you whether your health was at risk during that time. The contaminants for which monitoring was not done are listed in the table below, with the period during which samples should have been taken, the number of samples each contaminant required, the number taken, and when the required sampling was conducted. In addition to sampling for these contaminants, our system announced public notification upon awareness of the violation.

Contaminant	Monitoring Period	Number of Samples Required	Number of Samples Taken	Date Sampling Conducted	Health Effects
Synthetic Organic Compounds	10/2019-12/2019	1	0	2/2020	Unknown
E. coli	8/22/2017-8/29/2017	1	0	N/A	See health effects statement

***Health Effects Statements***

**Total Coliform:** Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other potentially harmful bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.

Fecal coliforms and *E.coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely-compromised immune systems.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The U.S. EPA/CDC (Centers for Disease Control and Prevention) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791 or on the Internet, at the following link: <http://water.epa.gov/drink/hotline>

<b>EDUCATIONAL INFORMATION</b>
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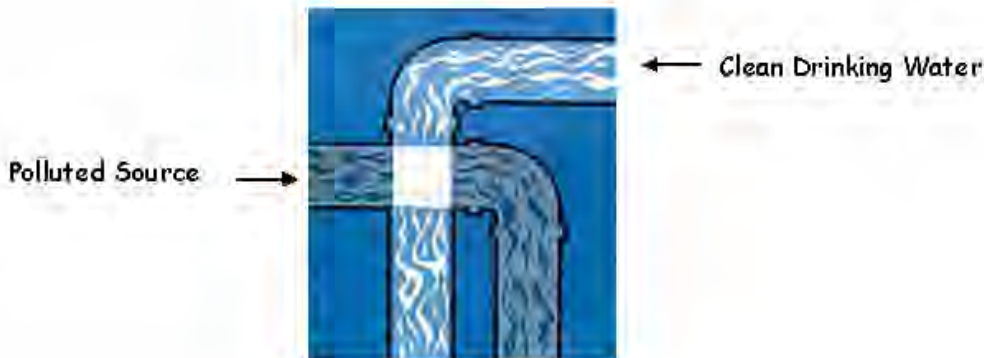
***Do I Need To Be Concerned about Certain Contaminants Detected in My Water?***

This is an alert about your drinking water and a cosmetic dental problem that might affect children under nine years of age. At low levels, fluoride can help prevent cavities, but children drinking water containing more than 2 ppm of fluoride may develop cosmetic discoloration of their permanent teeth (dental fluorosis). The drinking water provided by Otis Air National Guard Base has a fluoride concentration of 0.7 mg/l. Dental fluorosis, in its moderate or severe forms, may result in a brown staining and/or pitting of the permanent teeth. This problem occurs only in developing teeth, before they erupt from the gums. Children under nine should be provided with alternative sources of drinking water or water that has been treated to remove the fluoride to avoid the possibility of staining and pitting of their permanent teeth. You may also want to contact your dentist about proper use by young children of fluoride containing products. Older children and adults may safely drink the water. Drinking water containing more than 4 ppm of fluoride (the U.S. Environmental Protection Agency's drinking water standard) can increase your risk of developing bone disease. Your drinking water does not contain more than 4 ppm of fluoride, but we're required to notify you when we discover the fluoride levels in your drinking water to exceed 2 ppm because of the cosmetic dental problem. Some home water treatment units are available to remove fluoride from drinking water. To learn more about available home water treatment units, you may call the NSF International at 1-800-NSF-MARK (1-800-673-6275). For more information, please call the Water Superintendent at (508) 968-4102 or for additional information on fluoride in drinking water, contact the Massachusetts Department of Public Health, Office of Oral Health, (617) 624-5943.

### ***Cross-Connection Control and Backflow Prevention***

Otis Air National Guard Base makes every effort to ensure that the water delivered to your home and business is clean, safe and free of contamination. Our staff works very hard to protect the quality of the water delivered to our customers from the time the water is extracted via deep wells from underground aquifers or withdrawal point from a surface water source, throughout the entire treatment and distribution system. But what happens when the water reaches your home or business? Is there still a need to protect the water quality from contamination caused by a cross-connection? If so, how?

What is a Cross Connection and what can I do about it?



A cross connection is a connection between a drinking water pipe and a polluted source. The pollution can come from your own home. For instance, you're going to spray fertilizer on your lawn. You hook up your hose to the sprayer that contains the fertilizer. If the water pressure drops at the same time you turn on the hose, the fertilizer may be sucked back into the drinking water pipes through the hose. This problem can be prevented by using an attachment on your hose called a backflow-prevention device.

We recommend the installation of backflow prevention devices, such as a low cost hose bib vacuum breaker, for all inside and outside hose connections. You can purchase this at a hardware store or plumbing supply store. This is a great way for you to help protect the water in your home as well as the drinking water system on the installation! For additional information on cross connections and on the status of your water systems cross connection program, please contact the Water Superintendent.

If you are the owner or manager of a property that is being used as a commercial, industrial, or institutional facility you must have your property's plumbing system surveyed for cross-connection by your water purveyor. If your property has NOT been surveyed for cross-connection, contact your water department to schedule a cross-connection survey.



**ADDITIONAL INFORMATION*****Tap Water vs. Bottled Water***

Thanks in part to aggressive marketing, the bottled water industry has successfully convinced us all that water purchased in bottles is a healthier alternative to tap water. However, according to a four-year study conducted by the Natural Resources Defense Council (NRDC), bottled water is not necessarily cleaner or safer than most tap water. In fact, about 25 percent of bottled water is actually just bottled tap water (40 percent according to government estimates).

The Food and Drug Administration (FDA) is responsible for regulating bottled water, but these rules allow for less rigorous testing and purity standards than those required by the U.S. EPA for community tap water. For instance, the high mineral content of some bottled waters makes them unsuitable for babies and young children. Further, the FDA completely exempts bottled water that's packaged and sold within the same state, which accounts for about 70 percent of all bottled water sold in the United States.

People spend 10,000 times more per gallon for bottled water than they typically do for tap water. If you get your recommended eight glasses a day from bottled water, you could spend up to \$1,400 annually. The same amount of tap water would cost about 73 cents. Even if you installed a filter device on your tap, your annual expenditure would be far less than what you'd pay for bottled water.

For a detailed discussion on the NRDC study results, check out "The Truth About Tap" website at the following link: [www.nrdc.org/water/drinking/qbw.asp](http://www.nrdc.org/water/drinking/qbw.asp)

***Brown, Red, Orange, or Yellow Water***

Brown, red, orange, or yellow water is usually caused by rust. The different colors can be attributed to varying chemical oxidation states of the iron (rust) and by varying concentrations of the rust in the water. There are two major sources that can cause water to be rusty:

- The water mains, or
- The water pipes in your building

Rusty water occurs from sediment or rust from the inside walls of the water mains. The rust can be disturbed and temporarily suspended in water with unusual water flows from water main breaks or maintenance or by flushing of a hydrant. This discolored water is not a health threat.

When the water is discolored it is recommended to either not wash laundry or to use a rust stain remover or regular detergent but not chlorine bleach as it will react with the iron to form a permanent stain.

The other major cause of brown, red, orange or yellow water is rusty water pipes in your building. Water that is being discolored by rusty pipes is not a health hazard.



**IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER  
Monitoring Requirements Not Met for Otis Air National Guard Base**

Our water system violated a drinking water standard over the past year. Even though this violation was not an emergency, as our customers, you have a right to know what happened and what we did to correct the situation.

*We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During October-December 2019 (4<sup>th</sup> Quarter), we failed to conduct Synthetic Organic Compounds (SOC) samples and therefore could not be sure of the quality of our drinking water during that time.*

**What should I do?**

There is nothing you need to do at this time.

The table below lists the contaminant that we did not properly test for, how often we were supposed to sample for, how many samples we were supposed to take, how many samples we took, when samples should have been taken, and the date on which follow-up samples were (or will be) taken.

Contaminant	Required sampling frequency	Number of samples taken	When all samples should have been taken	When samples were or will be taken
SOC	1	0	October-December 2019	February 2020

**What happened? What is being done?**

Failure to collect SOC samples is a violation of the monitoring requirements and we were notified of this non-compliance.

However, we did take the required samples in February 2020. The results did not detect any Synthetic Organic Compounds present in the drinking water.

For more information, please contact SMSgt Keith Delgado at 508-968-4078 or 102 MDG/SGPB 156 Reilly, Box 12 Otis ANGB, MA 02542.

*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

Otis Air National Guard Base

PWS ID#: 4096001

Distributed on 28 May 2020

**IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER  
Monitoring Requirements Not Met for Otis Air National Guard Base**

It was determined that our water system violated a drinking water standard in 2017. Even though this was not an emergency, as our customers, you have a right to know what happened and what we did to correct the situation.

*We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During 8/22/2017-8/29/2017, we failed to conduct triggered fecal indicator source monitoring for fecal coliform and therefore cannot be sure of the quality of our drinking water during that time.*

**What should I do?**

There is nothing you need to do at this time.

The table below lists the contaminant that we did not properly test for during August 2017, how often we were supposed to sample for, how many samples we were supposed to take, how many samples we took, when samples should have been taken, and the date on which follow-up samples were (or will be) taken.

Contaminant	Required sampling frequency	Number of samples taken	When all samples should have been taken	When samples were or will be taken
E. coli	1 sample	0	August 2017	N/A - violation

**What happened? What is being done?**

Triggered source samples are used to monitor water quality and indicate if the water is free of fecal indicator bacteria. Following a positive routine total coliform result in our distribution system, our water system is required to submit one triggered source sample for every active ground water well. Failure to collect all required triggered source samples is a violation of the monitoring requirements and we were notified of this non-compliance.

However, we did take multiple repeat bacteriological samples; one repeat sample at the original site, one repeat sample within five service connections upstream, and one repeat sample within five service connections downstream.

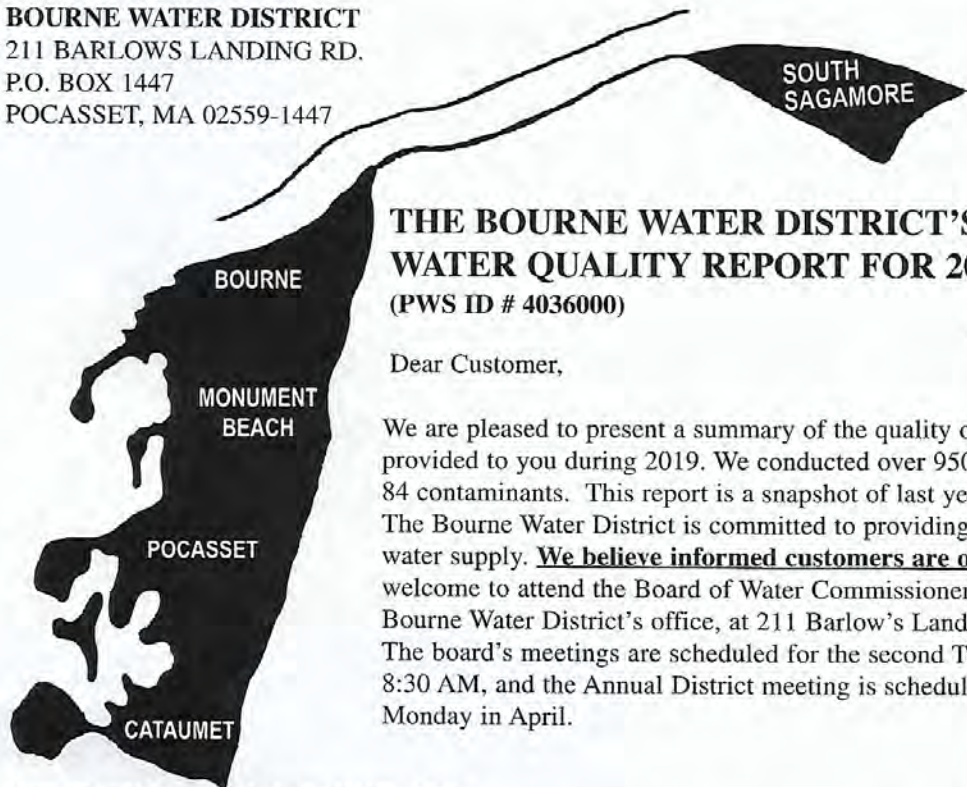
For more information, please contact SMSgt Keith Delgado at 508-968-4078 or 102 MDG/SGPB 156 Reilly, Box 12 Otis ANGB, MA 02542.

*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

Bourne Water District  
Water Quality Report 2019



**BOURNE WATER DISTRICT**  
 211 BARLOWS LANDING RD.  
 P.O. BOX 1447  
 POCASSET, MA 02559-1447



**THE BOURNE WATER DISTRICT'S  
 WATER QUALITY REPORT FOR 2019**  
 (PWS ID # 4036000)

Dear Customer,

We are pleased to present a summary of the quality of the drinking water provided to you during 2019. We conducted over 950 tests for more than 84 contaminants. This report is a snapshot of last year's water quality. The Bourne Water District is committed to providing you with a reliable water supply. **We believe informed customers are our best allies.** You are welcome to attend the Board of Water Commissioners meetings held at the Bourne Water District's office, at 211 Barlow's Landing Road in Pocasset. The board's meetings are scheduled for the second Tuesday of the month at 8:30 AM, and the Annual District meeting is scheduled on the fourth Monday in April.

**WATER SOURCES AND TREATMENT**

The Bourne Water District is supplied by 10 different sources, 7 of our own gravel packed well sites and 3 gravel packed well sites from the Upper Cape Regional Water Supply Cooperative. Four of our well sites are in the Monument Beach area of the Town Forest. The other two wells are in the Cataumet area of the Town of Bourne. One well is on Joint Base Cape Cod and we have one transfer station on Connery Ave. The Bourne Water District treats all supplies with lime slurry for corrosion control. The lime slurry is used to raise the pH of the water. This makes the water less aggressive to the copper pipe and lead joints in your homes to prevent exposure to lead and copper.

**WHAT DOES THE FOLLOWING TABLE MEAN?**

- Action Level (AL)** The concentration of a contaminant which if exceeded triggers treatment or other requirements.
- Maximum Contaminant Level (MCL)** The highest level of a contaminant that is allowed in the drinking water. The MCL is set as close to the MCLG as feasible using the best available treatment technology.
- Maximum Contaminant Level Goal (MCLG)** The level of a contaminant in the drinking water below which there is no known or expected risk to health. The MCLG allow for a margin of safety.
- 90th Percentile** Out of every 10 houses sampled, 9 were below this level.

**KEY TO TABLE**

- AL = Action Level
- MCL = Maximum Contaminant Level
- MCLG = Maximum Contaminant Level Goal
- MFL = million fibers per liter
- Mrem/year = millirems per year (a measure of radiation absorbed by the body)
- NTU = Nephelometric Turbidity Units
- pci/l = picocuries per liter (a measurement of radioactivity)
- ppm = parts per million, or milligrams per liter (mg/l)
- ppb = parts per billion, or micrograms per liter (ug/l)
- ppt = parts per trillion, or nanograms per liter
- ppq = parts per quadrillion, or picograms per liter
- TT = Treatment Technique



DISTRIBUTION SYSTEM WATER QUALITY This report summarizes only those items detected during Sampling-not all contaminants that are monitored								
Microbial Results	Highest Detected	Range Detected	MCL	MCGL	Violation	Possible Source of Contamination		
Total Coliform Bacteria**	0	0	0	0	No	Naturally present in the environment		
Fecal Coliform or E. Coli	0	0	0	0	No	Human and Animal Fecal Waste		
*Compliance with the Fecal Coliform/E.Coli MCL is determined upon additional repeat testing								
**Total Coliform:Coliform are bacteria that are naturally present in the environment and are used as an indicator that other potentially harmful bacteria may be present								
Lead and Copper	Dates collected	90th Percentile	Action Level	MCGL	# of sites sampled	# Sites above Action Level	Violation	Possible Source of Contamination
Lead (ppb)	9/1/2019thru 12/31/2019	0.0028	15	0	30	0	No	Corrosion of household plumbing systems; Erosio of natural deposits
Copper (ppm)	9/1/2019thru 12/31/2019	0.179	1.3	1.3	30	0	No	Corrosion of household plumbing systems; Erosio of natural deposits
TESTING FOR LEAD - If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Bourne Water District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information about lead in drinking water, testing methods and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <a href="http://www.epa.gov/safewater/lead">http://www.epa.gov/safewater/lead</a> .								
SUMMARY OF FINISHED WATER CHARACTERISTICS								
Regulated Contaminants	Date(s) collected	Highest Detect Value	Range Detected	MCL	MCGL	Violation	Possible Source of Contamination	
<b>Inorganic Contaminants:</b>								
Barium (ppm)	2018	0.009	0.002-0.009	2	2	No	Discharge of drilling waste; discharge from metal refineries; erosion of natural deposits	
Nitrate * (ppm)	2019 2018	0.71 0.35	0.06-0.71 0.08-0.35	10	10	No	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits	
Perchlorate ** (ppb)	2019 2018	0 0	0-0 0-0.23	2	-	No	Rocket propellants, fireworks, munitions, flares, blasting agents* (see note below)	
*Nitrate	Nitrate in drinking water at levels above 10ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant, you should ask advise from your health care provider.							
**Perchlorate (Various Chemical Abstract Service Registry Numbers (CASRN) for different chemical species	Perchlorate interferes with the normal function of the thyroid gland and thus has the potential to affect growth and development, causing brain damage and other adverse effects, particularly in fetuses and infants. Pregnant women, the fetus, infants and children up to the age of 12, and people with hypothyroid condition are particularly susceptible to perchlorate toxicity. "J" values are required when the results are above the MDL(0.012) and below the MRL(0.05)							
<b>Organic Contaminants</b>								
Tetrachloroethylene(PCE)(ppb)	2019	1.64	0-1.64	5	-	No	Discharge from factories and dry cleaners	
Chloroform (ppb)	2019	1.21	0-1.21	ORSG 70	NA	No	By-product of drinking water chlorination	
CIS-3,2 Dichloroethylene (ppb)	2019	1.26	0-1.26	70	NA	No	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits	
Secondary Contaminants	Date(s) collected	Highest Detect Value	Range Detected	SMCL	OSRG	Possible Source of Contamination		
Magnesium (ppm)	2019	3	1.1-3.0	-	-	Natural Mineral and Organic Matter		
Chloride (ppm)	2019	40	7.2-40	250	NA	Natural Mineral, Road Salt		
Calcium (ppm)	2019	14	3.0-14	-	-	Natural Mineral and Organic Matter		
Iron (ppb)	2019	0.08	0-0.08	300	NA	Erosion of Natural Deposits and oxidation of iron components		
Manganese (ppb)*	2019	0.012	0-0.012	50	NA	Erosion of Natural Deposits		
Sodium(ppm)**	2019	28**	5.7-28	-	20	Road Salting; erosion of natural deposits		
Potassium (ppm)	2019	1.2	0.6-1.2	-	-	Natural Mineral and Organic Matter		
Sulfate (ppm)	2019	7.2	5.1-7.2	250	250	Natural Sources		
Zinc (ppm)	2019	0.014	0-0.014	5	NA	Erosion of Natural Deposits and industrial discharge		
*EPA has established a lifetime health advisory (HA) for Manganese at 300ppb and an acute at 1000ppb								
**Sodium is a naturally occurring element found in soil and water. It is necessary for the normal functioning of regulating fluids in human systems. Some people, however, have difficulty regulating fluid volume as a result of several diseases, including congestive heart failure and hypotension. The guideline of 20mg/L for sodium represents a level in water that physicians and sodium sensitive individuals should be aware of in cases where sodium exposures are being carefully controlled. For additional information, contact your health care provider, your local Board of Health or the Massachusetts Dept. of Public Health, Bureau of Environmental Health Assessment at 617-624-5757.								



## NATIONAL PRIMARY DRINKING WATER REGULATION COMPLIANCE

The Total Coliform rule requires water systems to meet a stricter limit for Coliform bacteria. Coliform bacteria are harmless, but the presence in water can be an indication of disease-causing bacteria. When Coliform bacteria is found, special follow up tests are done to determine if harmful bacteria are present in the water supply. Over 500 Coliform samples were taken throughout the Bourne Water District in the year 2019.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead and copper in drinking water is primarily from materials and components associated with service lines and home plumbing. The Bourne Water District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead and copper exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead and copper in your water, you may wish to have your water tested. Information on lead and copper in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>.

Sodium; ORSG = 20 Sodium sensitive individuals, such as those experiencing hypertension, kidney failure or congestive heart failure, should be aware of the levels of sodium in their drinking water where exposures are carefully being controlled. Massachusetts Office of Research and Standard Guidelines (ORSG): This is the concentration of a chemical in drinking water, at or below which, adverse health effects are likely to occur after chronic (lifetime) exposure, with a margin of safety. If exceeded, it serves as an indicator of the potential need for further action.

If you are interested in a more detailed report, contact Robert Prophett at 508-563-2294.

### REQUIRED ADDITIONAL HEALTH INFORMATION:

To insure that tap water is safe to drink, Department of Environmental Protection (DEP) and Environmental Protection Agency (EPA) prescribes limits on the amounts of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) and the Massachusetts Department of Public Health regulations establish limits for contaminants in bottled water. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency Safe Drinking Water Hotline (1-800-426-4791). The sources of drinking water (both tap and bottled) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in the sources include:

- (A) Microbial contaminants such as viruses and bacteria which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- (B) Inorganic contaminants such as salts and metals which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- (C) Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm water runoff and residential uses.
- (D) Organic chemical contaminants, including synthetic and volatile organics which are by-products of industrial processes and petroleum production and can also come from gas stations, urban storm water runoff and septic systems.
- (E) Radioactive contaminants, which can be naturally occurring or be the results of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infections by *Cryptosporidium* are available from the Safe Drinking Water Hotline (1-800-426-4791).

## SOURCE WATER ASSESSMENT

The Bourne Water District had a source water assessment performed by the MA. Department of Environmental Protection in 2002. The Source Water Assessment and Protection (SWAP) program, established under the Federal Safe Drinking Water Act requires every state to:

- Inventory land uses within the recharge areas of all public water supply sources.
- Assess the susceptibility of drinking water sources to contamination from these land uses.
- Publicize the results to provide support for improved protection.

A susceptibility ranking of high was assigned to the Bourne Water District using the information collected during the assessment by the DEP. The high ranking was due to the potential contamination from land uses such as auto repair shops, truck terminal, furniture refinishing, auto salvage operation, an industrial park and activities in the recharge area (Zone II's) of some of the wells. The complete SWAP report is available at the Bourne Water District's office. For more information contact Robert Prophett at 508-563-2294.



**CROSS CONNECTION**

A cross connection is a connection between a drinking water pipe and a polluted source. The pollution can come from your own home. For instance, you're going to spray fertilizer on your lawn, and you hook up your hose to the sprayer that contains the fertilizer. If the water pressure drops (say because of a fire hydrant being used or water main break) when the hose is connected to the fertilizer sprayer, the fertilizer may be sucked back into the drinking water pipes through your hose. Using an anti-siphon backflow-prevention device on your sprayer or hose bib can prevent this problem. The Bourne Water District recommends using devices with an anti-siphon feature or equipping hose bibs with hose bib vacuum breakers to prevent against back flow. For additional information on cross connections and on the status of your water system's cross connection program, please contact Robert Prophett at 508-563-2294.

**UPPER CAPE REGIONAL WATER SUPPLY COOPERATIVE  
2019 Consumer Confidence Report (PWS ID # 4261024)**

The Upper Cape Regional Drinking Water Supply Cooperative consists of three groundwater supply wells located in Sandwich, MA on Joint Base Cape Cod (JBCC). A Board of Managers representing four-member public water supply systems manages the Cooperative. The Cooperative has the capacity to provide a supplemental supply of water to its member public water systems, which include the Town of Falmouth, the Bourne Water District, the Mashpee Water District and the Sandwich Water District. The Cooperative also supplies water to the Otis Air National Guard public water system on JBCC and the Barnstable County Jail.

Wells #1, #2 and #3 are located in a forested area of the northeastern portion of the JBCC. In July 2004, the Department of Environmental Protection completed a source water assessment (SWAP) report for the Cooperative water supply wells. A SWAP report is a planning tool to support local and state efforts to improve water supply protection by identifying land uses within water supply protection areas that may be potential sources of contamination. The report identifies potential sources of contamination including a gas station, a medical facility and a military facility, and helps focus protection efforts on appropriate Best Management Practices. A susceptibility ranking of high was assigned to the Cooperative using information that was collected during the assessment. A copy of the report is available, upon request, from the Cooperative. JBCC has adopted a Groundwater Protection Plan to prohibit inappropriate activities on JBCC property within the Zone II areas of community public water supply wells. In addition, the Environmental Management Commission provides oversight over activities on the northern portion of the JBCC. For information regarding the Groundwater Protection Plan call Elizabeth Kirkpatrick at 508-968-6487. For information regarding the Environmental Management Commission call Len Pinaud at 508-946-2871. For questions regarding SWAP or other information contained within this document call Marisa Picone-Devine at 508-888-7262.

Our system, out of an abundance of caution and concerns about PFAS, sampled for PFAS compounds (PFBS, PFHpA, PFHxS, PFNA, PFOA, and PFOS) at all three wells in 2019; there were no detections of any of the analytes in any of the samples.

**2019 WATER QUALITY DATA**

Listed below are the substances detected in water samples collected during the most recent sampling period from the three (3) wells that comprise the Upper Cape Drinking Water Supply Cooperative.

Inorganic Contaminants	Year Sampled	Highest Result	Range of Detections	MCL	MCLG	Violation (Y / N)	Possible Sources
Nitrate	2019	0.08 ppm	0.08 ppm	10 ppm	10 ppm	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Radioactive Contaminants	Year Sampled	Amount Detected	Range of Detections	MCL	MCLG	Violation	Possible Sources
Radium 228	2015	0.623 pCi/L	NA	5 pCi/L	0	No	Erosion of natural deposits
Combined Radium	2015	0.623 pCi/L	NA	5 pCi/L	0	No	Erosion of natural deposits
Unregulated and Secondary Contaminants	Year Sampled	Amount Detected	Range of Detections	SMCL	ORSG	Violation	Possible Sources
Chloroform	2019	2.08 ppb	1.09 -2.08 ppb	NA	70 ppb	No	Trihalomethane: by-product of drinking water chlorination. In non-chlorinated sources, chloroform may be naturally occurring
Chloride	2019	9.1 ppm	8.0 -9.1 ppm	250 ppm	--	NO	Runoff and leaching from natural deposits; seawater influence
Copper	2019	0.015 ppm	.009 ppm - 0.015 ppm	1 ppm	--	No	Internal corrosion of household plumbing; erosion of natural deposits
Iron	2019	10 ppb	ND - 10 ppb	300 ppb	--	No	Natural and industrial sources as well as aging and corroding distribution systems and household pipes
Sodium	2018	5.8 ppm	5.8 ppm	--	20 ppm	No	Natural erosion, road salt
Sulfate	2019	5.6 ppm	5.1 - 5.6 ppm	250 ppm	--	No	Runoff and leaching from natural deposits; industrial wastes

# APPENDIX F

## RARE SPECIES REPORTED TO NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM



## Appendix F - LIST OF RARE SPECIES REPORTED TO NHESP

Quantities shown are not resulting of standardized surveys, and should not be interpreted as population trends

Common/Scientific Names	Fed Status <sup>14</sup>	State Status	Individuals Reported									
			TY 2011	TY 2012	TY 2013	TY 2014	TY 2015	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
<b>BIRDS</b>												
Grasshopper Sparrow <sup>13</sup> ( <i>Ammodramus savannarum</i> )	-	T	26	27	19	26	23	16	15	16	20	34
Northern Harrier <sup>1</sup> ( <i>Circus cyaneus</i> )	-	T	4	5	8	12	Wintering	Wintering	Wintering	Wintering	Wintering	Wintering
Upland Sandpiper <sup>13</sup> ( <i>Bartramia longicauda</i> )	-	E	4	3	5	2	4	9	8	7	12	6
Eastern Meadowlark <sup>13,16</sup> ( <i>Sturnella magna</i> )	-	SC	9	2	3	1	0	8	3	2	7	14
Long-eared Owl <sup>1</sup> ( <i>Asio otus</i> )	-	SC	0	0	0	1	0	0	0	0	0	0
Vesper Sparrow ( <i>Pooecetes gramineus</i> )	-	T	3	1	3	1	0	0	0	0	0	0
Whip-poor-will <sup>2</sup> ( <i>Antrostomus vociferous</i> )	-	SC	0	201	51	156	96	87	52	110	53	99
Bald Eagle <sup>1</sup> ( <i>Haliaeetus leucocephalus</i> )	-	SC	0	0	0	0	3	0	0	0	0	0
<b>REPTILES and AMPHIBIANS</b>												
Eastern Box Turtle ( <i>Terrapene carolina carolina</i> )	-	SC	29	13	1	15	13	38	42	43	58	45
Eastern Hog-nosed Snake ( <i>Heterodon platirhinus</i> )	-	SC	0	0	0	0	0	2	3	8	9	1

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Common/Scientific Names	Fed Status <sup>14</sup>	State Status	Individuals Reported									
			TY 2011	TY 2012	TY 2013	TY 2014	TY 2015	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
<b>ODONATES</b>												
Comet Darner <sup>3</sup> ( <i>Anax longipes</i> )	-	-	14	4	0	5	0	N/A	N/A	N/A	N/A	N/A
Spatterdock Darner <sup>3</sup> ( <i>Aeshna mutata</i> )	-	-	10	14	0	9	0	N/A	N/A	N/A	N/A	N/A
<b>PLANTS</b>												
Adder's Tongue Fern <sup>4,6</sup> ( <i>Ophioglossum pusillum</i> )	-	T	48	84	542	1467	256	98	247	0	25	646
Broad Tinker's Weed <sup>5,6</sup> ( <i>Triosteum perfoliatum</i> )	-	E	233	332	1230	297	N/A	113	127	0	200	TBD
American Arborvitae <sup>9</sup> ( <i>Thuja occidentalis</i> )	-	E	0	0	0	0	0	4	N/A	N/A	N/A	N/A
<b>BEEES</b>												
Walsh's Anthophora <sup>15</sup> ( <i>Anthophora walshii</i> )	-	E	0	0	0	0	0	0	5 (1)	0	32 (9)	4
<b>BUTTERFLIES and MOTHS<sup>11</sup></b>												
Buck Moth ( <i>Hemileuca maia</i> )	-	SC	0	0	0	4	13	90	95	0	4	2
Pine Barrens Speranza ( <i>Speranza exonerata</i> )	-	SC	0	0	0	0	0	44	13	0	0	0
Sandplain Euchlaena ( <i>Euchlaena madusaria</i> )	-	SC	0	0	0	0	0	3	7	0	0	1
Heath Metarranthis ( <i>Metarranthis pilosaria</i> )	-	SC	0	0	0	0	0	1	1	0	0	0

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Common/Scientific Names	Fed Status <sup>14</sup>	State Status	Individuals Reported									
			TY 2011	TY 2012	TY 2013	TY 2014	TY 2015	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
<b>BUTTERFLIES and MOTHS<sup>11</sup></b>												
Melsheimer's Sack Bearer ( <i>Cicinnus melsheimeri</i> )	-	T	0	0	0	0	0	2	0	0	0	7
Gerhard's Underwing ( <i>Catocala herodias</i> )	-	SC	0	0	0	0	0	33	10	0	0	2
Pine Barrens Zale ( <i>Zale lunifera</i> )	-	SC	0	0	0	0	0	13	8	0	0	0
Barrens Dagger Moth ( <i>Acronicta albarufa</i> )	-	T	0	0	0	0	0	1	0	0	0	0
Chain-dotted Geometer ( <i>Cingilia catenaria</i> )	-	SC	0	0	0	0	0	0	0	0	1	0
Drunk Apamea ( <i>Apamea inebriata</i> )	-	SC	0	0	0	0	0	1	0	0	0	0
Pink Sallow ( <i>Psestraglaea carnosae</i> )	-	SC	0	0	0	0	0	9	5	0	0	0
Pink Streak ( <i>Dargida rubripennis</i> )	-	T	0	0	0	0	0	25	0	0	0	3
Collared Cynia ( <i>Cynia collaris</i> )	-	T	0	0	0	0	0	0	1	0	11	33
Coastal Heathland Cutworm ( <i>Abagrotis benjamini</i> )	-	SC	0	0	0	0	0	0	1	0	0	0
Woolly Gray ( <i>Lycia ypsilon</i> )	-	T	0	0	0	0	0	0	2	0	0	0

Appendix F - LIST OF RARE SPECIES REPORTED TO NHESP

Quantities shown are not resulting of standardized surveys, and should not be interpreted as population trends

Common/Scientific Names	Fed Status <sup>14</sup>	State Status	Individuals Reported									
			TY 2011	TY 2012	TY 2013	TY 2014	TY 2015	TY 2016	TY 2017	TY 2018	TY 2019	TY 2020
<b>BUTTERFLIES and MOTHS<sup>11</sup></b>												
Water-willow Stem Borer ( <i>Papaipema sulphurata</i> )	-	T	0	0	0	0	0	0	1	0	0	0
Waxed Sallow Moth ( <i>Chaetagnalea cerata</i> )	-	SC	0	0	0	0	0	0	2	0	0	0
Frosted Elfin <sup>12</sup> ( <i>Callophrys irus</i> )	-	SC	0	0	0	0	0	5	5	5	TBD	25
Slender Clearwing Sphinx ( <i>Hemaris gracilis</i> )	-	SC	0	0	0	0	0	0	0	0	0	5
<b>CRUSTACEANS</b>												
Agassiz's Clam Shrimp <sup>10</sup> ( <i>Eulimnadia agassizii</i> )	-	E	0	0	0	0	1	0	6	38	9	3
<b>MAMMALS</b>												
Northern Long-Eared Bat <sup>7,8</sup> ( <i>Myotis septentrionalis</i> )	T	E	0	0	0	8	22 (2)	15 (1)	2	1	3	TBD
Little Brown Bat <sup>7</sup> ( <i>Myotis lucifugus</i> )	UR	E	0	0	0	4	40	22	4	2	6	TBD
Tricolored Bat <sup>7</sup> ( <i>Perimyotis subflavus</i> )	UR	E	0	0	0	11	11	7	3	2	3	TBD
Eastern Small-Footed Bat <sup>7</sup> ( <i>Myotis leibii</i> )	UR	E	0	0	0	0	0	0	0	0	1	TBD



<sup>1</sup> NHESP is only accepting reports of nesting raptors, rather than opportunistic observations of individuals. Reports are provided as relevant, but common wintering birds or migrants are not individually tracked or reported (e.g., Northern Harrier). <sup>2</sup> As of TY 2016, quantities only reflect the results of annual survey routes during May, after totaling the minimum number (between two observers) heard at each site. In prior years, the number shown reflects the quantity reported to NHESP, which may include multiple survey windows and repeated counts. Due to Covid-19 concerns, 2020 routes were not run in duplicate, and the number represents the total number of individual birds heard calling throughout the routes. <sup>3</sup> Comet and Spatterdock Darner are no longer on NHESP's rare species list. Also, Odonate surveys were suspended after TY 2015. <sup>4</sup> Several known *Ophioglossum* sites could not be surveyed in TY 2016 due to a lack of cease-fire agreement with the off-base Monument Beach Shooting Club. 2019 numbers are likely under representative, as surveys occurred late in the season. In 2020 *Ophioglossum* was surveyed earlier in the year in order to get an accurate count. <sup>5</sup> Actual 2019 numbers may be as few as 82, MAARNG staff is now studying the genetics of *Triosteum perfoliatum* and *T. aurantiacum* due to difficulty in accurately differentiating the two species. Once the genetics project is completed, 2020 numbers will be reported. <sup>6</sup> In 2018, only sites with historic records and no recent records were surveyed, and this should not be interpreted as a loss of rare plants between 2017 and 2018. <sup>7</sup> Acoustic monitoring collects "call sequence" data and the true number of individuals is unknown. Numbers in the table reflect the number of survey sites with acoustic detections confirmed through manual call vetting. Numbers are reported to NHESP, but not tracked by them due to current uncertainty in using acoustic identifications. TY 2020 data is still being processed, these numbers are to be determined at a later date (TBD). <sup>8</sup> Number in parentheses is captured individuals trackable by NHESP due to species identification confirmation versus acoustic data. <sup>9</sup> NHESP is not interested in tracking this population, as it is likely of anthropogenic origin (pers. comm. with State Botanist, Bob Wernerehl). <sup>10</sup> Numbers represent only locations where species was found and ID confirmed by either NHESP Aquatic Ecologist or trained MAARNG staff. <sup>11</sup> Moths were extensively surveyed under contract with the Lloyd Center for the Environment between 2016 and 2017. There were no surveys in 2018, and MAARNG staff is not recording flight records of Barrens Buckmoth, as they are ubiquitous around the Training Area/Reserve. 2019 and later quantities represent individuals or groups of individuals (a group of Barrens Buckmoth caterpillars on a single leaf is counted as one, as are a pair of Unexpected Cynia caterpillars sharing the same butterflyweed plant). <sup>12</sup> MAARNG staff did not perform surveys for *Callophrys irus* in 2019, but facilitated USFWS surveys. Results are pending, but USFWS staff found Frosted Elfins across a wider area than was previously known. <sup>13</sup> Grassland bird numbers represent individual territories observed in a given year rather than the total number of birds observed throughout repeated surveys as was reported in past years (prior to the TY 2019 SOTRR). Upland Sandpiper counts exclude known females, but include unknown birds. Also, the numbers reported in annual reports TY 2015 and earlier included birds found on the Coast Guard airfield, which is not reported by MAARNG Natural Resources. Due to these changes, past year quantities may be different from prior versions of Appendix F, but now reflect the population more accurately. <sup>14</sup> "UR" indicates a species is currently under review for listing on the federal Endangered Species Act. <sup>15</sup> MAARNG contracted a targeted survey for *Anthophora walshii* in 2019 after an exploratory bee survey in 2017. The first number represents the number of flying/foraging records, and in parentheses the records of nesting activity. Unconfirmed nests were not counted. <sup>16</sup> Species added to MA Endangered Species List in TY 2020. Observation quantities included for prior years, but would not have been officially reported to NHESP.

# APPENDIX G

## ENVIRONMENTAL PERFORMANCE STANDARDS

### VIOLATIONS HISTORY

EPS VIOLATIONS HISTORY			
TRAINING YEAR	REPORTED VIOLATION	EXPLANATION OF VIOLATION	CORRECTIVE ACTION
TY 2020	Training Area Fire Management EPS  (EPS 11)	Three burn barrels (55-gallon drums) were found at SVLs 1 and 2. The MAARNG reported the nonconformance to the EMC on October 25, 2019.	All full-time and Mobilization Day staff are instructed to review Training Area Clearing processes and be re-briefed on guiding regulations and standards that apply to the Training Area/Reserve. Clear and obvious signage stating that open burning is prohibited has been posted at Range Control. The Camp Edwards Operations and Training Regulation 350-2 has been updated to clearly state the requirement for clearing training areas and that open burning is prohibited on Camp Edwards.
TY 2019	General Performance Standard	Three L600 M119 whistling booby trap simulators were used; they are not on the approved munitions list and were not authorized for use. The MAARNG reported a nonconformance to the EMC on September 17, 2019.	All levels: command, units training and the ASP will be provided a list of items permanently and temporarily authorized for a particular training event. The ASP will make a change in their ammunition reservation program that will not allow unauthorized ammunition or simulators to be reserved. Camp Edwards Range Control will do a final munition check as units check in for their reserved training area or venue.
TY 2018	Rare Species EPS  (EPS 3)	A road puddle containing state-listed Agassiz clam shrimp was filled by a unit training at Dig Site 1. The MAARNG forwarded a formal notice of violation to the EMC on May 16, 2018.	Camp Edwards will, after relocation of the clam shrimp and in concert with the CMP, fill the puddles, use signage to avoid infilling of relevant puddles, and educate users as to how they are supposed to coordinate with Camp Edwards before taking actions outside of their training plan while in the Training Area/Reserve.
TY 2017	None	-----	-----
TY 2016	General Performance Standard	Eight thousand paintball rounds were fired by a unit on the IMT range (Dig Site 3) without permission or prior coordination. The MAARNG forwarded a formal notice of violation to the EMC on November 9, 2015.	Unit soldiers cleaned and cleared the area of debris, discussion of the seriousness of the violation with the Unit Commander and told of actions needed for compliance when wanting to train with any unapproved munition.  Camp Edwards staff conducted a Range Officer in Charge and Range Safety brief audit to validate content and effectiveness.  Range Control staff will conduct assessments of units while they are training in the Training Area/Reserve to ensure activities are within established performance standards.
TY 2015	Vehicle Performance Standard EPS  (EPS 17)	A pickup truck was driven into, off road, and placed in Training Area BA-7 as a temporary training aid. The MAARNG forwarded a formal notice of violation to the EMC on June 5, 2015.	Camp Edwards staff conducted a Range Officer in Charge and Range Safety brief audit to validate content and effectiveness.  Range Control staff will conduct assessments of units while they are training in the Training Area/Reserve to ensure activities are within established performance standards.
TY 2014	None	-----	-----
TY 2013	None	-----	-----

EPS VIOLATIONS HISTORY			
TRAINING YEAR	REPORTED VIOLATION	EXPLANATION OF VIOLATION	CORRECTIVE ACTION
TY 2012	Small Arms Range EPS (EPS 19)	On November 7, 2011, the EMC issued a notice for failure to remove water from bullet traps on all three active small arms ranges within the prescribed time periods on multiple occasions during TY 2011. The EPA also cited the MAARNG for a violation for the same failure.	The MAARNG submitted a Response Packet to the EMC in early December 2011 which included: 1) a Notification Protocol should it not be able to comply with a requirement of the OMMPs; 2) a STAPP™ Range Tarp Cover Project Description; 3) Water Removal Contracting and Budgeting provisions; 4) creation of a Camp Edwards Sustainable Range Program Working Group; and 5) a Standard Operating Procedure for STAPP™ System Range Maintenance Procedures and Inspections.
TY 2011	Wetlands & Surface Water EPS (EPS 2) & General Use and Access EPS (EPS 18)	On May 17, 2011 military vehicles (Humvees) were driven into an off limits area within 100 feet of Donnelly Pond in the B 8 Training Area.  On the same date, Humvees were driven on a seasonably restricted road in the B 8 Training Area.	The using unit notified Range Control and the EMC's Environmental Officer, who was present at Range Control when the using unit reported the violation.  The MAARNG reestablished the seasonal road closure and closing of unauthorized access points in the B 8 Training Area, revisited all seasonal road closure areas to ensure road blocks and proper signage was in place, and conducted a debriefing by Range Control of the involved unit.



Cover photographs: Clockwise from top left, A soldier firing on Sierra Range at Camp Edwards; a box turtle at Camp Edwards; Lupines found at Camp Edwards; a Canada Armed Forces soldier training at Camp Edwards