STATE OF THE RESERVATION REPORT

FINAL TRAINING YEAR 2018 • CAMP EDWARDS

Final Annual State of the Reservation Report, Camp Edwards, Training Year 2018
February 2019

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PREFACE

The Annual *State of the Reservation 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 and 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. Ultimately, the goal of the Annual Report is to illustrate that military training can occur in the Camp Edwards Training Area/Upper Cape Water Supply Reserve in a manner that is compatible with the Environmental Performance Standards.

The Annual *State of the Reservation Report* covers the Massachusetts National Guard's Training Year 2018, which ran from October 1, 2017 to September 30, 2018; 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 environmental compliance. 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.

This 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 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 Reserve during Training Year 2018. Data is provided on the levels of training in the various training areas in the 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 Reserve and program compliance with the Environmental Performance Standards for the Reserve for the training year.

Section 4, Remediation Program Activities, provides a summary of remediation activities undertaken in the 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 2018 that may not be directly related to a

Massachusetts Army National Guard environmental management program, actions in the Reserve, or specific Environmental Performance Standards for the 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 Reserve to interested stakeholders and the community at large.

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' 15,000-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 15,000 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 15,000 acres of Camp Edwards. It comprises—and for the purposes of this report, may be synonymous with—Camp Edwards' 15,000-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 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 Camp Edwards Training Area at Joint Base Cape Cod. 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. 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 2018 (October 1, 2017 – September 30, 2018).

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. handgun, rifle, shotgun, or machine gun. 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 six 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. All the small arms ranges are focused around the perimeter of the Impact Area, and all small arms range firing is pointed towards 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. The Central Impact Area contains critical habitat for several state-listed species.

Cantonment Area

The southern 5,000-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.

Environmental Protection Agency Administrative Order

In February 1997, the Environmental Protection Agency utilized its powers under the Safe Drinking Water Act to issue the first Administrative Order concerning Camp Edwards. There are four administrative orders in total; Administrative Order #2 was issued in April 1997 to the National Guard Bureau and the Massachusetts National Guard. It required that certain training activities (artillery and mortar firing) cease pending the completion of environmental investigations at the training ranges and Impact Area. As small arms ranges and other training activities are brought back on-line by the Massachusetts National Guard, they must, in some cases, petition EPA to amend Administrative Order #2 to allow the training.

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 2018. 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, 508-968-5146, emily.d.kelly2.nfg@mail.mil.

FORWARD

The Massachusetts Army National Guard at Camp Edwards is pleased to present the State of the Reservation Report for Training Year 2018 for the Camp Edwards Training Area/Upper Cape Water Supply Reserve (Reserve).

During Training Year 2018, a variety of actions were undertaken to ensure the continued compatible environmental use of the Training Area/Reserve. A continuing priority for the Massachusetts Army National Guard; actions and projects undertaken by the Guard are designed and completed with the environment in mind with those actions documented in this report.

Camp Edwards began the design and environmental review for a new $11.5 million Multi-Purpose Machine Gun Range planned for construction at an existing range (KD Range) on Camp Edwards. This required range an undertaking will require close coordination between the Camp, Natural Resources staff, the Environmental Management Commission, and state agencies to ensure it is as environmentally protective as possible while still providing the necessary and required training. Camp Edwards's ranges are operated in accordance with an Operation, Maintenance and Monitoring Plan (OMMP) or Standard Operating Procedure (SOP) and Range Management Plan. The focus of these plans is to ensure that safe operations occur while still monitoring and being protective of the environment. Any future ranges, like the current ranges, will be developed to be as environmentally protective as possible while still providing the necessary and required training.

The Guard is also proposing a change to the Environmental Performance Standards (EPSs). 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. The change would modify EPS 15.3: Fuel Management, to allow refueling in the Reserve under certain conditions for habitat management, contract work and training purposes. Similar to the small arms ranges, a Standard Operating Procedures has been developed with training and environmental protection as its core focus. The Guard is working in coordination with the Environmental Management Commission and plans to formally request the change to the EPS late in Training Year 2019.

Within the Natural Resources and Integrated Training Area Management (ITAM) program, activities focused on supporting training and conservation of the resources on Camp Edwards. The ITAM program continues to coordinate and work with the Camp Edwards' trainers, Range Control, and the Environmental Management Commission to address compatible training needs. One example of programmatic activities during TY 2018 is the repair of large puddles impeding the use of Cat and Herbert roads in the Reserve for training and other activities. The puddles support Agassiz's Clam Shrimp (*Eulimnadia agassizii*), a state listed endangered species. The Natural Resources Office worked with the Natural Heritage and Endangered Species Program to create a Conservation and Management Plan, which outlines a plan for habitat creation, clam shrimp relocation, and monitoring to provide for a net benefit to the species and allow for necessary road repairs.

Sustainable range use and training while still being protective of our environment is still the core principle of using the Upper Cape Water Supply Reserve/Camp Edwards Training Area. To this end, Camp Edwards Head Quarters has reinitiated its Sustainable Range Program where training needs and environmental concerns are coordinated internally and with the Environmental Management Commission.

The Environmental & Readiness Center will continue to be the Adjutant General's environmental management element at Camp Edwards. Questions and comments regarding the Training Year 2018 *State of the Reservation Report* should be addressed to: Dr. Michael Ciaranca, Deputy Director, Massachusetts National Guard Environmental & Readiness Center, Building 3468, Beaman Street, Camp Edwards, MA, 02542, (508) 968-5154, michael.a.ciaranca.nfg@mail.mil or Mr. Leonard Pinaud, Environmental Officer, Environmental Management

Commission, Building 3468, Beaman Street, Camp Edwards, MA, 02542, (508) 946-2871, leonard.pinaud@mass.gov.

For more information, please access the Environmental & Readiness Center's web site at www.massnationalguard.org/ERC/index.htm. Please take the opportunity to provide us feedback on this important document. Regulatory and community feedback help ensure the future viability and environmental integrity of this piece of land we refer to as Camp Edwards on Joint Base Cape Cod.

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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
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
CPQC	Combat Pistol Qualification Course
CS	Chemical Spill
CSE	Comprehensive Site Evaluation
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
EDB	Ethylene Dibromoide
EMC	Environmental Management Commission
EPA	Environmental Protection Agency
EPS	Environmental Performance Standard
FAA	Federal Aviation Administration
FS	Fuel Spill
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IAGWSP	Impact Area Groundwater Study Program
IED	Improvised Explosive Device
IMT	Individual Movement Techniques
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
ISWM	Integrated Solid Waste Management Site
ITAM	Integrated Training Area Management

Acronyms, continued

JBCC	Joint Base Cape Cod
JLUS	Joint Land Use Study
LQG	Large Quantity Generator
MAANG	Massachusetts Air National Guard
MAARNG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MCP	Massachusetts Contingency Plan
MEC	Munitions and Explosives of Concern
MESA	Massachusetts Endangered Species Act
MGL	Massachusetts General Law
MIPAG	Massachusetts Invasive Plants Advisory Group
mm	millimeter
MMR	Massachusetts Military Reservation
MMRP	Military Munitions Response Program
MPMG	Multipurpose Machine Gun Range
NBC	Nuclear-Biological-Chemical
NHESP	Natural Heritage and Endangered Species Program
NLEB	Northern Long-eared Bat
OEA	Office of Economic Adjustment
OMMP	Operation, Maintenance and Monitoring Plan
P2	Pollution Prevention
PAVE PAWS	Precision Acquisition Vehicle Entry – Phased Array Warning System
ppb	parts per billion
ppm	parts per million
PAN	Percussion Actuated Neutralizer
RDX	Royal Demolition Explosive
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
SEMASS RRF	Southeastern Massachusetts Resource Recovery Facility
SHPO	State Historic Preservation Office
SPVS	Solar Photovoltaic System
SR/ES	Source Registration/Emissions Statement
SVL	Soldier Validation Lane

Acronyms, continued

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
WPA	Wetlands Protection Act
WWTP	Waste Water Treatment Plant
XRF	X-Ray Fluorescence

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 15,000 acre Camp Edwards Training Area/Upper Cape Water Supply Reserve (Reserve).

1.1 JOINT BASE CAPE COD STRUCTURE

Joint Base Cape Cod is a multi-service military installation and is home to 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), the Massachusetts Army National Guard's (MAARNG) Camp Edwards, 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 Massachusetts Army National Guard's components of JBCC comprise two primary land use zones. The Camp Edwards Training Area comprises approximately 14,400 acres of the Reserve. The remaining Camp Edwards military-controlled area of JBCC lies in the southern portion, or Cantonment Area.

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 Reserve. The USCG's Communications Station is located on a 542-acre parcel along the northeastern side of the 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 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 and the Coast Guard Communications Station should be addressed to the persons listed in Appendix B of this report.

Figure 1-1 Map of Joint Base Cod

The Commonwealth of Massachusetts has issued three utility easements on its state-owned property in the 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 Reserve, coordinates the actions of environmental agencies of the Commonwealth in the enforcement of environmental laws and regulations in the Reserve, as appropriate, and facilitates an open and public review of all activities in the Reserve. The legislation also states that the environmental agencies on the EMC retain all their respective, independent enforcement authority.

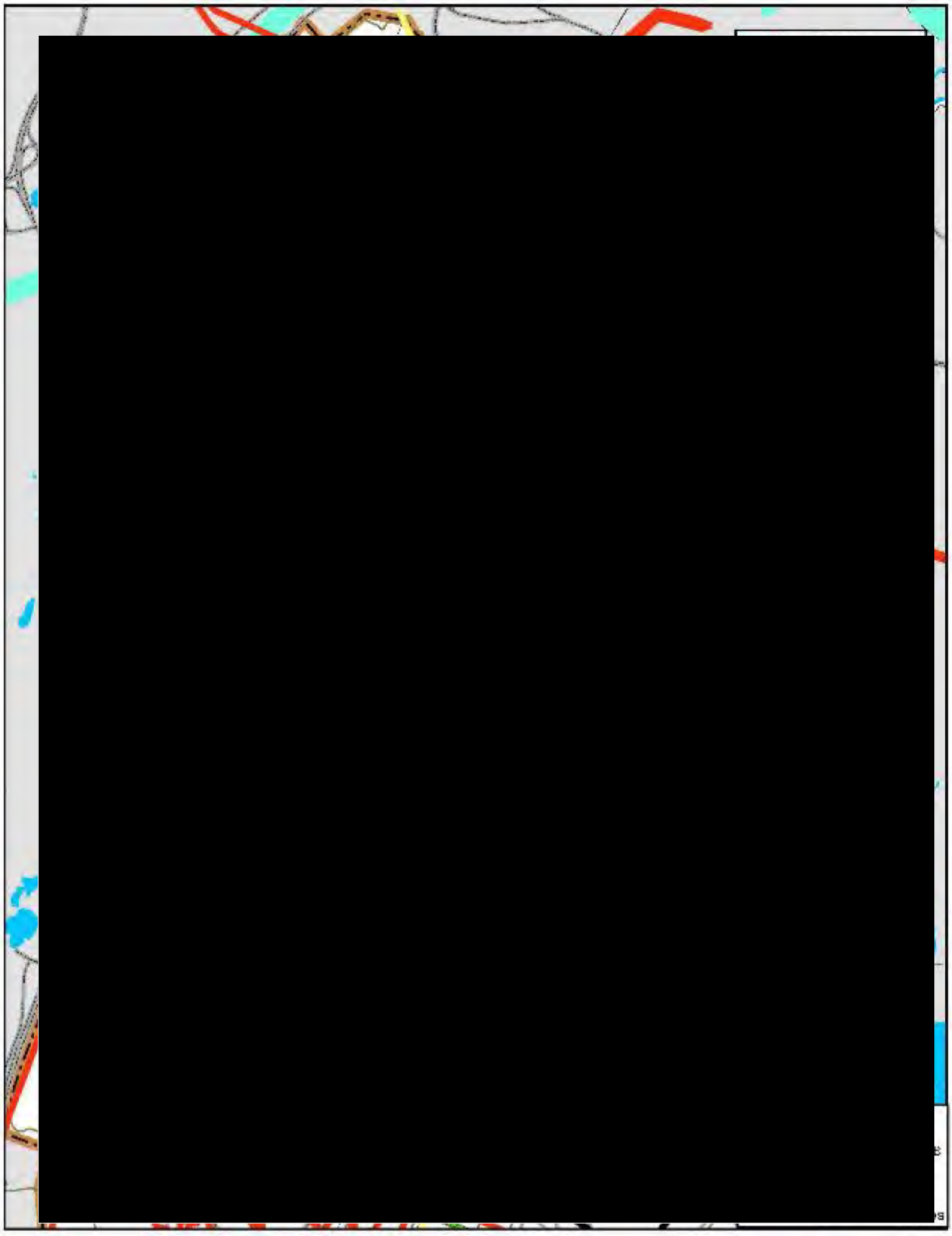
Chapter 47 of the Acts of 2002 also directed that the EMC be assisted by two advisory councils. The Community Advisory Council (CAC), consisting of 15 members, assists the EMC by providing advice on issues related to the protection of the water supply and wildlife habitat within the Reserve. The Science 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 Reserve.

Chapter 47 of the Acts of 2002 also established an Environmental Officer for the 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 Reserve and the impact of those activities and uses on the water supply and wildlife habitats. 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 Reserve. He has full access to all points in the 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 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 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 seven times during Training Year (TY) 2018. 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 www.massnationalguard.org/ERC/emc.html.

Figure 1-2 Utility Easements and Leases



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 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 2018.

2.1 CAMP EDWARDS TRAINING AREA/UPPER CAPE WATER SUPPLY RESERVE

2.1.1 Military and Civilian Use

The MAARNG has approximately 5,880 soldiers who train on average one weekend per month and one two-week cycle during a training year. 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 2017) to the year of execution (TY 2018) units confirm geographical areas and training sites within the Reserve.

Military training activities in the 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 firing ranges in the 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 2018, while Table 2-2 shows their utilization for each of the past 10 training years. For specific training area use for TY 2018 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 and safety regulations.

Military training activities in the 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 a color-coded personnel use by training area for each of the past ten training years. Figure 2-3 provides a color-coded ten year personnel use by training for the past ten training years. Figure 2-4 shows a color-coded daily usage by training area for each of the past ten training years with Figure 2-5 providing a color-coded ten year daily usage by training area for the past ten training years. For example, as seen in Figure 2-5, training areas B-8 and B-9 were not used, and area B-10 shows a reduction in use; this is a result of the closure of these training areas due to the proximity to the Monument Beach Sportsman's Club's firing range. These training areas are within the surface danger zone for the rifle range and therefor are closed when the club's range is operational. Another example would be the increased use in BA-7 where the Dig Site was used for a combined arms exercise this past June; thereby a single

event caused the appearance of a significant increase in use of the training area as a whole. Graph 2-1 shows the average personnel use by training area for TY 2009 to TY 2018; Graph 2-2 shows the average days used by training area for TY 2009 to TY 2018. As units become aware that the ranges and other training venues at Camp Edwards meet qualification standards, the use of the areas were 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, cleanup activities in the Reserve have resulted in small arms ranges and other training venues being unavailable for use. As the cleanup comes to completion, it is likely that there will be greater training opportunities at Camp Edwards. So with new ranges, training venues, and eventual completion of the cleanup program, Training Area use and numbers will fluctuate accordingly.

Figure 2-1 Camp Edwards Training Area and Ranges

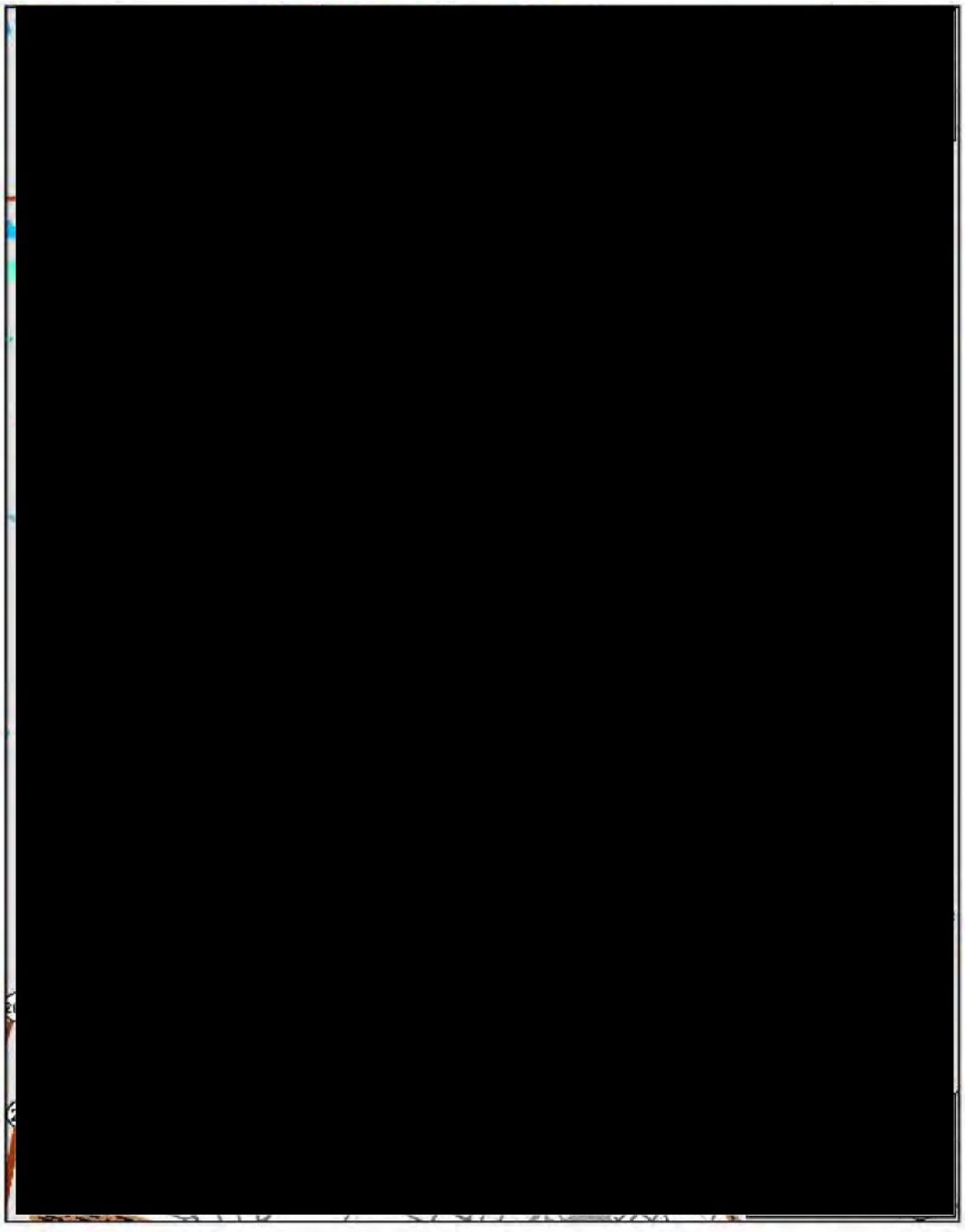


Figure 2-2 Personnel Usage by Training Area in the Reserve, TY 2009 – TY 2018

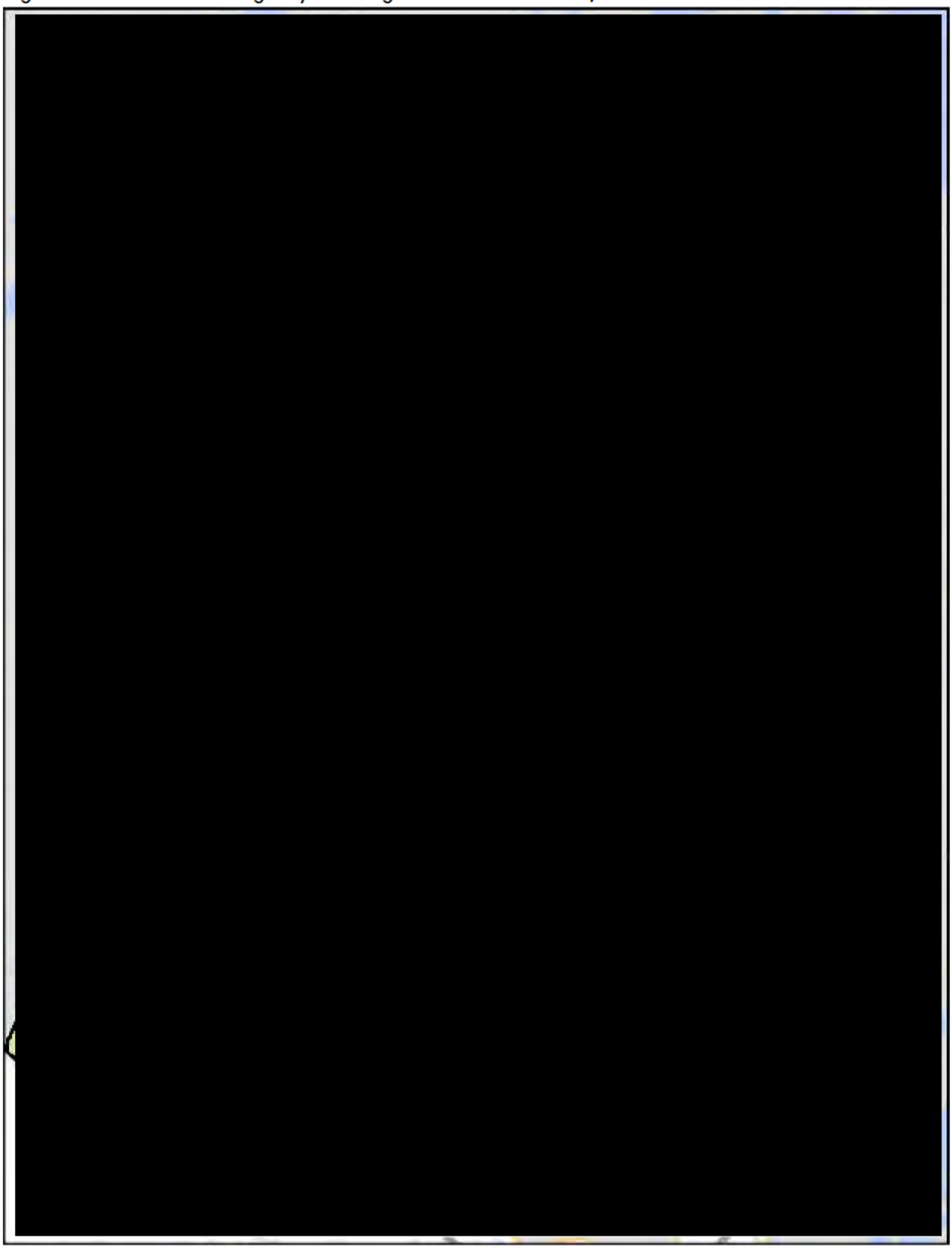


Figure 2-3 Ten Year Personnel Use by Training Area in the Reserve, TY 2009 – TY 2018

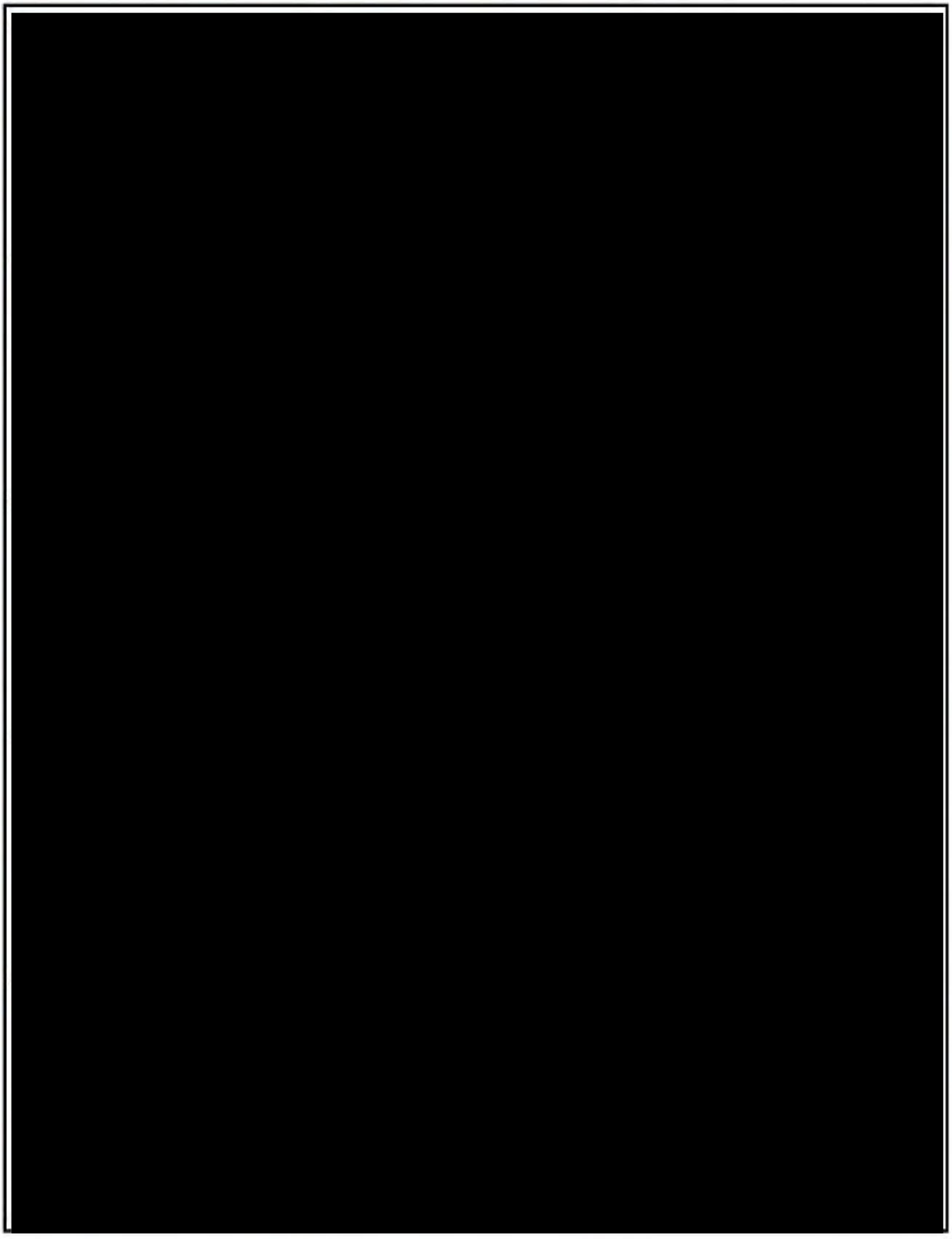


Figure 2-4 Daily Usage per Training Area in the Reserve, TY 2009 – TY 2018

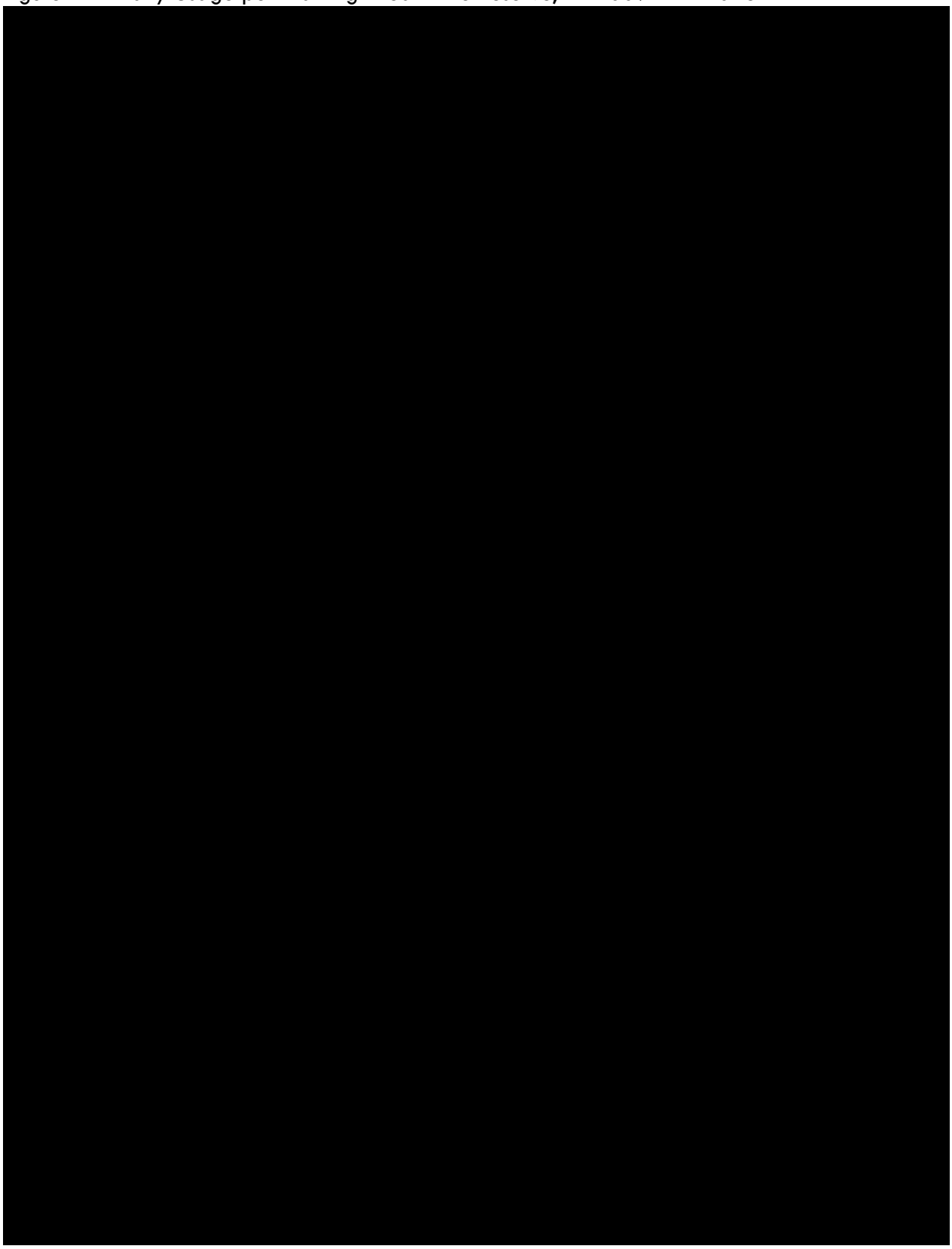
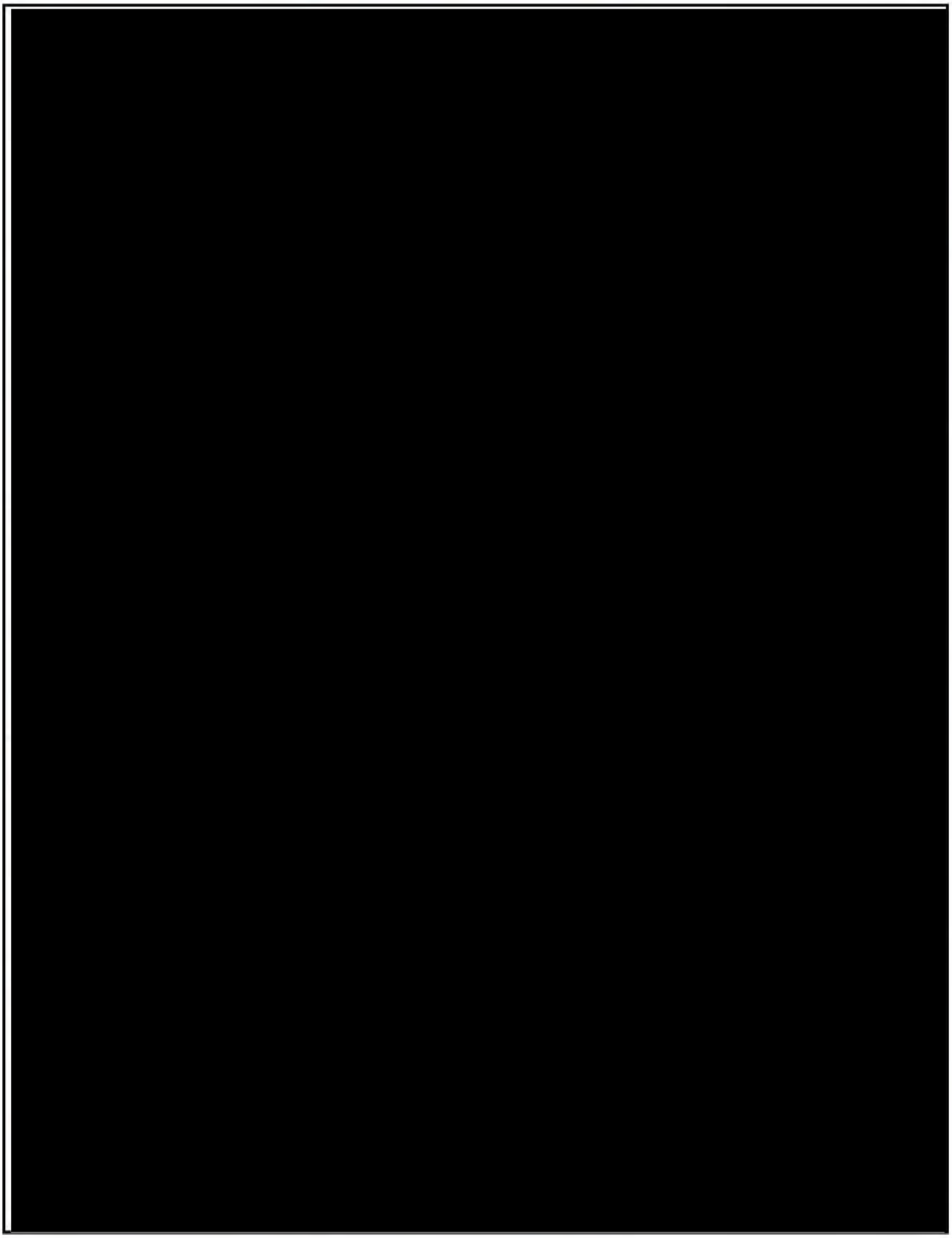
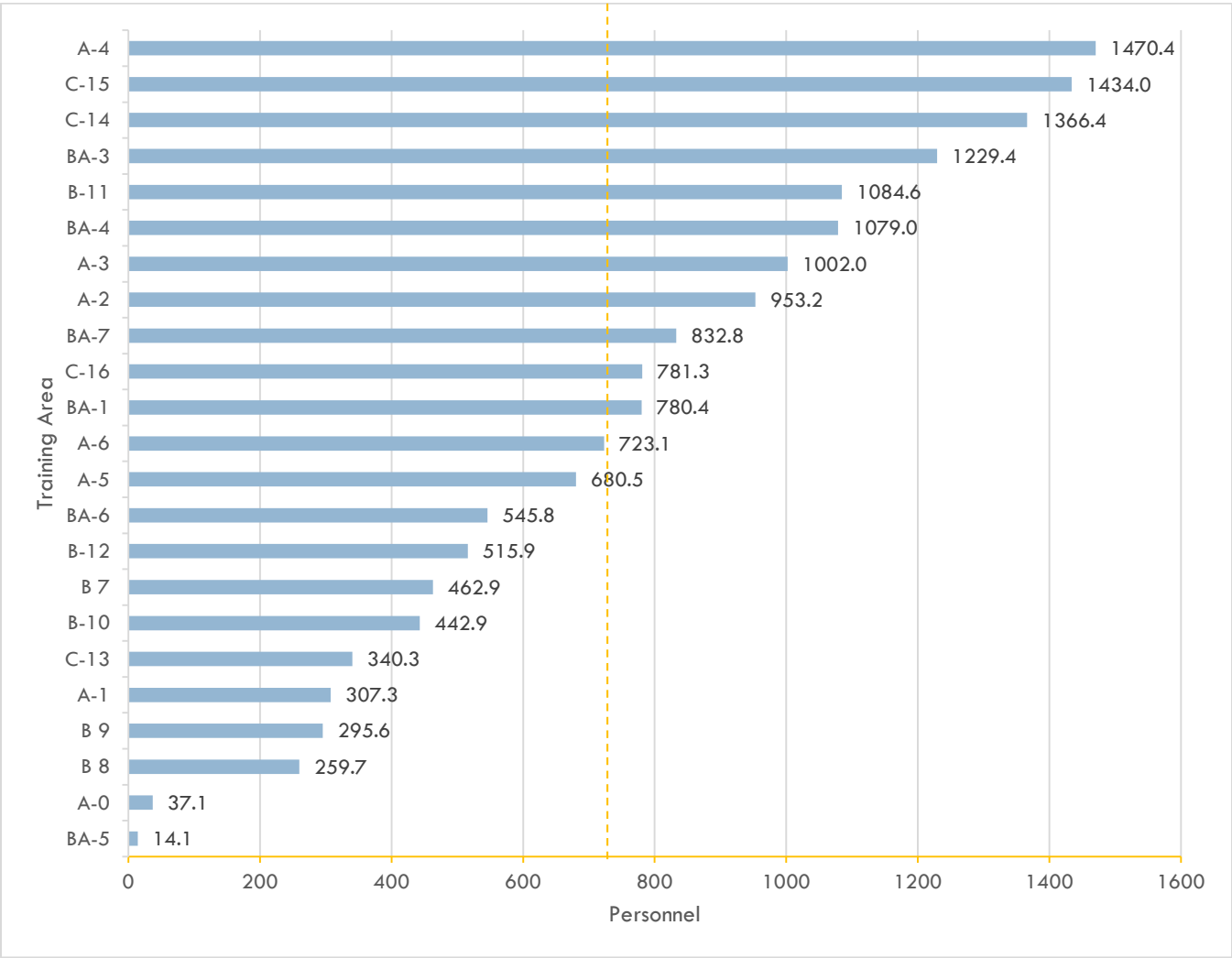


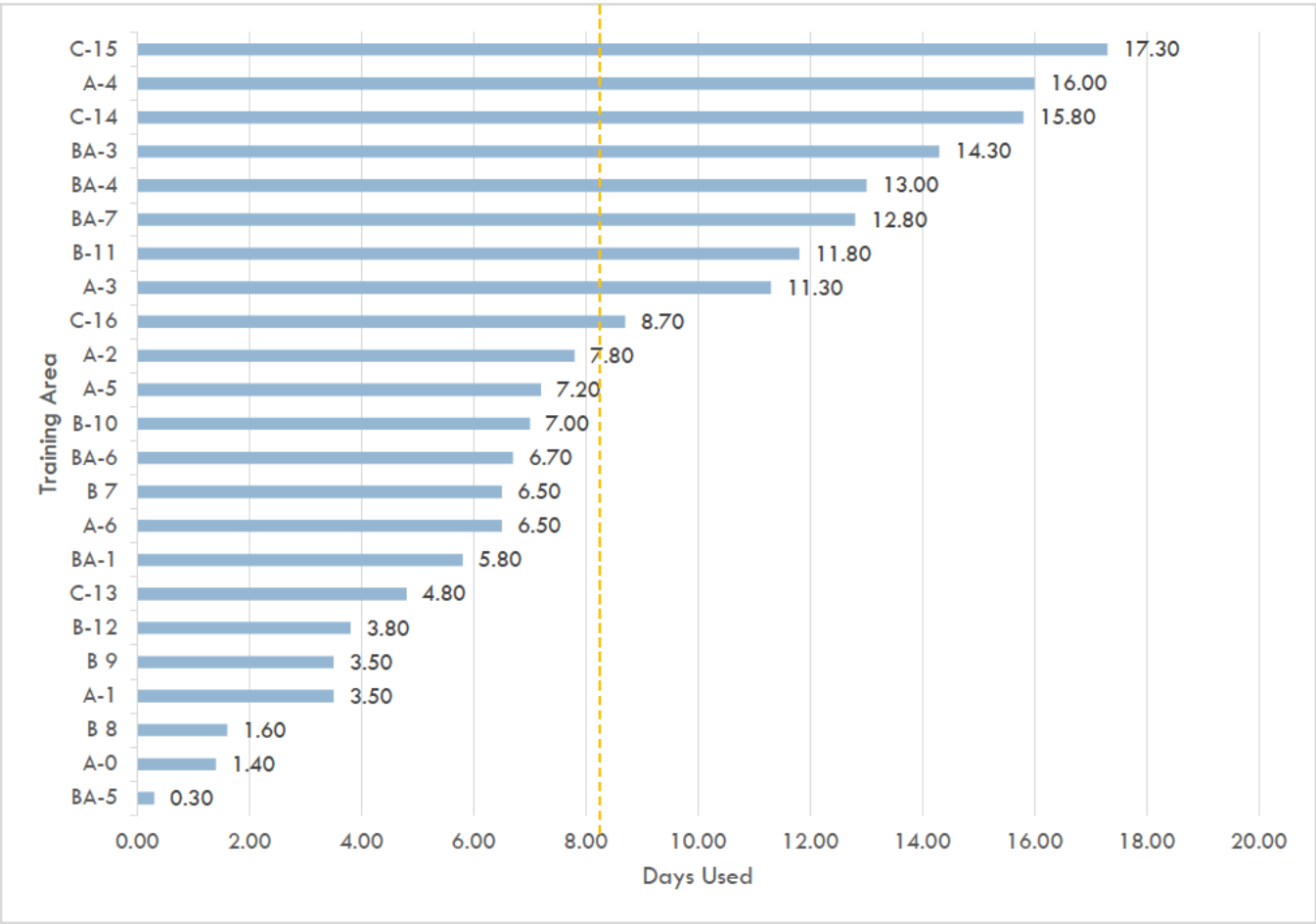
Figure 2-5 Ten Year Daily Usage by Training Area in the Reserve, TY 2009 – TY 2018



Graph 2-1 Average Personnel Use by Training Area for TY 2009 to TY 2018



Graph 2-2 Average Days Used by Training Area, TY 2009 to TY 2018



In the tables below, civilian use includes use of the ranges and training areas in the Reserve and the Training Support Areas 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 deer and turkey hunting seasons during TY 2018. 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 2018

		PERSONNEL	
Area	**Training Days/Events**	**Military Personnel**	**Civilian Personnel**
Ranges	174	5,669	120
Training Areas	893	69,652	238
Training Support Areas	1,051	28,543	1,315
TOTAL	**2,118**	**103,864**	**1,673**

TABLE 2-2 TRAINING USE HISTORY

Training Year	Training Days/Events	Military Personnel	Civilian Personnel
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
TY 2010	1,721	156,425	6,945
TY 2009	1,535	116,122	1,324
TOTAL	**17,058**	**1,054,363**	**23,739**

2.2 RANGE UPDATE

The current active small arms ranges on Camp Edwards are Juliet, Kilo, Sierra, India, and Lima ranges. Tango Range is currently inactive as its STAPP™ system was dismantled in Fall 2017 (see Section 2.3.2). 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 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 Cold Regions Research Lab, who is a metals mobility expert. The committee has a sunset clause of two years until November 2, 2019.

The committee met on August 15, 2018, and discussed whether the current small arms range monitoring is meeting the requirements of the EPSs and if the monitoring program is designed in a way that provides an early warning indicator that is protective of the groundwater. Instead of continuously measuring metals levels in soil that has shown insignificant change since monitoring began, the committee recommended monitoring for those conditions that could cause metals mobility in soils. This would act as a monitoring indicator that metals could become mobile. Metals monitoring would continue and based on sampling data to date the timing of monitoring may be changed as well, e.g. annually vs every three years. An Ad Hoc meeting will be held late winter of 2019 to bring new data and information forward and to propose a new sampling plan.

2.4 TANGO, JULIET AND KILO RANGES

Lead ammunition firing resumed at Tango Range in August 2007, at Kilo Range in March 2009, at Juliet Range in August 2009, Tango Range was dismantled in November 2017 and will be reconfigured as a copper-only range (see Section 2.4.2).

2.4.1 Range Maintenance and Sampling

Inspections of the Tango, Juliet and Kilo ranges were conducted by Camp Edwards personnel during TY 2018 in accordance with the provisions of the OMMP.

Maintenance activities conducted at Juliet, Kilo and Tango ranges during TY 2018 included one or more of the following: securing the tarp cover after severe weather, replacing the old tarp, disposing of water from the internal reservoir, repairing tears and seam failures in the top cover and replacing target frames.

A list of the inspection and maintenance activities at these ranges in TY 2018 is included in Appendix C.

In October 2018, surface soil, porewater, and groundwater samples were collected from porewater from the ranges per the OMMP. The samples were analyzed for lead, copper, and antimony. Results 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. The porewater results indicate the presence of antimony in several lysimeters on these ranges, and the concentrations exceeded the Action Level (6 parts per billion [ppb]) for antimony in porewater at each of these locations. However, levels have stayed the same or have dropped off significantly. Figures showing lysimeter locations and data and graphs are in Appendix C. These lysimeters have had antimony detections in previous sampling rounds. It should be noted that the concentrations of the other metals tested for in porewater (lead and copper) remain below the action levels and have remained at relatively the same concentrations since testing began. Antimony is in lead alloy bullets and in bullet primers. There is legacy antimony and lead in the berms from bullets fired into the berms before the STAPP™ systems were built.

There are several potential causes of increased antimony in porewater:

- legacy range soils, where lead-antimony bullets were fired, were used for berm and range construction at Julie, Kilo, and Tango ranges;
- phosphates added to range soils (1998-1999) to immobilize lead in legacy soils; and
- pH levels of soil and porewater.

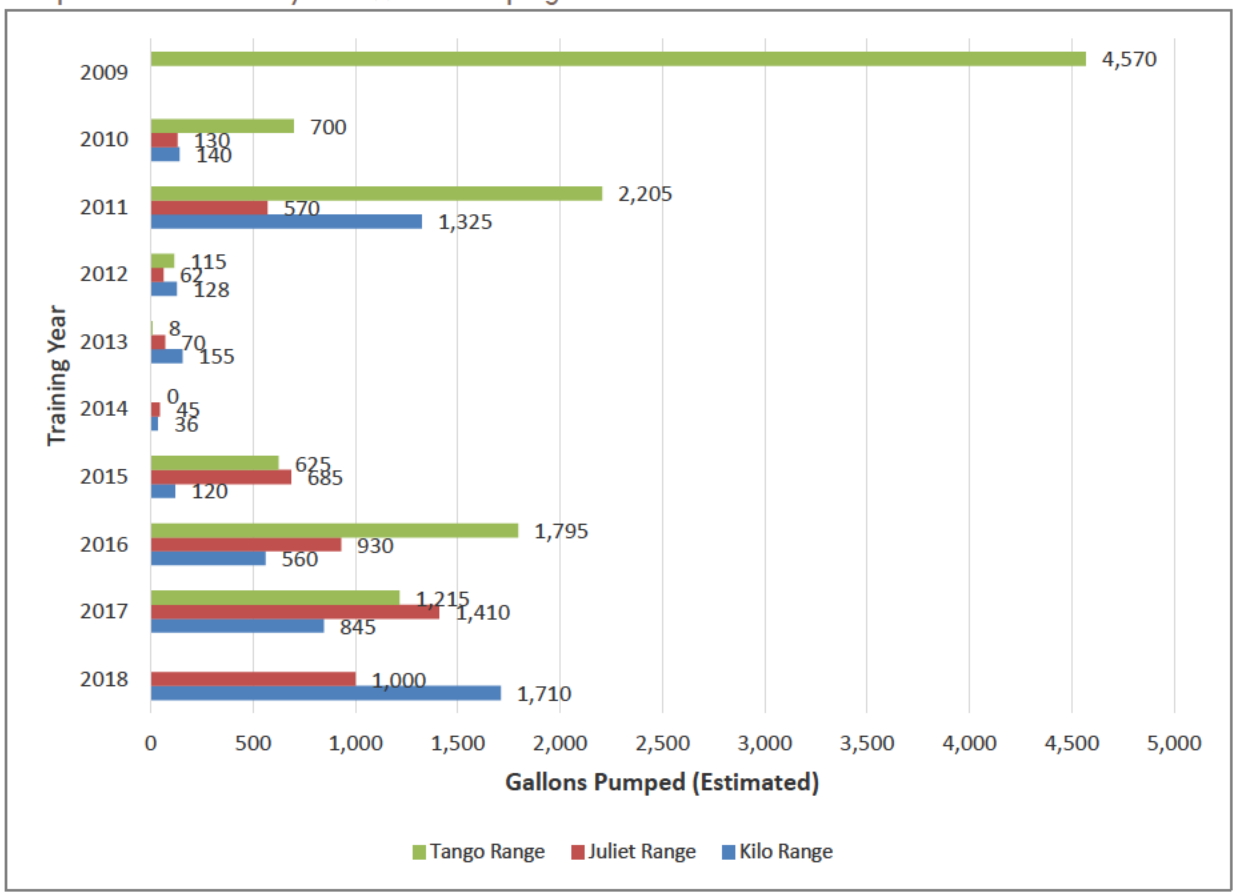
To further address the issue of antimony and other metals movements through soils, the MAARNG, along with members of the SAC, formed an Ad-Hoc Committee (see Section 2.3) to address this issue and future range monitoring at all active ranges on Camp Edwards. The Ad-Hoc Committee has requested that the MAARNG add the sampling of substances that can cause metals to be mobile in soil to their range monitoring efforts. This will be done in 2019. Another finding of the Ad-Hoc Committee through lab studies at the Cold Regions Research Lab in New Hampshire is that antimony is not threatening the groundwater. (see Section 2.3)

The Tango, Juliet and Kilo Ranges sampling results for TY 2018 are available in Appendix C.

A total of 2,710 gallons (estimated) of water were pumped from the STAPP™ systems on Juliet and Kilo ranges during TY 2018: 1,000 gallons at Juliet and 1,710 gallons at Kilo. The water pumped is the result of incidental seepage of rain water, 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 metals. The water is managed as a non-hazardous waste water and disposed of accordingly.

Graph 2-3 reflects the amount of water pumped from the STAPP™ systems from TY 2009 to TY 2018. 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 in the Kilo Range STAPP™ system in TY 2018. During the winter, the tarps protecting the system were damaged; because the system was uncovered, there is an increase in water entering the system. Replacement tarps are on order and all regulatory requirements for STAPP™ water disposal have been met.

Graph 2-3 STAPP™ System Water Pumping



2.4.2 Tango Range Dismantling

Camp Edwards decommissioned and removed the STAPP™ system from Tango Range in November 2017. The range will be converted to a 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.

The STAPP™ bullet catcher system and all associated appurtenances were removed in November 2017 and were disposed of in accordance with state and federal regulations and laws. The MAARNG will expand Tango Range to 32 lanes to meet current range standards. To safely use Tango Range, the target and firing lines will be moved 25 meters north to move them out of the Surface Danger Zone of the adjoining Sierra Range, such that both ranges can be used simultaneously.

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.

India Range is a basic 25-meter firing 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.

The EMC approved use of Sierra Range for copper ammunition for a two-year pilot program period in June 2012; India Range was approved for copper ammunition in May 2013. Firing of copper ammunition commenced at Sierra Range in July 2012 and at India Range in September 2013. At its meeting on July 24, 2014, the EMC extended the pilot program period for both ranges through December 31, 2016. In December 2016, the MAARNG requested and was granted EMC approval of an extension of the pilot program period for both ranges through December 31, 2017. The Pilot Period was extended so that further soil, porewater and groundwater monitoring data could be gathered to evaluate environmental impacts of utilizing these ranges and to allow time for the presentation of environmental monitoring data to the SAC, CAC and the EMC. At its November 2, 2017, meeting, the EMC voted to authorize the Acting Environmental Officer to close out the Pilot Period for India and Sierra Ranges and allow the MAARNG to continue to operate the ranges in accordance with the EPSs and the OMMPs.

The MAARNG sent a letter of request to end the Pilot Period on Sierra and India ranges to the EMC's Environmental Officer on November 11, 2017. In a letter dated December 29, 2017, the EMC's Environmental Officer stated that after a compliance review, it was determined that the MAARNG was not in compliance "with one more laws, regulations, orders, licenses, permits or approvals enforced by the EMC and that additional actions are necessary for compliance with the requirements of Chapter 47 of the Acts of 2002 (Chapter 47), the Environmental Performance Standards (revised April 6, 2017; the EPSs) and the range specific SOP and Range Maintenance Plans. Compliance issues identified included lack of completed Detailed Inspection Forms and Range Maintenance Forms; degradation and erosion on the backstop berm at India Range, in the frontal Station Infantry Target berms at the 50 meter targets, and in the 50 and 100 meter backstop berms on Sierra Range. The MAARNG was required to perform maintenance on those ranges prior to any utilization.

The EMC reinspected India and Sierra ranges and found the MAARNG to be in compliance with the OMMP for the range and authorized their use. The Pilot Period for Sierra and India Ranges was extended until December 31, 2018. In a letter dated November 2, 2018, the MAARNG sent a letter of request to end the Pilot Period for Sierra and India Ranges to the EMC's Environmental Officer. On December 12, the EMC's Environmental Officer, along with representatives from Camp Edwards, conducted a compliance inspection at India and Sierra ranges. The ranges were found to be in compliance. In a letter dated December 27, 2018, the EMC's Environmental Officer terminated the Pilot Period for Sierra and India ranges.

2.5.1 Range Maintenance and Sampling

Groundwater, porewater, and surface soil samples were collected from Sierra Range and India Range as prescribed in the OMMP. X-Ray Fluorescence (XRF) soil sampling was conducted at Sierra Range as required. The samples were analyzed for antimony, copper, and lead. Results of the soil and groundwater analyses continue to show no exceedance of the Action Levels specified in the OMMP.

During the 2018 operational sampling, the porewater results indicate that antimony was detected in the porewater lysimeter near the berm on India Range at a concentration exceeding the Action Level (6 ppb). Figures and graphs are available in Appendix C. This result is slightly higher than previous antimony detections at India Range. There is antimony in the berm, along with lead, from bullets fired into the berms before the range was rebuilt for use with only copper bullets.

To further address the issue of antimony and other metals movements through soils, the MAARNG, along with members of the SAC formed an Ad-Hoc Committee (see Section 2.3) to address this issue and future range monitoring at all active ranges on Camp Edwards. The Ad-Hoc Committee has requested that the MAARNG add the sampling of substances that can cause metals to be mobile in soil to their range monitoring efforts. This will be done in 2019. Another finding of the Ad-Hoc Committee through lab studies at the Cold Regions Research Lab in New Hampshire is that antimony is not threatening the groundwater. (See Section 2.3)

Lead was detected in the porewater collected from the lysimeter at the foot of the India Range berm in July/August 2013 at a concentration of 25.1 ppb, exceeding the 15 ppb Action Level. As recommended, this result can now be compared to the current sampling results. The concentration in 2014 dropped to 5 ppb, to 3.6 ppb in 2015, then spiked to 19.8 ppb in 2016, then dramatically decreased to 1.8 ppb in 2017 and has stayed at this level as of the 2018 sampling–below the OMMP Action Level of 7.5 ppb.

The lysimeter at the center range floor on India range had shown an increasing trend for metals in porewater with lead above the OMMP Action Level of 7.5 ppb at 21.6 ppb in 2017. However in 2018, the lead level in this lysimeter was significantly lower at 2.8 ppb which is well below the OMMP Action Level for lead. Antimony and copper are below the established OMMP Action Levels. Graphs showing metals levels are available in Appendix C. Coordination in regards to sampling results takes place with the EMC's Environmental Officer, SAC members, and the Army's Cold Regions Research Lab to help resolve the issue of metals in porewater at the current small arms ranges. The Sierra and India Range sampling results for TY 2018 are in Appendix C.

2.6 LIMA RANGE

In 2012, 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 formula for the Day-Glo-Orange marking powder has not changed and as used is considered to be non-toxic to human health and the environment. 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

A list of the inspection activities at Lima Range in TY 2018 is included in Appendix C.

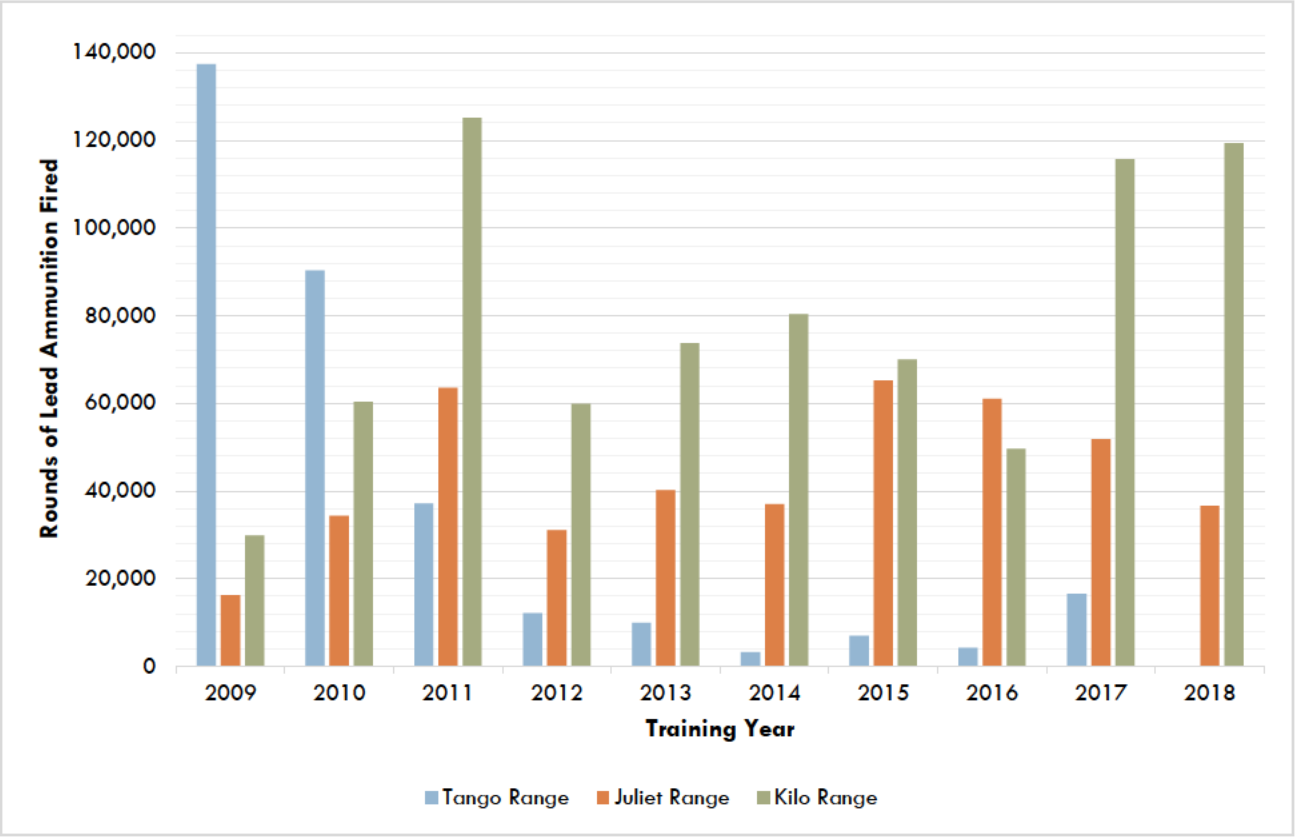
Porewater samples were collected from Lima Range in accordance with the OMMP and analyzed for lead, copper, and antimony. There were no Action Level exceedances when samples were analyzed from Lima Range during the 2018 sampling effort. The Lima Range sampling results for TY 2018 are in Appendix C.

2.7 RANGE USAGE DATA

A total of 1,565,081 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: 437,131 at Juliet Range and 783,924 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 2009 to TY 2018. The graph shows a declining trend in usage of lead ammunition. There is a small uptick in usage on Kilo Range due to Tango Range being dismantled; Kilo Range is also the larger of the two remaining STAPP™ system ranges and can accommodate more soldiers during a given training. In addition, the number of functional lanes on Juliet Range has decreased. As unit awareness increase that there are qualification ranges at Camp Edwards, the preference is to use the copper ranges (Sierra and India ranges). Therefore, there has been an increase in use of copper ammunition and, in general, an associated decrease in the use of lead ammunition at the STAPP™ ranges where units have to use an alternate qualification process. However, as units become aware that the ranges at Camp Edwards meet qualification

standards, the use of all ranges, and ammunition types, will go up, to include the lead ranges. Fluctuations in training usage/ammunition usage is also largely influenced by deployment cycles and changes to training doctrine and directives. Information on lead ammunition fired from TY 2009 through TY 2018, including amounts and types, is provided in Appendix C.

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

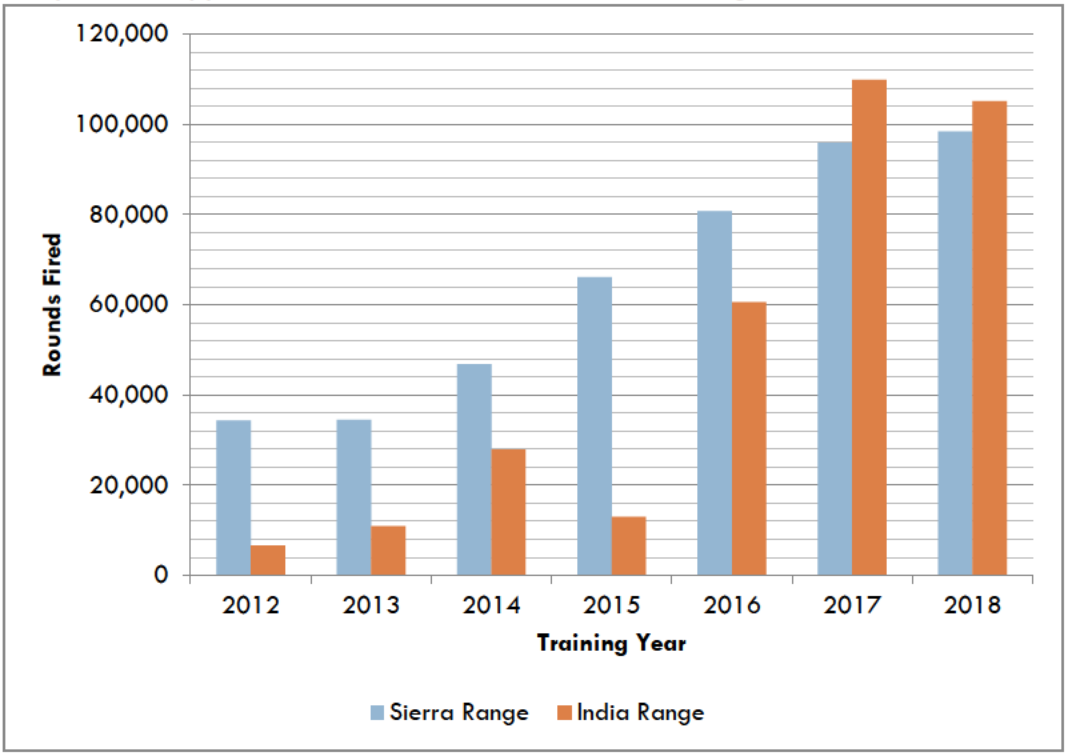


*The Tango Range STAPP system was dismantled in November 2017. There is currently no firing on Tango Range.

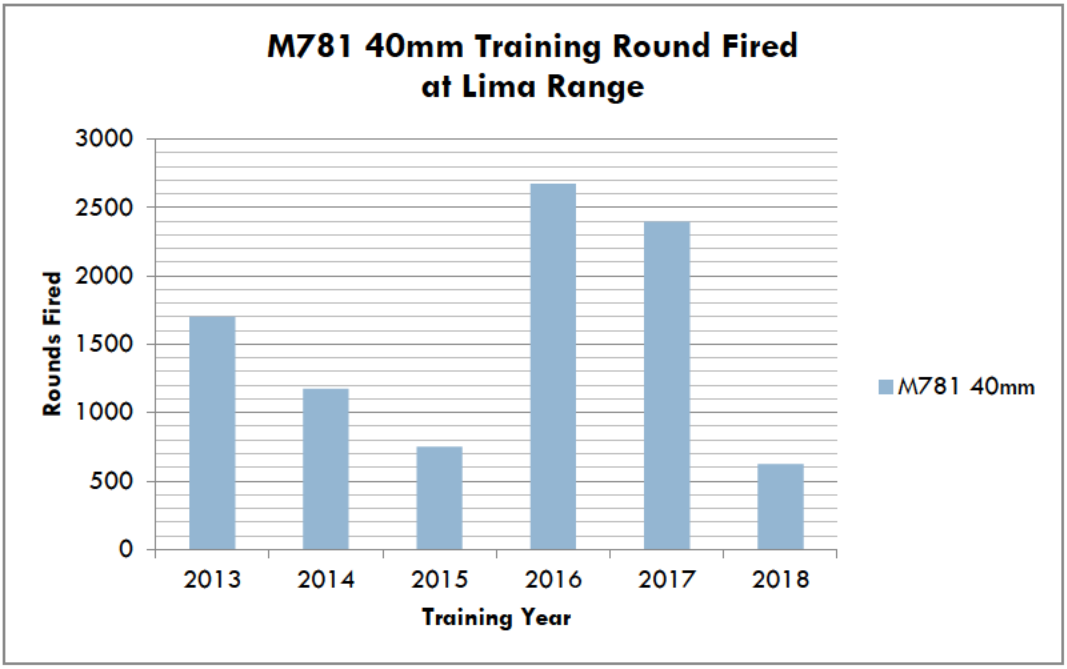
A total of 790,731 rounds of copper ammunition have been fired at Sierra and India ranges since its use was approved: 456,787 at Sierra Range and 333,944 at India Range. Graph 2-5 provides a summary of copper ammunition fired at Sierra and India ranges since use of copper ammunition was approved at them. The graph shows an upward trend in copper ammunition use. The MAARNG's stores of lead ammunition are nearly exhausted; once it is gone, the MANG will be transitioning to all copper-based ammunition. Juliet and Kilo ranges (lead ammunition ranges) will no longer be used by the MAARNG, but will be still be used by other entities, such as law enforcement. Information on the number of copper ammunition fired on Sierra and India ranges each training year from TY 2012 through TY 2018 is provided in Appendix C. A total of 9,323 M781 40mm Training Rounds have been fired at Lima Range since its use was approved. Graph 2-6 provides information on the number of M781 40mm Training Rounds fired at Lima Range since their use was approved. 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.

There was no civilian use of the firing ranges during TY 2018. During TY 2018, some type of weapons firing was conducted on at least one of the ranges on 55 calendar days.

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



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



2.7.1 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 2018 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 2018, some type of training was conducted in at least one of the training areas on 208 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 Reserve during the deer and turkey seasons are not tracked as they move through the various training areas; 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 2018 included the Massachusetts Air National Guard, the New York ARNG, the New Hampshire ARNG, the Army Reserve, the US Coast Guard and US Coast Guard Reserve, the US Air Force, the US Marine Corps, and the US Navy. Civilian organizations using the Training Areas during TY 2018 included the Boy Scouts of America, Brookline Special Response Team, Avwatch, Massachusetts Environmental Police, and Massachusetts Institute of Technology-Lincoln Lab, and environmental remediation contractors and environmental restoration contractors.

TABLE 2-3 TRAINING AREA USE - TY 2018

Training Area	Training Days	Personnel		Vehicles (Wheeled) #	Vehicles (Tracked) #
		Military	Civilian		
SVL-OBJ 1	35	3,003	16	107	0
SVL-OBJ 2	16	1,961	0	0	0
SVL-OBJ 3	7	547	0	48	12
OP 1	11	1,388	0	0	0
OP 2	11	1,388	0	0	0
OP 3	11	1,388	0	0	0
OP 4	11	1,388	0	0	0
OP 5	6	531	0	0	0
OP 6	9	888	0	0	0
OP 7	9	888	0	0	0
BP 1	5	205	0	0	0
BP 2	18	583	0	0	0
BP 6	10	1,040	0	0	0
BP 7	19	1,046	0	2	0
BP 8	15	348	0	0	0
BP 9	9	118	28	0	0
BP 14	19	918	0	0	0
BP 16	19	918	0	0	0
BP 24	2	125	0	6	0
BP 27	21	2,018	0	38	0
BP 28	19	1,538	0	0	0
NBC 1	13	1,116	0	10	0
NBC 4	4	400	0	0	0
Training Roads	72	6,866	28	0	0

TABLE 2-3 TRAINING AREA USE - TY 2018, cont'd

Training Area	Training Days	Personnel		Vehicles (Wheeled) #	Vehicles (Tracked) #
		Military	Civilian		
A 1	3	56	0	0	0
A 2	14	1,882	0	12	0
A 3	19	1,736	0	12	0
A 4	18	1,864	0	0	0
A 6	12	1,044	0	0	0
B 7	15	1,065	0	31	0
B 10	12	1,080	0	6	0
B 11	14	1,020	0	6	0
B 12	14	1,143	0	6	0
BA 1	4	248	0	13	0
BA 3	37	2,190	120	0	0
BA 4	30	2,665	0	10	0
BA 6	3	96	0	0	0
BA 7	48	3,232	0	86	0
C 13	18	1,813	0	0	0
C 14	41	3,449	0	92	0
C 15	29	2,195	0	33	0
C 16	21	1,568	0	0	0
Land Nav 1	14	717	0	6	0
Land Nav 2	23	1,762	0	6	0
Land Nav 3	20	950	0	0	0
Land Nav 4 Alpha	12	823	0	0	0
Land Nav 4 Bravo	9	735	0	0	0
Land Nav 4 Charlie	16	1,010	10	0	0
Dig Site 3	40	4,298	28	0	0
R-4101 Airspace	36	402	8	0	0
Total	**893**	**69,652**	**238**	**530**	**12**

TABLE 2-4 TRAINING AREA USE HISTORY

Training Year	Training Days/Events	Personnel		Vehicles (Wheeled)	Vehicles (Tracked)
		Military	Civilian		
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

TABLE 2-4 TRAINING AREA USE HISTORY, cont'd

Training Year	Training Days/Events	Personnel		Vehicles (Wheeled)	Vehicles (Tracked)
		Military	Civilian		
TY 2010	614	63,379	488	5,627	3
TY 2009	327	17,577	56	2,445	10
TOTAL	**5,173**	**331,073**	**6,698**	**24,731**	**51**

2.7.2 Vehicle Use, Fueling and Maintenance

Vehicle use in the training areas during TY 2018 was 530 wheeled vehicles. Twelve 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 Reserve has been prohibited by the EPSs since 2002, however the MAARNG is proposing to modify the EPSs to allow refueling in the 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.

2.7.3 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 2018. Overall historical use of the TSA for the past 10 training years is included in Table 2-6. 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.

Civilian organizations using the Training Support Areas in the Cantonment Area of Camp Edwards during TY 2018 included AIGS, Boy Scouts of America, Drug Enforcement Agency-Special Response Team, the Federal Aviation Administration, the Barnstable County Sheriff's Department, Brookline Special Response Team, Massachusetts State Police, US Geological Survey, the Civil Air Patrol, Massachusetts Maritime Academy, Massachusetts Division of Fisheries and Wildlife, and the US Postal Service.

TABLE 2-5 TRAINING SUPPORT AREA USE - TY 2018

Training Support Area	Training Days/Events	Personnel	
		Military	Civilian
1100 Training Area (Drivers Tng)	7	230	0
1300 Training Area	10	2,150	0
3400 Training Area/Rail Load Ramp	2	100	0

TABLE 2-5 TRAINING SUPPORT AREA USE - TY 2018, cont'd

Training Support Area	Training Days/Events	Personnel	
		Military	Civilian
APFT Running Track	32	3,010	0
Asymmetric Threat Classroom	8	292	0
Battle Simulation Ctr - Bldg 1206	126	8,360	420
Battle Simulation Ctr - Rear Offices	46	1,355	0
Battle Simulation - Bldg 1213, 1st Floor	39	2,130	300
Battle Simulation - Bldg 1213, 2nd Floor	71	2,760	300
Battle Simulation - TOC Pads	14	700	0
Call for Fire Trainer	54	1,191	43
Virtual Battle System 3 Classroom - Bldg 3494	43	1,063	0
Connery Field	12	330	0
Engagement Skill Trainer 2000 - A	10	136	0
Engagement Skill Trainer 2000 - B	68	983	28
Engagement Skill Trainer 2000 - C	38	331	12
HMMWV Egress Assistance Trainer 1123	8	288	0
HMMWV Egress Assistance Trainer 1132	2	39	0
HMMWV Egress Assistance Trainer 1215	7	121	0
Lee Field	19	1,880	1,080
MRAP	6	321	0
ODS - Operator Driving System	3	50	0
Shaw Field	42	3,232	960
Vault 1 - TSC	32	364	0
Vault 2 - TSC	30	60	0
Vault 3 - TSC	62	132	0
Virtual Convoy Opns Trainer #43 (VCOT - TSC)	37	439	0
Virtual Convoy Opns Trainer #98 (VCOT - TSC)	31	362	0
Weapons Cleaning - Bldg 3498	41	1,246	0
Welcome Center	151	5,634	842
YD Memorial Park	10	330	300
TY 2018 Total	**1,061**	**39,619**	**4,285**

TABLE 2-6 TRAINING SUPPORT AREA USE HISTORY

Training Year	Training Days/Events	Personnel		
		Military	Civilian	Total
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

TABLE 2-6 TRAINING SUPPORT AREA USE HISTORY, cont'd

Training Year	Training Days/Events	Personnel		
		Military	Civilian	Total
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
TY 2010	1,052	90,439	6,116	96,555
TY 2009	1,137	94,836	1,180	96,016
TOTAL	**10,636**	**681,423**	**17,850**	**700,586**

2.8 OFF-SITE TRAINING

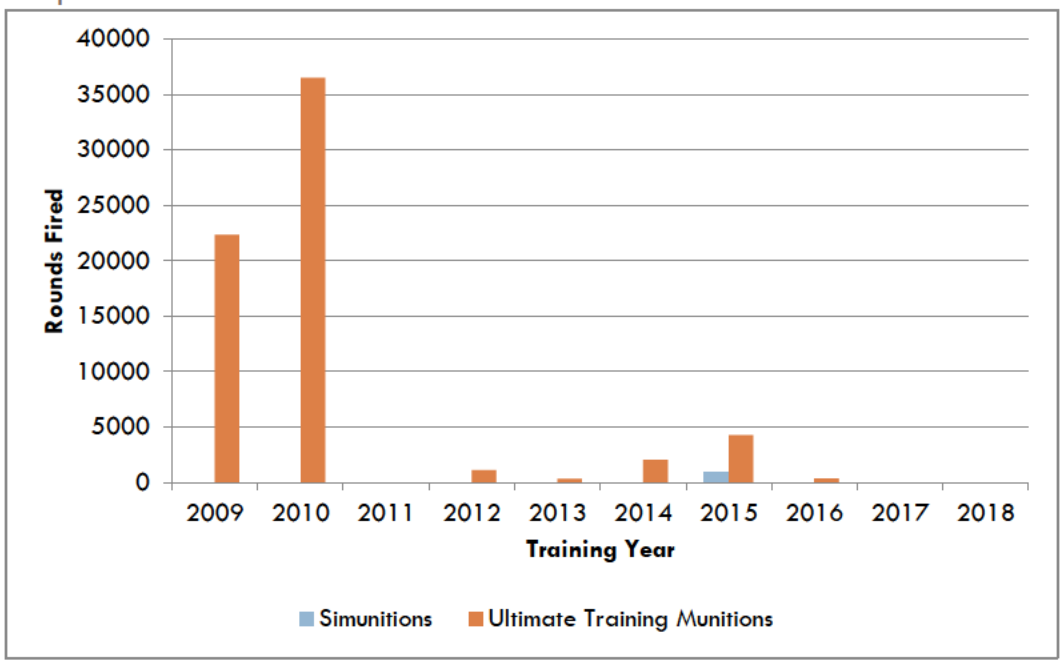
During TY 2018, the MAARNG had 87 units conduct their annual two-week training cycle. Of these, 30 units trained in Massachusetts, 29 of which trained solely at Camp Edwards. Thirty-three units trained in twelve different states and one country; two in Connecticut, one in Alabama, one in Indiana, three in California, fourteen in New York, two in Iowa, one in North Carolina, one in Utah, one in Texas, nine in Vermont, and one in New Jersey, four units in Canada, and six units deployed oversees.

The total number of Massachusetts soldiers trained during annual training for TY 2018 was 3,968 out of 6,335. Fifteen units conducted year-round annual training consisting of 594 soldiers, while 1,773 attended a military school or returned from deployment, in lieu of annual training. The number of MAARNG soldiers that completed a two-week annual training cycle by general geographical locations is: 80 in Massachusetts, 3,578 in other states, and 310 outside of the continental United States.

2.9 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. No simulated munitions were used during TY 2018. 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 Reserve since 2009. The higher numbers of UTM used in 2009 and 2010 were due to units deploying.

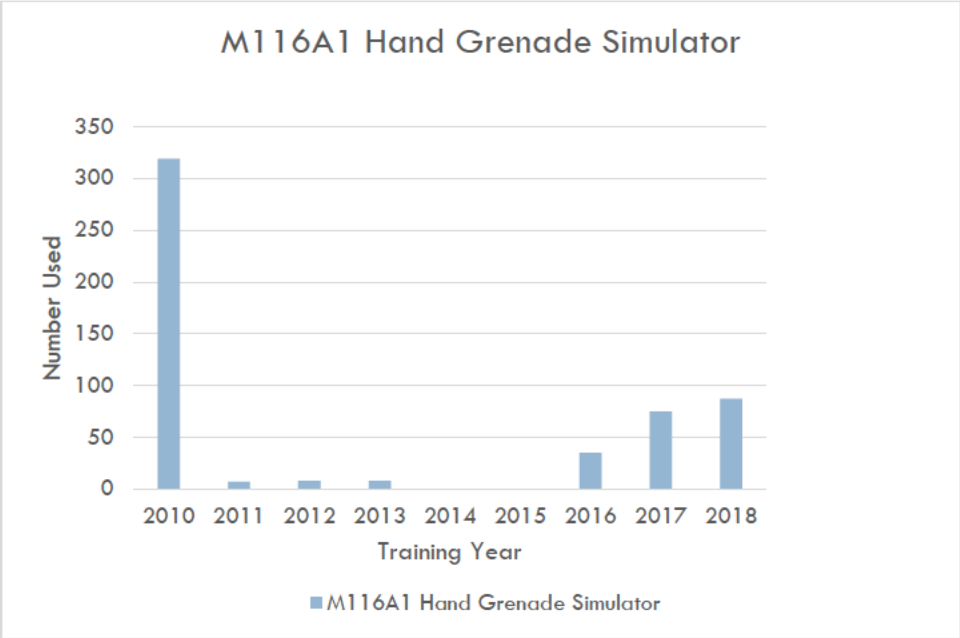
Graph 2-7 Simulated Munitions Use



2.10 PYROTECHNICS

The M116A1 Hand Grenade Simulator was approved for use at Camp Edwards in March 2010. Eighty-seven were used in the Reserve during TY 2018. Graph 2-8 shows the number used each training year since TY 2010.

Graph 2-8 Pyrotechnics Use in the Reserve History



2.11 M69 HAND GRENADE SIMULATOR

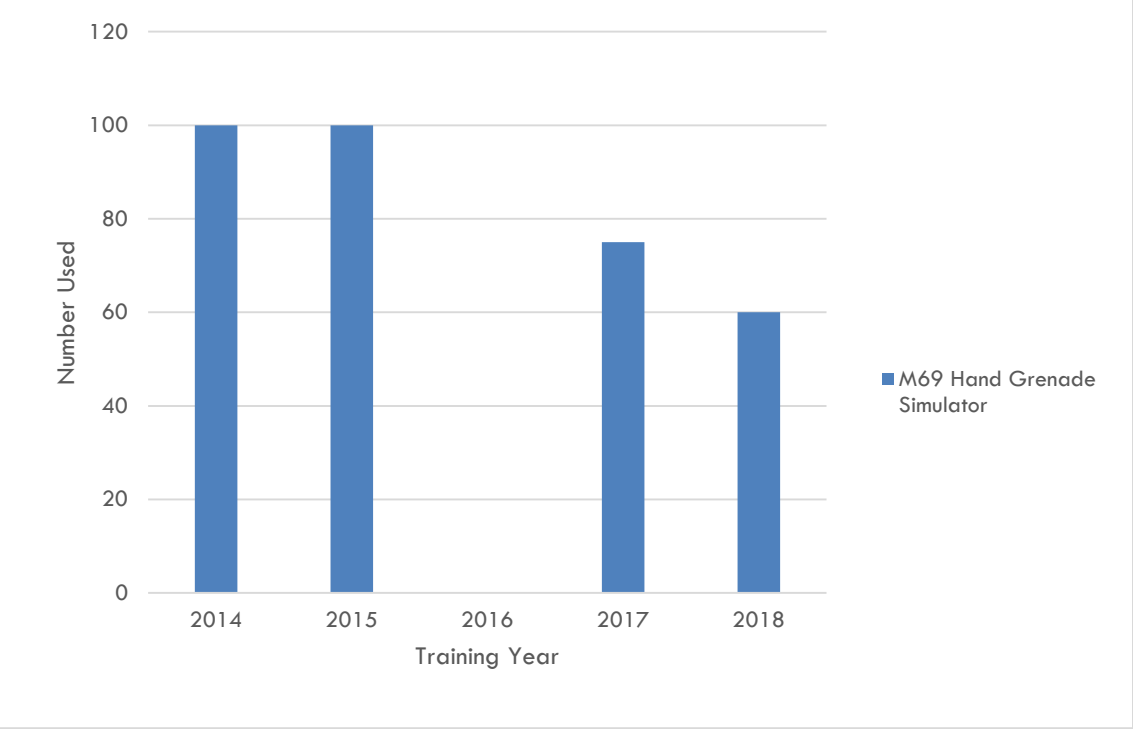
In 2013, EPA Region 1 and the EMC approved the use of the M69 Hand Grenade Simulator on Camp Edwards.

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. Sixty were used in the Reserve in TY 2018. Graph 2-9 shows the number of M69 Hand Grenade Simulators used since TY 2014.

Graph 2-9 M69 Hand Grenade Simulator Use



2.12 SOLDIER VALIDATION LANE

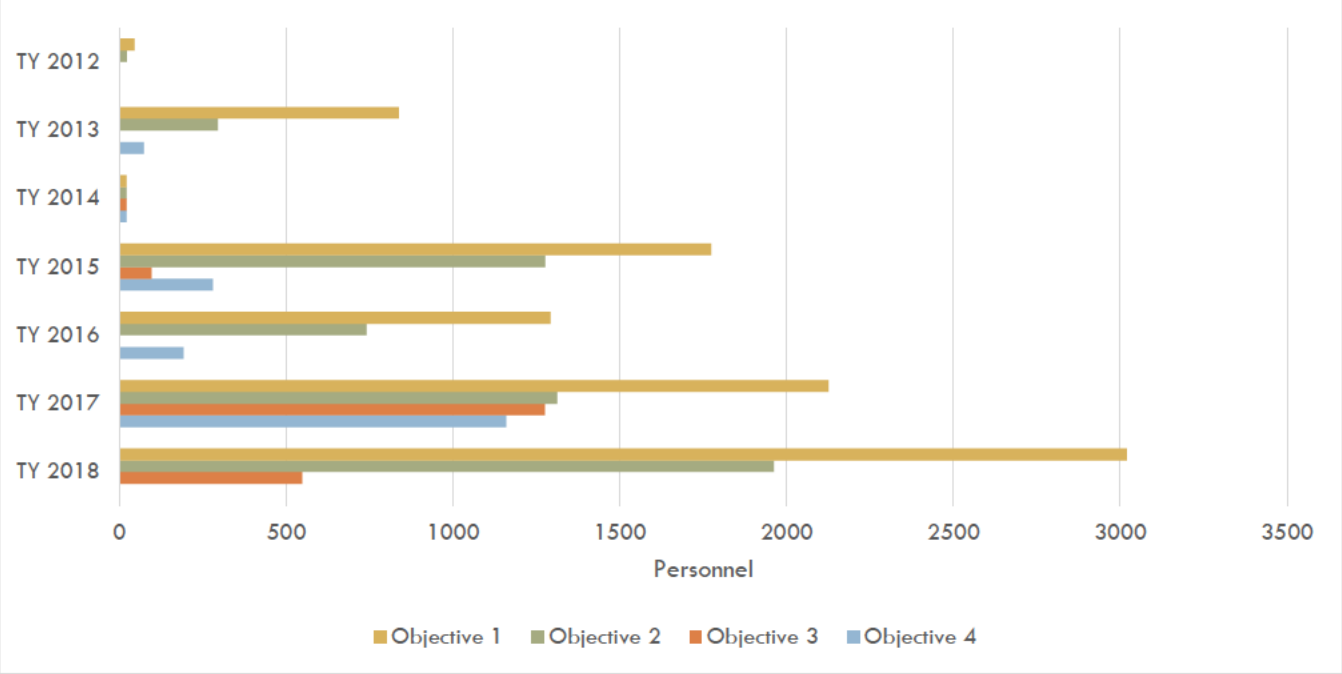
The SVL uses conex-like shipping containers as training aids, which can be reconfigured to mimic small villages and used for Improvised Explosive Device (IED) training. The containers are located in open or previously cleared, historically used training areas including training and bivouac sites within the Training Area. The ability to periodically reconfigure the portable training aides 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.

Three SVL locations (called objectives) were used during TY 2018 to meet military training needs: Objective 1 in Training Area A-4; Objective 2 in Training Area BA 4; and Objective 3 in Training Area B 11. Graph 2-10 shows the use of all four SVL Objectives since TY 2012. The locations of the SVL Objectives are shown in Figure 2-6. The graph shows an increase in usage at the SVL objectives. Units have been directed to utilize Camp Edwards, and training doctrine has shifted towards more supporting unit exercises.

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 2018 is available in Appendix C.

Graph 2-10 Soldier Validation Lane Use



2.13 ECHO RANGE

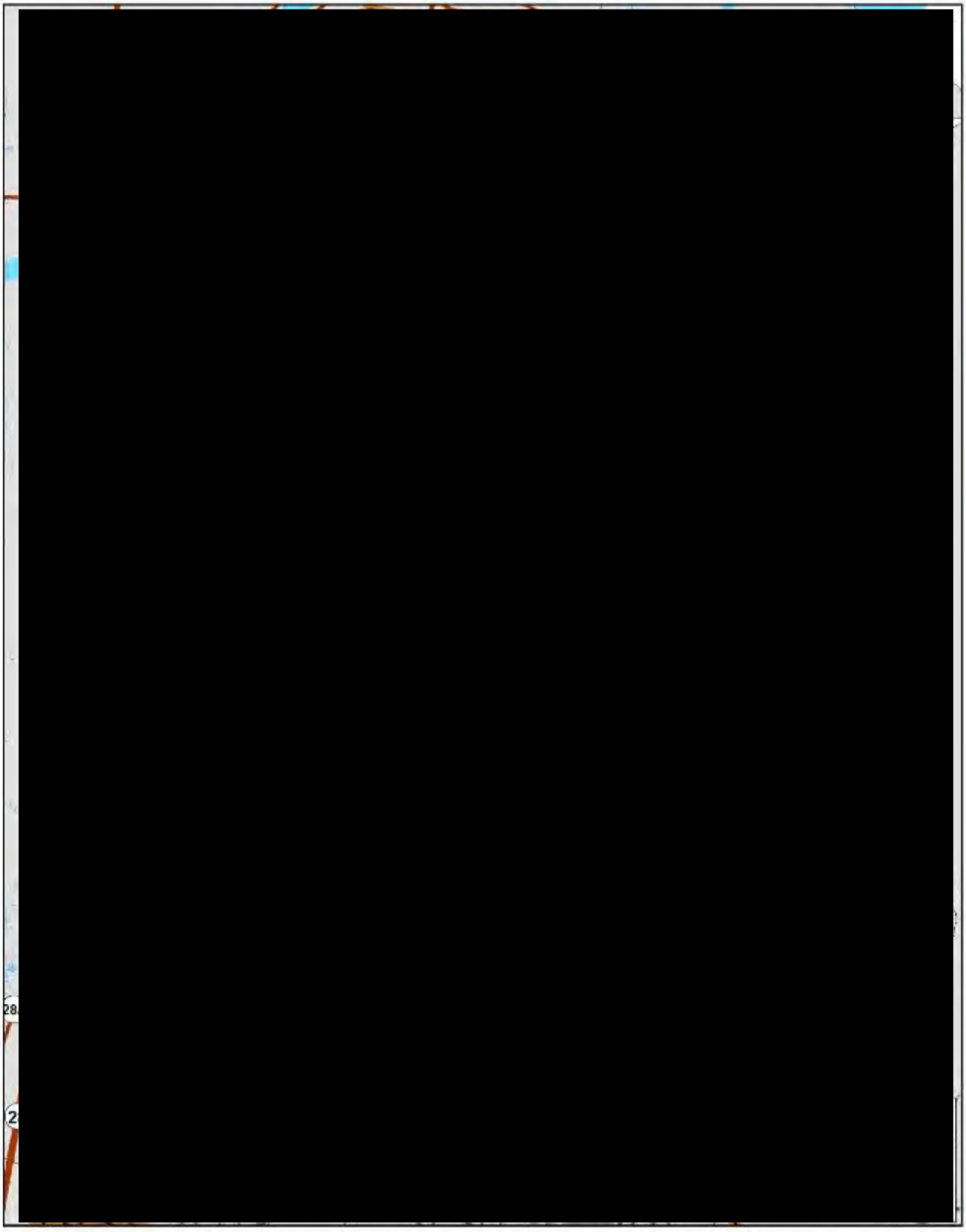
Echo Range, a dual purpose range, is a Combat Pistol/Military Police Qualification Course (CPMPQC), consisting of 15 firing lanes with seven pop-up targets per lane offset along the firing lanes at varying distances with one fixed Military Police target at the end of the lane. Shooters shift their pistol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

Over the last four training years, Camp Edwards staff has worked to finish upgrading Echo Range for use with lead ammunition, a process originally begun in 2006. Actions included conducting line of site analyses, test firing, and the development of a scope and contract for range design modification that is in compliance with regulatory requirements and be protective of the environment.

Camp Edwards has constructed Echo Range to be a CPQC. The backstop berm will be utilized as the primary projectile capture area. Single Individual Target (SIT) 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 top soil that slows projectiles and allows for vegetation and slope stabilization.

In TY 2017, the EMC's Environmental Officer approved the range design and OMMP for Echo Range. During TY 2018, Camp Edwards Range Control brought the Megett Target company to Echo Range to trouble shoot issues with the pop-up targets on the range. The company identified two issues: the target lifters were becoming damp and the antenna installed at Sierra Range controlling those targets was causing interference. Those issues were fixed. Range Control staff also received training on targetry maintenance. Echo Range is expected to be operational in winter 2019.

Figure 2-6 SVL Objective Locations



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 Reserve be allowed under certain conditions. In the past, exceptions to the standard have been granted regularly 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.

In TY 2017, the MAARNG conducted its first Proof of Concept was conducted outside of the 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 BMPs, which are protective of the environment. 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 (See Photograph 2-1).

The MAARNG has drafted a Standard Operating Procedure for fueling in the Reserve along with a map that denotes areas for fueling vehicles and off-limits areas. The MAARNG will also develop language for the proposed EPS change. The MAARNG plans to return to the EMC and its advisory bodies in TY 2019 to present this information and request a change to this EPS.

Photograph 2-1 HUMVEE refueling in the Reserve during the TY 2018 Proof of Concept

2.15 MULTI-PURPOSE MACHINE GUN RANGE

During TY 2015, the MAARNG was awarded a MILCON (Military Construction) project to construct a Multi-Purpose Machine Gun Range (MPMG) in 2020 on Camp Edwards at the current KD Range. 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 will include review under both the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA). An Environmental Assessment will be created and will be available for public review and comment in late TY 2019 or early TY 2020. The MAARNG The project is anticipated to begin construction in March 2020 with project completion in March 2022.

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 for in 2017, and the Rusty-patched bumble bee, which was surveyed for 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.

In November 2018, the RFP for the range design contract was awarded. When there is a 30% design, the environmental review process will begin in earnest with the start of the NEPA process and completion of the draft Environmental Assessment; beginning the MEPA process, and completing the EMC range development process by complying with the EPSs. All these processes will be coordinated with the EMC’s Environmental Officer.

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 Reserve and to report on activities associated with the EPSs for the 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 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 2009, when available, or longer when appropriate to illustrate long-term trends. Additional information on environmental management activities performed in the Reserve can be found on the Publications page of the E&RC web site at: www.EandRC.org.

During TY 2018, eight Records of Environmental Consideration (RECs) were reviewed for natural and cultural resources for proposed actions in the Reserve. The RECs reviewed were for Natural Resources Program-related activities.

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

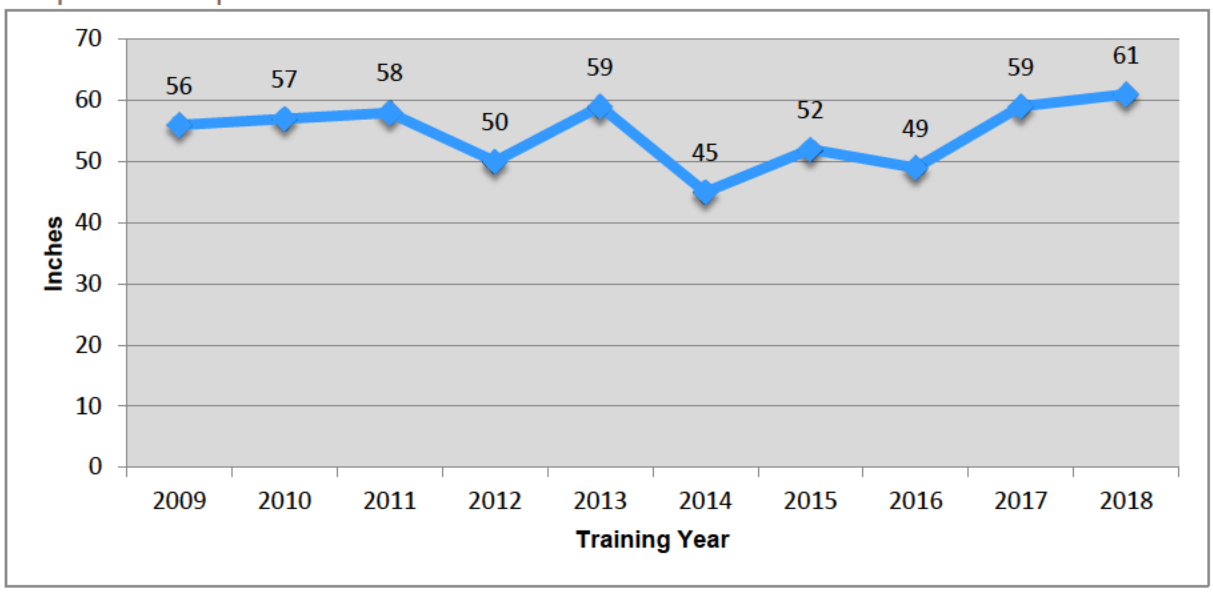
3.1 GROUNDWATER RESOURCES MANAGEMENT

The MAARNG complied with the Groundwater Environmental Performance Standard during TY 2018. 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 Reserve. Both the Upper Cape Water Supply Cooperative and the 102nd 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 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: www.EandRC.org.

3.1.1 Precipitation

Precipitation information included in the Annual Report for TY 2009 was provided by the base weather station near the airfield in the Cantonment Area of Otis ANGB. Starting with data for TY 2010, precipitation information 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 61.21 inches of precipitation for TY 2018 (Graph 3-1).

Graph 3-1 Precipitation Recorded



Note: Source of precipitation information changed with TY 2010 data. See explanation in above text.

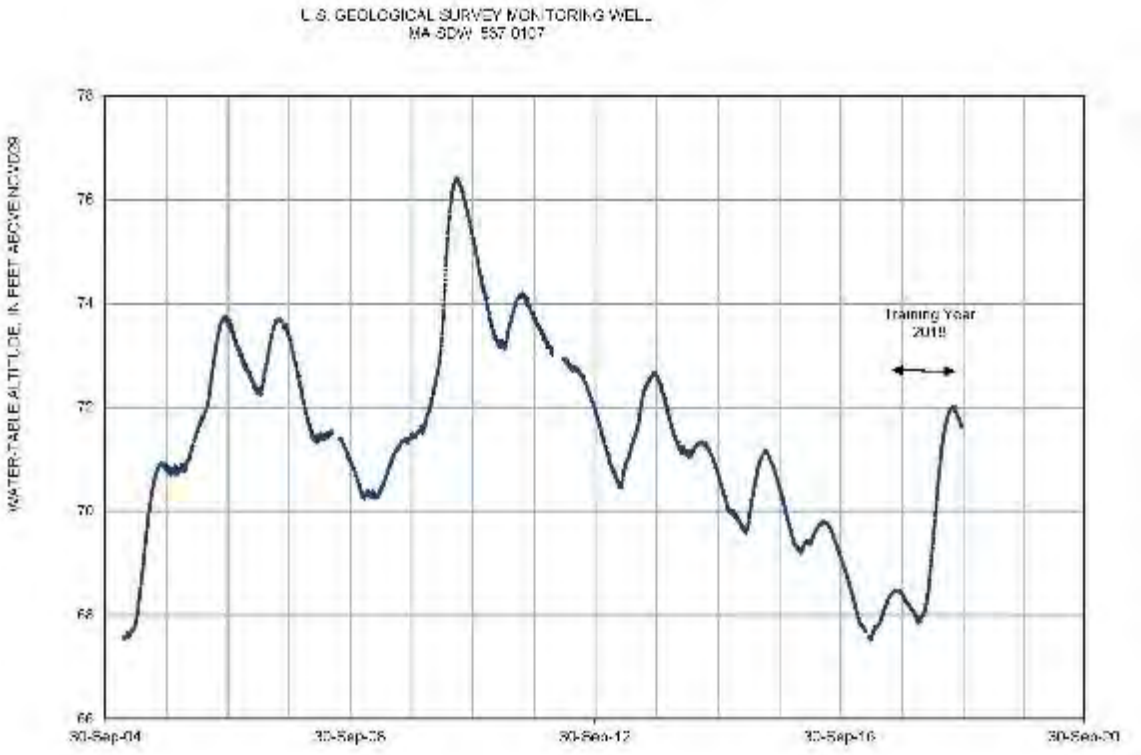
3.1.2 Groundwater Level

During the early part of 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 is located west of Greenway Road on the J-1 Range in the 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 2005-2018 training years. In TY 2017, the water-table altitude (in feet above the National Geodetic Vertical Datum of 1929, also referred to as sea level) declined to its lowest level since measurements began in 2005. During TY 2018 (October 1, 2017, to September 30, 2018), the water-table altitude rose about 4.2 feet. The water-level rise reflects higher than average precipitation on Cape Cod in 2018.

The IAGWSP provides part of the funding for the installation and operation of the monitoring well because the water-level data are used in that program. The well became operational in January 2005. 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



3.1.3 Water Supply Systems

Upper Cape Regional Water Supply Cooperative

The Upper Cape Regional Water Supply Cooperative provided 445,355,000 gallons of water (a daily average of 1,220,150) from its three wells to the six public water supply systems it services during TY 2018: 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. Graph 3-3 shows the daily average pumping rate of the Cooperative since TY 2009. 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. The Cooperative's 2018 Long Term Monitoring Sentry Well Sampling Results are in Appendix E.

In May 2018 the explosive compound RDX was detected in groundwater samples collected by the Upper Cape Regional Water Cooperative from sentry wells C-1S (0.43 µg/L) and C-4S (0.27 µg/L). The Massachusetts Contingency Plan Groundwater 1standard for RDX is 1 µg/L (ppb) and the EPA Health Advisory is 0.6 µg/L.

The IAGWSP resampled sentry wells C-1S and C-4S for explosives and perchlorate on August 1, 2018. No explosives were detected; however perchlorate was detected at low, estimated values in C-1S (0.043-J µg/L) and C-4S (0.018-J µg/L), below the Massachusetts Maximum Contaminant Level (MMCL) for perchlorate of 2 µg/L Travel time from the sentinel wells to the water supply wells is approximately 3 years. The Cooperative water supply wells WS-1, WS-2 and WS-3 were sampled for explosives and perchlorate on August 6, 2018 with no detections.

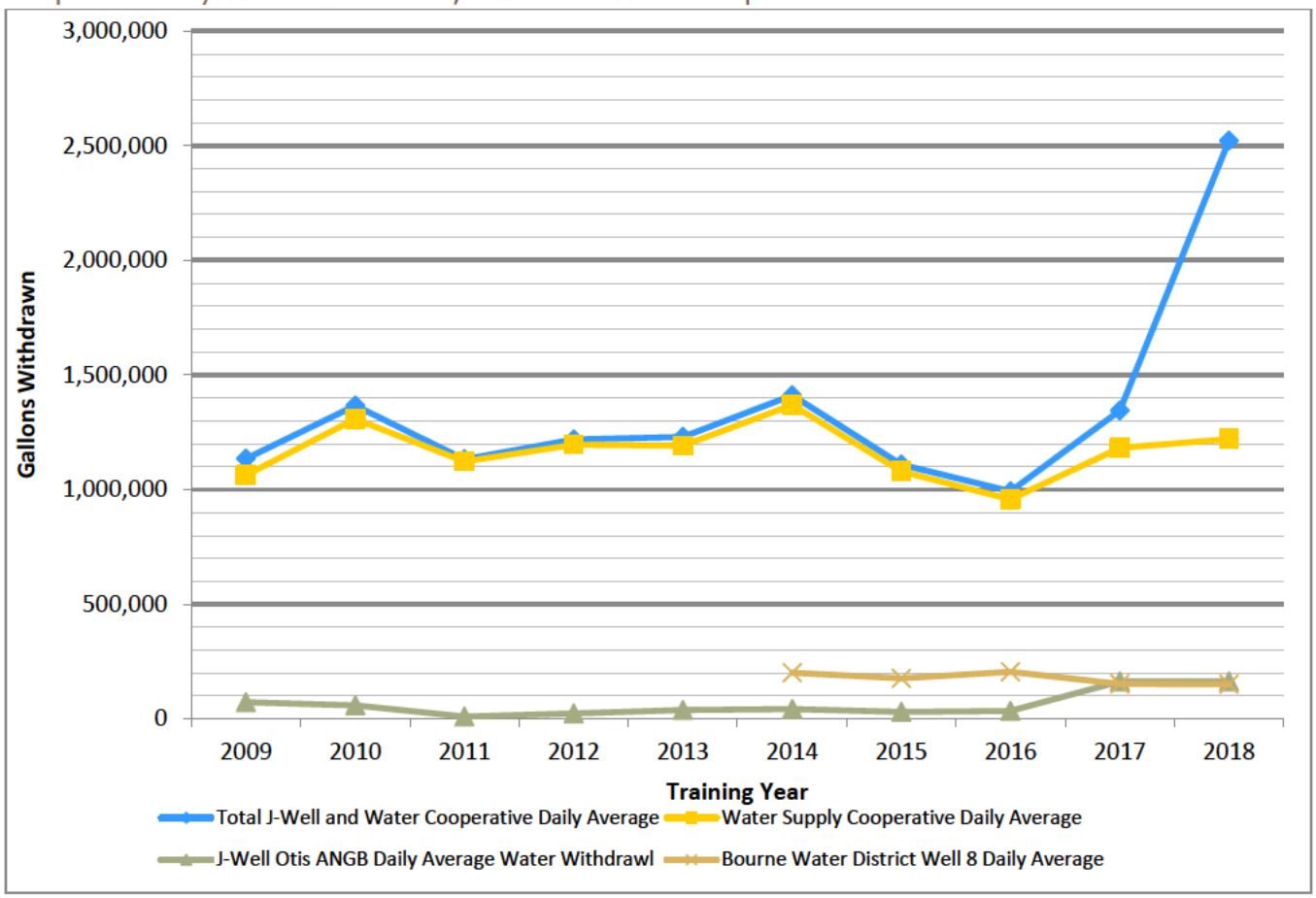
The IAGWSP has identified groundwater contaminated with RDX and perchlorate in areas upgradient of the Cooperative's sentry wells. The J-2 Northern plume is upgradient of the C4-S sentry well and the J-2 eastern Plume is located upgradient of the C1-S sentry well.

The RDX and perchlorate in these plumes is being captured by multiple extraction wells and RDX has not been previously detected in monitoring wells downgradient of the extraction wells. Shallow and intermediate sentry wells were sampled for explosives and perchlorate in 2015 and the deep sentry wells were sampled for explosives and perchlorate in 2017 - none of these compounds were detected in any of the samples.

Environmental monitoring wells located upgradient of C-4S were sampled for explosives and perchlorate. Monitoring well 330 was nondetect for explosives/0.022 µg/L j for perchlorate and Monitoring Well 345 was nondetect for explosives and perchlorate.

The Cooperative's and IAGWSP's sampling results are 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.

Otis ANGB Public Water Supply System

The Otis ANGB system pumped an average of 125,583 gallons of water per day and a total of 46,727,000 gallons of water from its well, known as J-Well (located in the Cantonment Area), during TY 2018. It also received 29,964,000 gallons from the Cooperative during TY 2018; a daily average of 82,093 gallons. Graph 3-3 shows the daily average pumping rate of the Otis system since TY 2009.

A copy of the calendar year 2017 Water Quality Report published by the 102nd Intelligence Wing in May 2018 is provided in Appendix E.

Bourne Water District Water Supply Well

Bourne Water District Well 8 became operational in May 2014. During TY 2018 a total of 55,300,700 gallons pumped, with a daily average of 151,508 gallons pumped. Graph 3-3 shows the daily average pumping rate of Well 8 for TY 2014 through TY 2018. The well's location is shown in Figure 3-1. A copy of the calendar year 2017 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 Reserve, which are not subject to Chapter 47 of the Acts of 2002 and the EPSs. These are located at Cape Cod AFS and the USCG Communications Station. Further information on these water supply wells is available by contacting the Massachusetts Department of Environmental Protection at 508-946-2760.

3.2 WETLANDS AND SURFACE WATER MANAGEMENT

The MAARNG did not take any actions during TY 2018 that resulted in the loss of any wetland resources or their 100-foot buffer areas. No new bivouac areas were created in the 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 the IAGWSP to stay abreast of the IAGWSP's remediation activities in the Reserve and to ensure appropriate coordination existed between appropriate offices and that remediation activities did not impact wetlands areas.

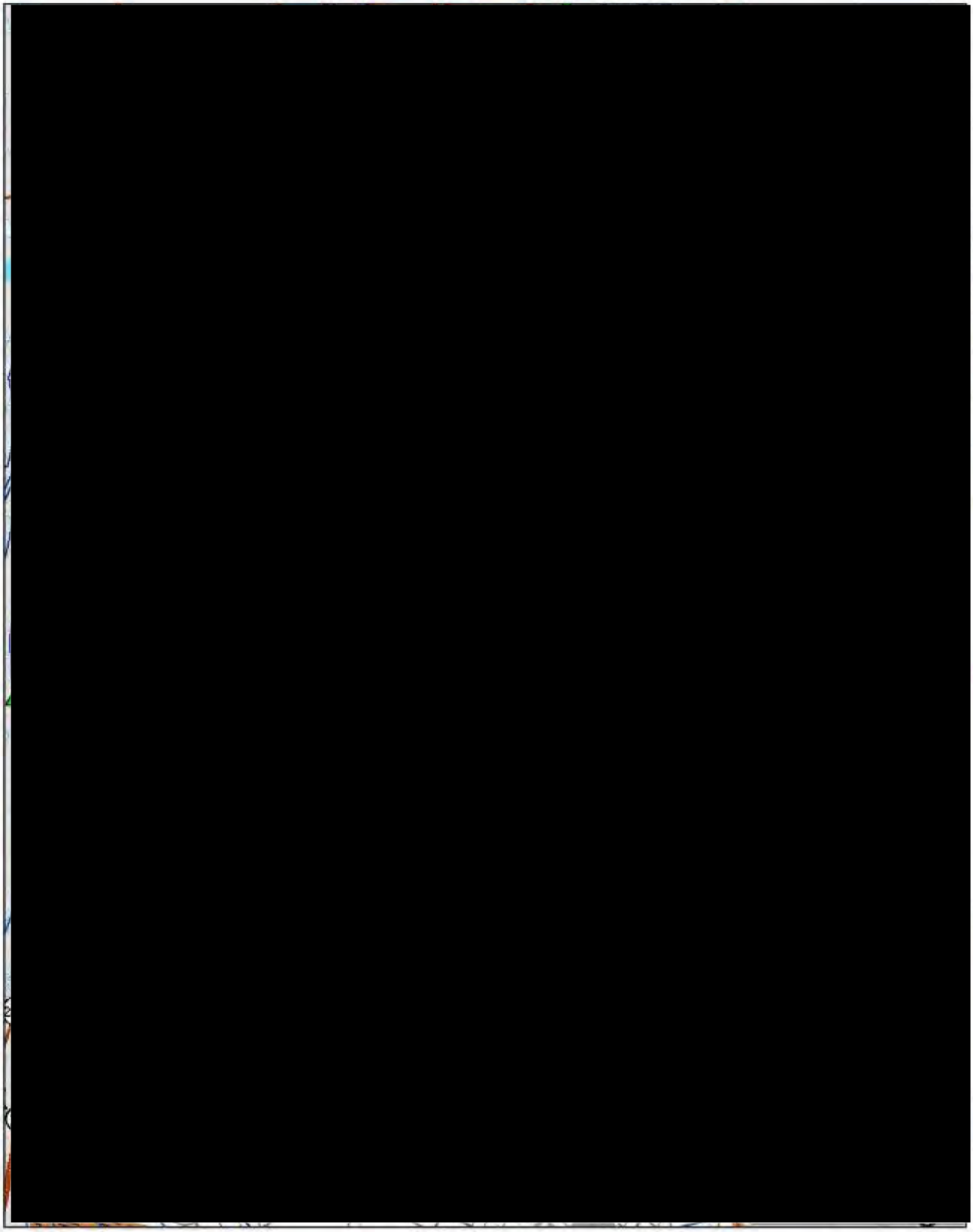
One project within the Reserve required coordination with the Town of Bourne regarding the town's Wetland Protection By-law in TY 2018. The project coordination with the Town of Bourne and NHESP began and was reported in the TY 2017 Annual Report. The project is the repair of a subset of large puddles impeding the use of Cat and Herbert roads for training and other activities. The puddles in question support Agassiz's Clam Shrimp (*Eulimnadia agassizii*), a state listed endangered species. The Natural Resources Office worked with NHESP to create a Conservation and Management Plan, which outlines a plan for habitat creation, clam shrimp relocation, and monitoring to provide for a net benefit to the species and allow for necessary road repairs. In addition to the NHESP coordination, a Request for Determination of Applicability was submitted to the Town of Bourne and representatives attended a Conservation Commission meeting on August 16, 2018. The work is within the 100-foot buffer of a town jurisdictional wetland. The Commission made a negative determination based on it only occurring within the Buffer Zone and not altering an Area subject to protection.

Additional coordination with the Town of Bourne and the SAC occurred to ensure that repair of a subset of roadway puddles would not require filing under the Wetlands Protection Act or Bourne Wetland Protection By-laws. There are many puddles throughout the training site that do not support clam shrimp and present a hazard to fauna, particularly vernal pool species by having insufficient hydroperiod. During a site visit a number of features were mutually identified for road repair without concern for negatively impacting wetlands resources.

3.2.1 Vernal Pools

In TY 2018, the Natural Resources Office only monitored puddles for the existence of clam shrimp. No other vernal pools or puddles were monitored for amphibian activity. Monitoring of puddles followed the guidance agreed upon in the Conservation and Management Plan (10 puddles surveyed every two weeks from mid-May to mid-July and then once a month until October 15). The Natural Resources Office had technicians survey additional sites to include puddles in the perimeter of the Impact Area and off base sites that were surveyed to gather data on the distribution of Aggasiz's clam shrimp.

Figure 3-1 Well Locations



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 2018. The office observed six species and is reporting the sightings to NHESP in early TY 2019 (Table 3-1). Field crew members hired for TY 2018 were primarily involved in observing and reporting these rare floral and faunal species in the Reserve with supplementary observations from others. The Natural Resources Office is also reporting observations of five "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 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 2018 for rare species. MESA coordination was initiated for future development of a MPMG range (Project #18-37434) along with submittal of two Impact Area Groundwater Study Program Records of Action (#265 and #266) for multiple monitoring wells and Former E Range investigation, respectively. Three streamlined consultation forms were submitted to the US Fish and Wildlife Service (USFWS) New England Field Office for projects that were outside the scope of the informal consultation, but met the criteria of the exemption for habitat and potential take under the Section 4(d) rule for the Northern Long-eared Bat. These projects included prescribed fire, a 14-acre forestry project, and the above mentioned monitoring wells (summer drilling).

Multiple contracts were developed or continued in TY 2018 for surveying and managing rare species. Wilkinson Ecological Design was contracted to develop a plan for the management of invasive species in rare plant sites. Wilkinson surveyed all sites presently and historically having *Ophioglossum pusillum* or *Triosteum perfoliatum* to determine invasive species present and the management needs. From the surveys, the contractor created a Vegetation Management Plan to treat invasive plants while protecting the rare plants present and the groundwater resource. NHESP reviewed and approved the Vegetation Management Plan. In July, the contractor treated invasives at rare plant sites in accordance with the Vegetation Management Plan and the NHESP permit.

Tetra Tech, a contractor for the MAARNG, completed a database for the Natural Resources Office for storing and analyzing bat acoustic data. The Natural Resources Office plans to populate this with past data to allow for the querying of the large dataset on Camp Edwards. Bat acoustic data requires vetting by qualified biologists. Tetra Tech is currently vetting data from TY 2017; data vetting for TY 2018 bat calls will be contracted in TY 2019.

In Fiscal Year 2018, DoD Partners in Amphibian and Reptile Conservation funded a survey of snake fungal disease on military installations. MAARNG Natural Resources used this as an opportunity to survey snakes on the installation while also aiding this nationwide survey. The Natural Resources Office also coordinated with the State Herpetologist, Mike Jones, to better provide information on two species of interest, black racers (*Coluber constrictor*) and eastern hognose snakes (*Heterodon platirhinos*), currently proposed for state listing as special concern. Coverboards were placed throughout the site and monitored monthly. Either scale cauterization or PIT tagging was used to prevent taking samples from the same individuals and to provide accurate information to MassWildlife. For the snake fungal disease survey, field staff filled all 50 provided vials with swabs taken from 17 individual snakes of four species. Results should be available in 2019. In total, coverboard surveys documented 32 individuals from five species.

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. Likewise, grassland bird monitoring standardization will allow for long-term trends analysis and better integration with broader conservation initiatives. The Natural Resource Program staff are working with statewide and regional efforts to coordinate monitoring, including participating in the annual Northeastern Nightjar Survey.

Based on recommendations from the state botanist in 2016, a subset of rare plant sites will be 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* or *Triosteum perfoliatum* in TY 2018. Neither species was found at any of the sites. Some of these sites haven't had rare species present since the early 2000s, and can now be removed from our monitoring schedule. Technicians took notes on the condition of these sites including the overgrowth of trees or shrubs that may now be precluding the presence of the rare species at the site. The condition of the historically occupied sites can give us indications of the factors limiting the species.

In TY 2018, acoustic bat recordings were made and detections will be reported to NHESP after qualitative evaluation is completed. This is expected to be contracted in Fiscal Year 2019. Annual bird surveys including focused state-listed species efforts were contracted and coordinated with MassWildlife.

Grassland bird numbers only include birds counted during official surveys to reduce multiple counting of individuals. There were no Vesper Sparrows observed in TY 2018. As of TY 2016, the number of Whip-poor-wills reported reflects the lowest number (between two observers) heard per site during a single round of surveys to remain conservative in reporting. It is of note that only a single Whip-poor-will survey night was completed due to assisting DFW on active netting of Whip-poor-wills for a migration study. In prior years, reported numbers have included multiple surveys, and likely repeated counts. The TY 2018 survey resulted in the most Whip-poor-wills of any year the Natural Resource Office has run the NHESP Northeast Nightjar Survey (110 individuals). The survey also documented five Chuck-will's-widows, a Common Nighthawk, an Eastern Screech Owl and nine Northern Saw-whet owls. 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. The raptor species are still noted when identified and included in reporting summaries as in Table 3-1, but caution is warranted in interpretation as some species such as Northern Harrier and Sharp-shinned Hawk are utilizing habitats whereas all Bald Eagle observations have been of flying individuals not apparently foraging or staying on site.

See Section 3.3.4 for information regarding clam shrimp (*Branchiopoda*: *Spinicaudata*) observations, and Table 3.1 for reporting of the state-listed clam shrimp *Eulimnadia agassizii*.

TABLE 3-1 LIST OF RARE SPECIES REPORTED TO NHESP

Common/Scientific Names	Individuals Reported TY 2014	TY 2015	TY 2016	TY 2017	TY 2018
BIRDS					
Grasshopper Sparrow (*Ammodramus savannarum*)	37	100	59	44	47
Northern Harrier[1] (*Circus cyaneus*)	7	Wintering	Wintering	Wintering	Wintering
Upland Sandpiper (*Bartramia longicauda*)	7	22	20	23	20
Sharp-shinned Hawk[1] (*Accipiter striatus*)	2	1	0	0	0
Long-eared Owl[1] (*Asio otus*)	1	0	0	0	0
Vesper Sparrow (*Pooecetes gramineus*)	1	0	0	0	0
Whip-poor-will[2] (*Antrostomus vociferous*)	156	96	87	52	110
Bald Eagle[1] (*Haliaeetus leucocephalus*)	0	3	0	0	0
REPTILES and AMPHIBIANS					
Eastern Box Turtle (*Terrapene carolina carolina*)	15	13	38	42	43
ODONATES					
Comet Darner[3] (*Anax longipes*)	5	0	N/A	N/A	N/A
Spatterdock Darner[3] (*Aeshna mutata*)	0	0	N/A	N/A	N/A
PLANTS					
Adder's Tongue Fern[4,6] (*Ophioglossum pusillum*)	1467	256	98	247	0
Broad Tinker's Weed[5,6] (*Triosteum perfoliatum*)	297	N/A	113	127	0
American Arborvitae[9] (*Thuja occidentalis*)	0	4	4	N/A	N/A
BUTTERFLIES and MOTHS[11]					
Barrens Buckmoth (*Hemileuca maia*)	4 clusters	13	90	95	0
Pine Barrens Speranza (*Speranza exonerata*)	0	0	44	13	0
Sandplain Euchlaena (*Euchlaena madusaria*)	0	0	3	7	0
Coastal Swamp Metarranthis (*Metarranthis pilosaria*)	0	0	1	1	0

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

Common/Scientific Names	Individuals Reported TY 2014	TY 2015	TY 2016	TY 2017	TY 2018
BIRDS					
Melsheimer's Sack Bearer *(Cicinnus melsheimeri)*	0	0	2	0	0
Gerhard's Underwing *(Catocala herodias)*	0	0	33	10	0
Pine Barrens Zale *(Zale lunifera)*	0	0	13	8	0
Barrens Dagger Moth *(Acronicta albarufa)*	0	0	1	0	0
Drunk Apamea *(Apamea inebriata)*	0	0	1	0	0
Pink Sallow *(Psectraglaea carnosa)*	0	0	9	5	0
Pink Streak *(Dargida rubripennis)*	0	0	25	0	0
Unexpected Cycnia *(Cycnia inopinatus)*	0	0	0	1	0
Coastal Heathland Cutworm *(Abagrotis benjamini)*	0	0	0	1	0
Pine Barrens Lycia *(Lycia ypsilon)*	0	0	0	2	0
Water-willow Stem Borer *(Papaipema sulphurata)*	0	0	0	1	0
Waxed Sallow Moth *(Chaetaglaea cerata)*	0	0	0	2	0
Frosted Elfin *(Callophrys irus)*	0	0	5	5	5
CRUSTACEANS					
Agassiz's Clam Shrimp[10] *(Eulimnadia agassizii)*	0	1	0	6	38
MAMMALS					
Northern Long-Eared Bat[7,8] *(Myotis septentionalis)*	8	21 (2)	15 (1)	TBD	TBD
Little Brown Bat[7] *(Myotis lucifugus)*	4	40	22	TBD	TBD
Tricolored Bat[7] (Perimyotis subflavus)	11	11	7	TBD	TBD

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

[1] 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). [2] 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. [3] Spatterdock Darner is no longer on NHESP's rare species list. Also, Odonate surveys were suspended after TY 2015. [4] 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. [5] Surveys performed in 2015 did not differentiate *Triosteum perfoliatum* from *T. aurantiacum*, greatly increasing the number of individuals counted. For this reason, *Triosteum perfoliatum* was not reported to NHESP in 2015. [6] 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. [7] 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. Numbers are reported to NHESP, but not tracked by them due to current uncertainty in using acoustic identifications. TY 2017-2018 data is still being processed, these numbers are to be determined at a later date (TBD). [8] Number in parentheses is captured individuals trackable by NHESP due to species identification confirmation versus acoustic data. [9] NHESP is not interested in tracking this population, as it is likely of anthropogenic origin (pers. comm. with State Botanist, Bob Wernerehl). [10] Numbers represent only locations where species was found and ID confirmed by either NHESP Aquatic Ecologist or trained MAARNG staff. [11] 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 Reserve.

3.3.2 Northern Long-Eared Bat (NLEB)

The 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 and acoustic hits for NLEB on base in March and November suggest bats may be overwintering on the island and Cape Cod. 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 2018, 10 sites were acoustically monitored, including two sites off-base where Natural Resource Program staff attempted to survey for NLEB hibernating on Cape. Four of these sites were chosen for long-term monitoring through the winter and into TY 2019, including two that have been recording since 2015. In TY 2019 program staff will aim to acoustically monitor the state listed species *Perimyotis subflavus* (also being considered for federal listing), as it is a high-flying species that requires different methods than those used to monitor NLEB. Currently, Tetra Tech is analyzing acoustic results from previous 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. Three projects were implemented that exceeded the programmatic consultation, all of which had MAARNG Environmental Affairs elements as proponent. These included the implementation of prescribed burns, an August timber harvest in low quality NLEB habitat, and placement of new groundwater wells in multiple locations during the summer. A significant investment in equipment, personnel training, and collaboration continued in TY 2018 to address concerns both over avoiding impacts to bats and minimizing bat impacts on ongoing actions such as pine barrens habitat management.

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 potential 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.

On September 11, 2015, the USFWS announced a "not warranted" finding for the New England cottontail. This initiates a 12-month review period for the decision, at which point the species will be removed from the federal candidate list and not added to the Endangered Species List unless substantial new information is received. The finding is 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, the MAARNG contracted wildlife detection dogs to search for rabbit pellets. The dogs surveyed both on base and off base sites. The dogs readily found pellets at the off base sites and two on-base sites along the powerlines along the western edge of the base. At several sites on base that had previously had rabbits, the dogs did not find rabbit sign. At one site, the dogs found sign, but not during all repeated surveys. 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. If certain sites are supplying more suitable forage, it is likely they are able to support more rabbits. The Natural Resources Office sent more fecal pellets from both on base and off base sites in TY 2018 for diet analysis to explore seasonal variations and site differences in diet. The low diversity of food resources at interior base sites with more native vegetation may be limiting the density of rabbits on base. The results of the diet analysis should provide useful information to use for on base restoration sites and for regional partners.

As part of the regional pellet search effort coordinated by the New England Cottontail Technical Committee, technicians conducted pellet searches at four regional plots throughout the training area. Ten-acre regional plots were surveyed two times each. Pellets were found and collected at three plots for DNA analysis by URI, a total of 23 samples. All but two samples from regional plots were Eastern cottontails. Incidental collections, mainly aimed at diet analysis, resulted in 140 samples, 64 of which were New England cottontail.

FLR-V GPS collars from Telemetry Solutions were used during trapping efforts in TY 2018. Of nine trapped rabbits, seven were collared and tracked, of which only three were New England cottontails. All of the rabbits tracked in the Reserve were Eastern cottontails, the three New England cottontails were trapped in Sandwich and Mashpee by DFW staff in a collaborative effort to test collar performance.

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. In Fiscal Year 2019, the Natural Resources Office plans to contract statistical analysis and reporting for the New England cottontail data compiled thus far.

3.3.4 Agassiz's Clam Shrimp

Clam shrimp were discovered in roadway puddles on base in TY 2015 and continue to be present on Camp Edwards during TY 2018. 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, Peter

Hazelton, confirmed *E. agassizii* in multiple roadway puddles along with the non-listed *Cyzicus gynecea*. *Limnadia lenticularis* has not been identified on base.

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 have become large enough to impede use for training. The Natural Resources Office worked with the 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.

The CMP calls for the creation of a puddle along the Tank Trail to relocate clam shrimp from Herbert Road. This puddle was created in the fall of 2018 and has been successfully holding water. The relocation of egg-bearing sediment will occur in the late fall/winter of 2018-19. The experimental treatment will determine if the species can be managed in place to allow for training use and clam shrimp habitat by maintaining shallow puddles. In the spring of 2019, two sites along Cat Road will have egg bearing sediment scraped, fill will be added to the puddle, and then the sediment will be laid back in place. Additionally, an existing puddle on Canal View Road will be used to relocate clam shrimp from Cat Road puddles. This relocation puddle has not been documented to have clam shrimp, likely due to the greater depth and lack of disturbance allowing a higher density of predatory amphibians and invertebrates. The Natural Resources Office will add material to the puddle before placing egg-bearing sediment on top.

Due to actions taken by a training unit in the field, one puddle with clam shrimp planned for filling in the CMP was prematurely filled in the course of soldier training activities. Although this kind of work is normally reviewed by Natural Resources staff, the filling was executed without pre-review and coordination with Natural Resources staff. The event and circumstances were reported to NHESP immediately and it was advised that the activity be integrated into the CMP permit application. In response to this event, the Natural Resources Office agreed with NHESP staff on additional monitoring and signage to prevent future incidents. Signage has been put in place to alert users of the presence of the rare species and to direct communications with the Natural Resources Office. Monitoring has also increased one additional year, two additional sites per year, and more frequent monitoring each year.

In TY 2018, Mr. Hazelton 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 Reserve. The Natural Resource Office also received a collection permit to sample clam shrimp on MAARNG lands or any lawfully entered lands in Massachusetts. The first of three years of monitoring required in the CMP was completed in TY 2018. The Natural Resource Office conducted repeated surveys (biweekly or monthly depending on season) at ten puddles, some known to have had clam shrimp. Pools were measured for area, depth, temperature and pH, and all aquatic life was recorded. These surveys led to three newly documented *Eulimnadia agassizii* sites. The methodology used was coordinated with Peter Hazelton at NHESP as part of the CMP process.

In addition to the monitoring required in the CMP, technicians searched for clam shrimp in many more road puddles in the Reserve and, based on good success, expanded the search off-base. In TY 2018, the Natural Resource Office field crew was able to document *Eulimnadia agassizii* at 38 new puddles (17 of which were in the Reserve) across seven properties, seven towns, and three counties. Previously the species had only been known from six towns in Massachusetts (two being historical records), two newly discovered locations in New York, two records in Ontario, a museum specimen in Virginia, and an aberrant collection in Florida. Samples were preserved and will be sent to NHESP for their collections.

3.4 SOIL CONSERVATION MANAGEMENT

All military and civilian uses and activities in the 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 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.

3.4.1 Erosion

The Integrated Training Area Management Program (ITAM) worked with Camp Edwards Facilities Engineering and troop labor to conduct limited 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 training area for military training and high quality habitat for rare species (above) 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 2018, two timber harvests restored low habitat value, densely wooded units to historically appropriate savannah conditions, two battle positions were cleared of densely regenerated woody vegetation and reseeded with native grasses, multiple primary prescribed burn operations were conducted, and invasive plant management was continued after emphasis on planning and personnel training and licensing. Additionally, six permits were maintained to continue wildlife and fire operations.

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 six years of bird monitoring data, Natural Resource Office staff are currently in the early process of evaluating trends for focal species.

3.5.1 Vegetation Surveys

No vegetation surveys were conducted in TY 2018. Vegetation surveys for New England cottontails are based on radiotelemetry locations. This year only one Eastern cottontail was collared on base, so vegetation surveys were not completed. 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 Plant Species Control Activities

Invasive plants can be native or 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; from the Massachusetts Invasive Plants Advisory Group (MIPAG).

Exotic invasive plants are a management concern both in the training area and within the Cantonment area. Effective management of these species, including 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 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 (*Centauria stoebe*) from restored training sites on BPs 1, 27, 28, and Demo 2, covering 11 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 tie in with the creation of an updated 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 populations of *Calamagrostis epigejos* (bushgrass), an invasive grass recently found on base. Personnel coordinated regularly with the Massachusetts Division of Fisheries and Wildlife in developing strategies to manage invasive plants, particularly *C. epigejos*, a species that isn't well-known. In TY 2018, Lavoie Horticultural was contracted to eradicate *C. epigejos* from approximately two acres of roadside sites in the Reserve. Treatment sites will be monitored through TY 2019, but initial results appear successful. Concurrently, Natural Resources Office staff began treatment of patches in areas harder to access. Several new, large patches were discovered this year.

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 was the third year of chemical treatment, and a mistblower was used for getting the best coverage possible. 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 Reserve is a high priority. Elsewhere in the training area, roadside invasives were treated with cut-and-paint methods in areas deemed high-risk for off-road spread.

Soil disturbance in the training area, particularly in groundwater treatment areas, bivouac areas, dig sites, or along road sides, is often first colonized by pitch pine. As a pine barrens species adapted to wildfires, pitch pine is capable of colonizing highly disturbed soils with little organic matter. The establishment of this species at sites can often lead to the exclusion of other species creating monocultures of little ecological or training value. Hence, in efforts to restore former training areas and create or improve habitat, the Natural Resources and ITAM Office often needs to manage this species to allow the growth of other species, providing improved habitat quality and site sustainability. To this end, ITAM contracted and conducted in-house mechanical removal of regenerated pitch pine in two battle positions, followed up by reseeding with a native grass mix (see Section 3.5.6). The Natural Resources Office also conducted mechanical and chemical control of pitch pine in the Cantonment grasslands.

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 will continue to monitor the sites in TY 2019.

3.5.3 Bird Surveys

This is the sixth year that point counts were conducted along a bird survey route throughout the training area to determine differences in bird activity in a variety of military training areas and habitat types. The routes consisted of 39 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 2018 due to other priorities. This will be an objective in our updated Integrated Natural Resources Management Plan (INRMP) and prioritized as needed given other projects. Additionally, with the completion of six 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 on May 17 for the region at 35 sites (three routes). In TY 2018, Whip-poor-wills were detected at 34 out of 35 sites. Conditions appeared to be less than desirable for nightjar surveys, but Natural Resources Office staff documented at least 110 Whip-poor-wills, five Chuck-will's-widows, and a Common Nighthawk. These numbers make TY 2018 our most productive year for nightjar surveys. One Eastern Screech Owl and nine Northern Saw-whet Owls were also recorded.

For the fourth year, a point-count methodology was implemented to participate in a state-wide survey of grassland birds coordinated with the DFW and Mass Audubon. This method is intended to be continued to better evaluate trends in grassland bird populations.

The Natural Resource-ITAM office assisted DFW on an additional Whip-poor-will project in TY 2017 and 2018 focused on migratory pathways and behaviors of the state-listed species. Two nights of mist-netting were conducted to support the State Ornithologist with the project. Several Natural Resource-ITAM staff and supporting volunteers participated both nights and extensive site scouting and support were provided. A total of seven Whip-poor-will were captured and tagged with geolocators (purchase funded by MAARNG NR-ITAM as partner support) and recapturing of birds to recover tags will be conducted in the summer of 2019. Only one of eight geolocator-equipped birds from 2017 was recaptured and data analysis is ongoing. Camp Edwards is one of multiple study sites in the Commonwealth for this project.

The Natural Resources Office continued support of a DoD Legacy Grant project awarded to the Vermont Center for Ecostudies, focused on grassland bird migration. The active portion of the grant-funded project was completed in TY 2017. The last satellite-transmitting Upland Sandpiper from Massachusetts stopped broadcasting while on her wintering grounds in Brazil in late March, 2018. Additionally no banded or transmitter-bearing Grasshopper Sparrows, Eastern Meadowlarks, or Grasshopper Sparrows were identified during annual bird surveys and opportunistic searching for bands.

3.5.4 Deer Hunt

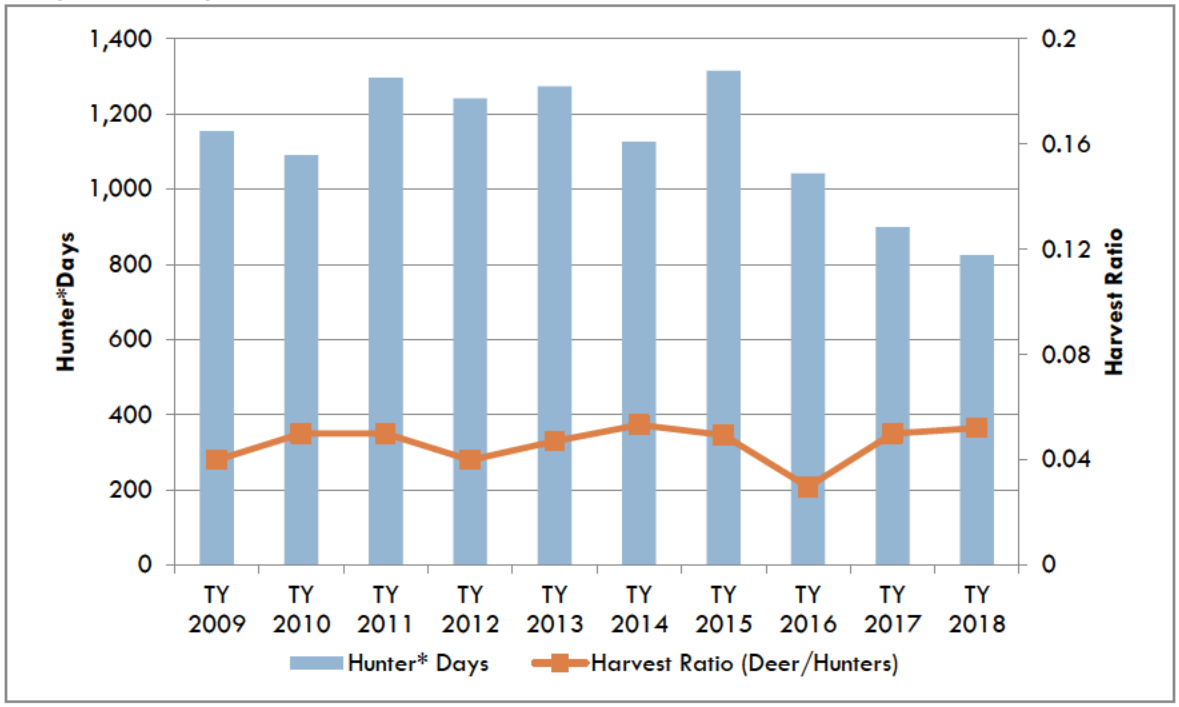
There was a deer hunting season in the Reserve during TY 2018 in which 43 deer were taken during 825 hunter days. The Natural Resource Program supports a hunt sufficient to maintain a harvest level that is compatible with a healthy deer herd and healthy ecosystem. MAARNG and MADFW generally feel that the recent average of 60 deer per year meets the overall objective.

The Natural Resource 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 2018 included a three-day hunt for paraplegic sportsmen (November 2-4, 2017), a one-day youth hunt (September 30, 2017), a two-day opening for archery scouting (November 13-14, 2017), a three-day archery season (November 16-18), a two-day hunt for military sportsmen (December 1-2, 2017), a six-day shotgun season (December 4-9, 2017), and a two-day primitive (muzzleloader) season (December 14-15, 2017). Graph 3-4 shows the hunter days and deer harvest ratio since TY 2009.

During TY 2018, the Conservation Biologist, Range Control Officer in Charge, and the EMC EO attended two meetings (spring and fall) of the Barnstable County League of Sportsman Clubs to provide information on the deer and turkey hunts at Camp Edwards and receive feedback from members related to hunting at Camp Edwards. During TY 2019, the Natural Resource Program will continue outreach to hunters including conducting a hunter survey during the 2018 deer season. The survey will evaluate hunter preferences and will include questions aimed at determining the best ways to distribute information to hunters.

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. With the update of the INRMP in TY 2019, specific goals for harvest will be discussed based on past biological data from deer harvested on base and browse surveys aimed at determining habitat impacts.

Graph 3-4 Camp Edwards Deer Harvest

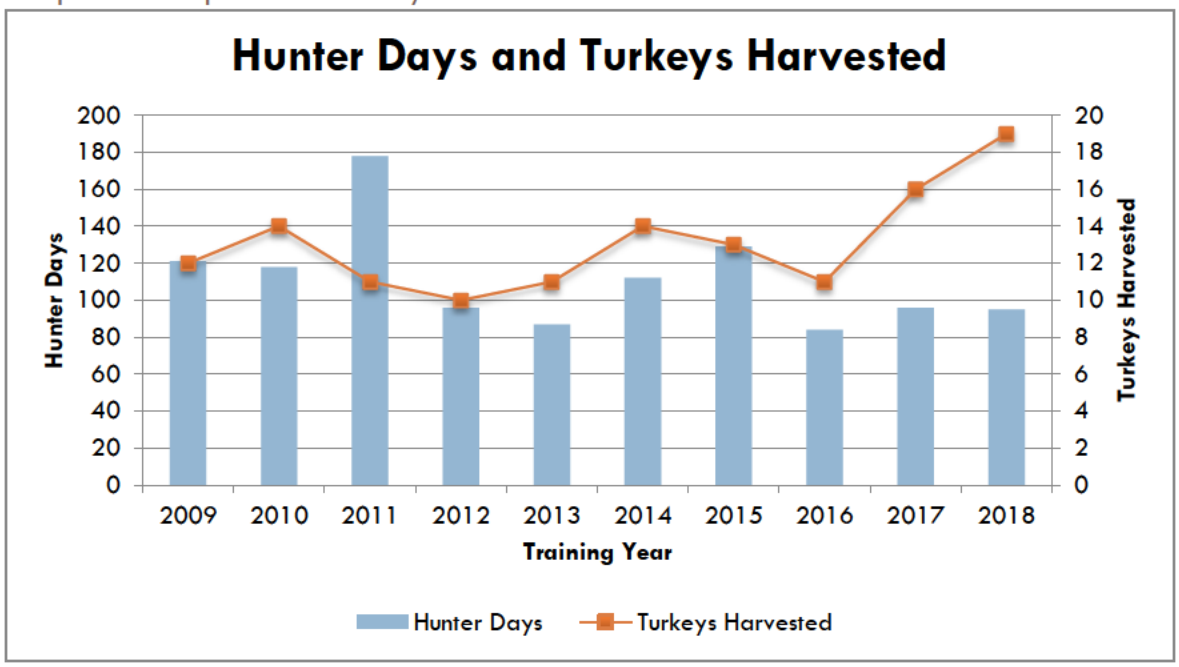


Note: Hunter Days is the sum of the number of hunters each day for each day of the annual hunt.

3.5.5 Wild Turkey Hunt

There was a five-day wild turkey hunting season in the Reserve from May 7-11, 2018 during which 86 hunters took seventeen turkeys. In addition, a one-day youth turkey hunt was held on April 28, 2018 in which seven youths participated with two turkeys taken. Graph 3-5 provides information on the wild turkey hunts conducted in the spring since TY 2008.

Graph 3-5 Camp Edwards Turkey Harvest



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

3.5.6 Restoration Activities

Through the ITAM program, the Natural Resources Office completed significant restoration work on four training sites and habitat patches throughout the base. In the largest project, contractors conducted mechanical thinning of 48 acres of Training Area C-14, restoring maneuver connections between the C-14 Bivouac Site and Demo 2. This training-driven project removed all standing trees smaller than 12" DBH (diameter at breast height), removing low value uniform habitat and restoring the site to a historically appropriate patchy savannah-like setting. The skid trails resulting from the project were contracted for reseeding using the custom Camp Edwards restoration seed mix created by Lavoie Horticulture.

Two additional training-driven projects removed overgrown vegetation from Battle Positions 11 and 20 in order to return them to their original training condition. Battle Position 20 was conducted using in-house ITAM resources and removed two acres of regenerated pitch pine that had almost completely overwhelmed the site, making it totally unsuitable for training. The Battle Position 11 project was of higher complexity and was contracted. The contractor grubbed out 2.5 acres of densely regenerated pine in the middle of BP-11 and restored it to exposed mineral soil. A further 6.5 acres of BP-11 were mechanically thinned to remove dangerous standing dead trees, fire-stressed trees unlikely to survive, and overly thick scrub oak understory that prevented troop access. Both BP-20 and the central 2.5 acres of BP-11 were contracted for reseeding using the custom Camp Edwards restoration seed mix created by Lavoie Horticulture.

The final major project of the year was a 14 acre fuels-management thinning project in the Range Area West 4 unit, adjacent to the southwestern corner of the impact area. Contractors cleared most of the trees in the unit, leaving standing all hardwoods and any pines over 10" DBH. The resulting savannah conditions are significantly safer from a wildfire perspective, will provide greater habitat value than the previous conditions and enhance the diverse habitat mosaic we have been constructing in the western impact area buffer units. Both the C-14 and RAW-4 thinning projects went through Forest Management Plan submission to DCR, which includes MESA review and permitting.

Natural Resource and ITAM staff also conducted rehabilitation and maintenance projects using in-house staff and equipment. Staff conducted understory mowing to improve bivouac and maneuver potential at OPs 9, 10 and 11, and BA-6. Additionally, staff hand-pulled and sprayed woody invasives encroaching on BPs 1,8,27,28, and Demo 2.

Staff also collected seed from regionally uncommon plant species. Species included butterfly milkweed (*Asclepias* tuberosa), wild lupine (*Lupinus perennis*), flax-leaved stiff-aster (*Ionactis linariifolia*), and sickle-leaved golden-aster (*Pityopsis falcata*). Seed received several treatment types, including a grow operation at Bristol County Agricultural High School's Natural Resource Management department, and then was distributed in several training sites and the Cantonment grasslands in order to increase biodiversity. Wild lupine will be planted in early 2019 in order to provide security for the species in the Reserve, where it has only persisted in one small location.

3.6 FIRE MANAGEMENT

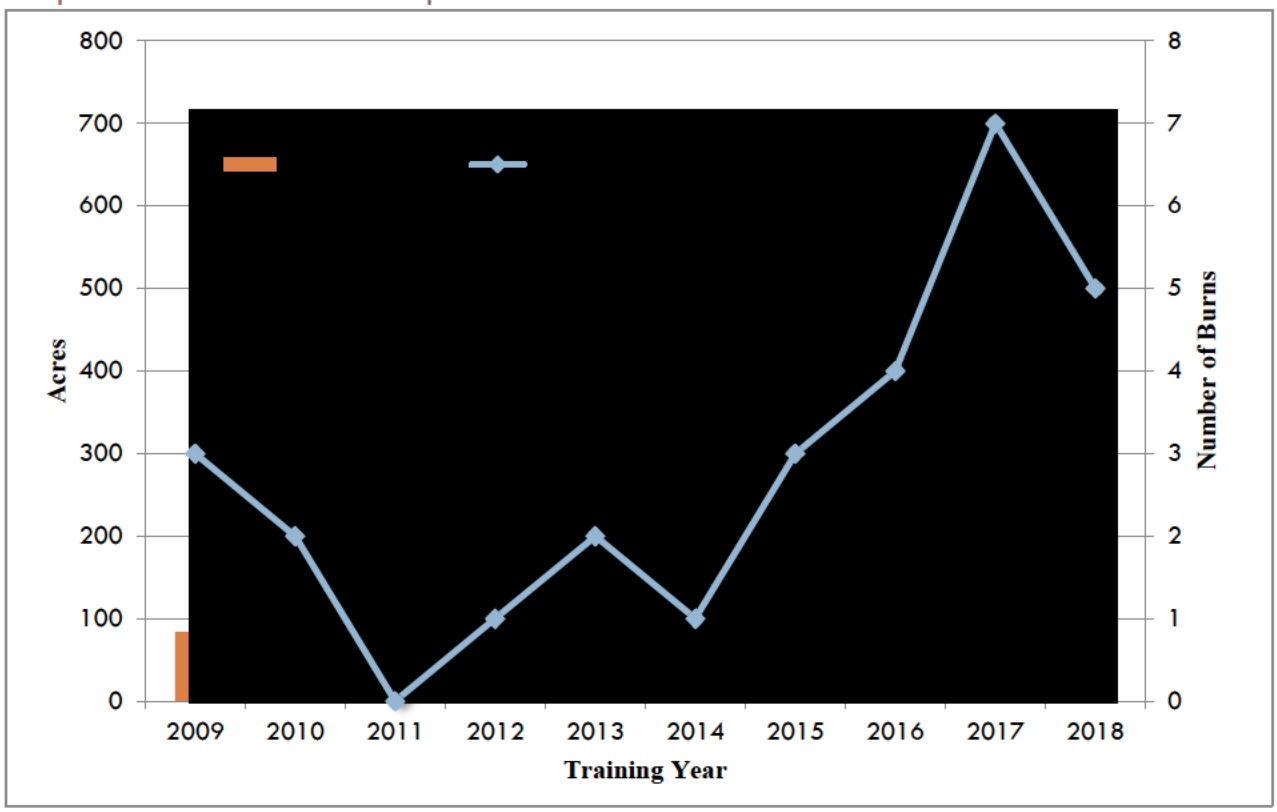
3.6.1 Prescribed Burn Program

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: www.EandRC.org.

Five prescribed fires were conducted during TY 2018 within the Reserve and one within the Cantonment grasslands. The burn operations totaled 300 acres within the Reserve and 24 in the grasslands and were conducted in the fall of 2017 (three) and spring and summer of 2018 (three). The ten-year prescribed fire accomplishment within the Reserve is shown in Graph 3-6. The Camp Edwards smoke management permit (#4F02008) was renewed August 20, 2018 and is valid through December 31, 2020. Goals for both number of burn operational days and acres burned were approximately double what was accomplished. The primary limiting factor was weather/climate with more extreme fluctuations in weather conditions (e.g., extended drought broken by extreme rain events) and more frequently shifting weather conditions – particulalry 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.

Prescribed fire goals for TY 2019 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). Significant programmatic 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 lands for soldiers.

Graph 3-6 Prescribed Fire Accomplishment within the 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.

3.6.2 Fire Management Training

The 2018 fire training was the first of its kind, focusing primarily on providing basic wildland firefighter training to the members of the JBCC Fire Department and other local departments. All students completed the S-130/S-190 (Firefighter Training and Introduction to Wildland Fire Behavior) suite of trainings. The class was structured around the rotating schedule of fire department shifts. Classroom and field days were separately offered over four days, each scheduled to coincide with one of the four shifts of JBCC Fire Department. Students completed the online portion of the blended class prior to attending the classroom. The one-day classroom session provided an overview of the material covered in the online class with a focus on local factors. The classroom sessions were followed up by four one-day field exercises. Each field day, students engaged in live fire exercises including hand line construction, suppression techniques and ignition operations. A framework was provided for the non-JBCC Fire Department students who could not attend the field sessions to complete the field day requirement with their home agency or in their local area. In total, training was provided to 53 students from eight fire departments, three government agencies and two non-government organizations completed the online and classroom sessions. Thirty-two students completed the field sessions at Camp Edwards. Lead instructors were contracted through Northeast Forest & Fire Management, LLC. Assistant instructors were provided by MAARNG, DCR, and DFW.

3.7 PEST MANAGEMENT

During TY 2018, Natural Resources and ITAM conducted and contracted precisely targeted herbicide spraying of unwanted shrub species encroaching on training sites and invasive species threatening habitat in the Reserve. As part of controlling control pitch pine, sweetfern, bayberry, scrub oak, spotted knapweed, and *Calamagrostis epigejos*, contractors and staff applied Roundup Pro and Rodeo (Glyphosate), Alligare Triclopyr 3 (Triclopyr 3,5,6), and Intensity (Clethodim). Over the course of TY 2018, the following amounts of pounds of active

ingredients were applied to sites within the Reserve. Glyphosate: 38 lbs. Triclopyr: 12 lbs. Clethodim: 0.05 lbs. Natural Resources-ITAM also conducted cut-and-paint herbicide application on *Aralia elata* and used hand pulling to remove spotted knapweed (*Centauria stoebe*) from restored training sites on BPs 1, 27, 28, and Demo 2, covering 11 acres. Additionally, approximately 40 acres of managed grassland (outside the Reserve) had chemical management of invasive plants with Triclopyr combined with mechanical and fire management to maximize efficacy.

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). Thus, Camp Edwards does not require an air quality control permit for stationary source emissions under the provisions of the Clean Air Act (CAA), nor is Camp Edwards required to measure and report actual emissions from its stationary sources. However, 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 August 20, 2018. The permit is good through December 31, 2020.

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 scheduled to be completed for June 1, 2018 using calendar year 2017 data. However, due to delays in MassDEP web forms availability, the reporting has been deferred until further notice by the MassDEP.

The only MAARNG stationary source emissions locations in the 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 August 20, 2018 and is valid through December 31, 2020. The biennial smoke management report is planned to be submitted in December 2018. Information on prescribed burn activities within the Reserve for TY 2018 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 blowing up unexploded ordnance in place and for other unusual noise events.

In June, a noise complaint was made via social media relating to nighttime training during the Combined Arms Exercise. During the training, a convoy took a wrong turn and became lost near a neighborhood by the fence line,

halting there until they could regroup. Camp Edwards' Administrative Officer responded to the complaint within 24 hours with all parties satisfied.

3.10 STORMWATER MANAGEMENT

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

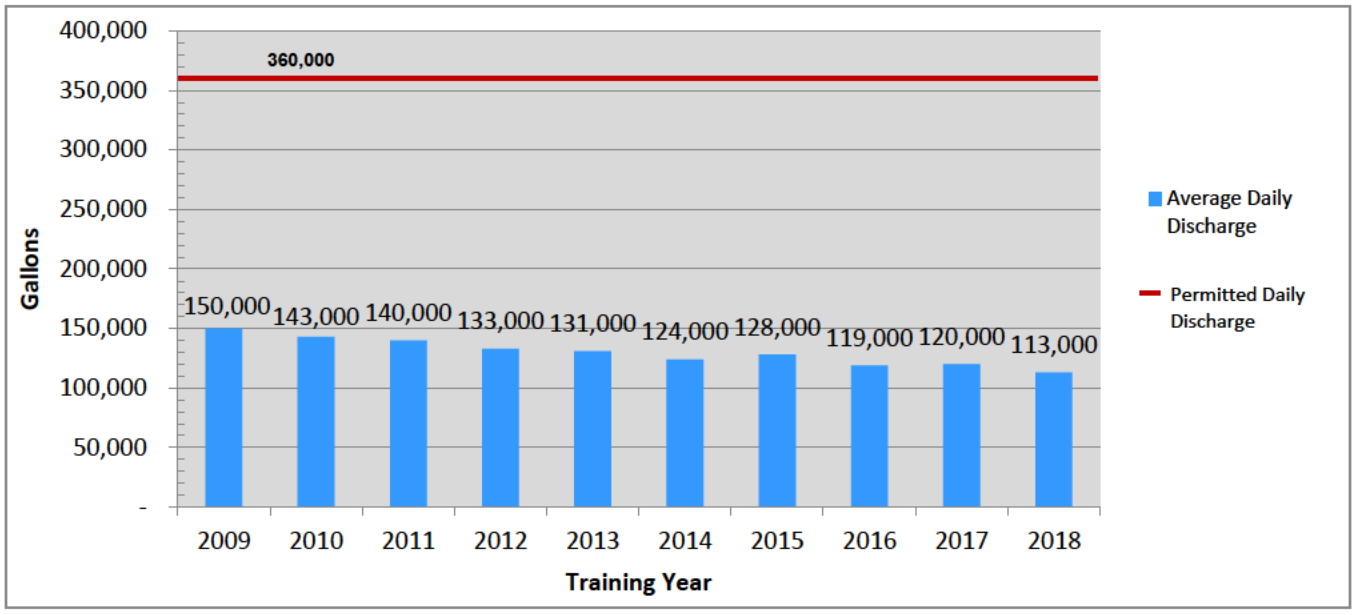
3.11 WASTEWATER MANAGEMENT

Depending on the location of facilities, wastewater and sewage from MAARNG training activities in the 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 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 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 2018. The plant discharged 68,112,863 gallons of sewage into the sand filtration beds in the Reserve; a daily average of 113,000 gallons versus its permitted twelve-month moving average flow of 360,000 gallons. Graph 3-7 shows the daily average pumping rate of the Otis system since TY 2009.

Graph 3-7 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 2018. 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 spills in the Reserve during TY 2018.

3.14 HAZARDOUS WASTE MANAGEMENT

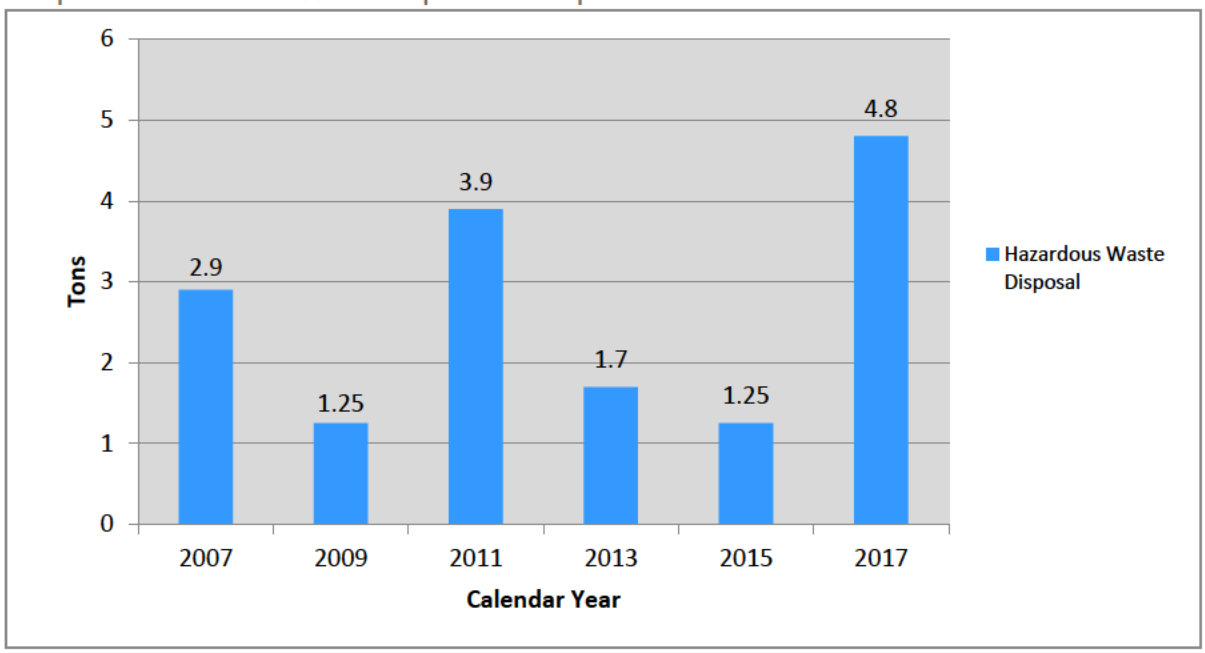
The MAARNG complied with its policy of not performing maintenance activities on military vehicles in the Reserve throughout the year. Thus, hazardous wastes normally associated with vehicle maintenance and repair facilities were not generated or stored in the Reserve. Vehicle maintenance is completed at the UTES facility, which is outside of the 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 Reserve, the E&RC tracks the procedure to ensure compliance with applicable regulations.

There is one hazardous waste Satellite Accumulation Point in the 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 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 2018 for hazardous waste disposed of during calendar year 2017. Graph 3-8 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 3-8 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 2018. 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 Reserve for ATV and dirt bike riding. However, this will be an ongoing effort.

3.16 GENERAL USE AND ACCESS MANAGEMENT

The Natural Resource Office hosted two grassland bird tours in the grasslands of Camp Edwards in 2018 on May 26 and June 2 with approximately 20 individuals per tour. The tours were conducted as part of the Sustainable Range Awareness program, a component within the ITAM program. The Sustainable Range Awareness program serves to educate the public on the success of natural resource management taking place on Camp Edwards in support of the military mission.

3.17 CULTURAL RESOURCES MANAGEMENT

All projects in the Reserve during TY 2018 were reviewed to ensure appropriate cultural resources requirements were followed.

The IAGWSP processed Records of Action (ROAs) for monitoring wells, soil sampling, geophysical survey and munitions removal in TY 2018. Several of the new ROAs involved activities in areas of moderate sensitivity for cultural resources and required consultation with federally recognized tribes (Aquinnah and Mashpee Wampanoag). Required consultations with federally recognized tribes and the SHPO are completed in advance of any MAARNG and IAGWSP program undertakings for any actions in areas designated as High or Moderate Sensitivity.

Additional information on the IAGWSP's investigation and cleanup activities is available on its website: http://jbcc-iagwsp.org.

3.18 EPS VIOLATIONS

On May 16, 2018, the MAARNG reported a violation of the EPSs, specifically EPS 3.1 and EPS 3.4, under the Rare Species Performance Standard. On April 7 and April 8, 2018, the MAARNG 379th Engineers were training at Dig Site 1 and graded a portion of Cat Road containing a road puddle with state-listed Agassiz clam shrimp (*Eulimnadia agassizii*). On May 10, 2018, MAARNG Natural Resource staff identified the filing while assessing the condition of Cat Road. Camp Edwards Headquarters was notified and the EMC was notified on May 14, 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 Reserve. Signage has been put in place to alert users of the presence of the rare species and to direct communications with the Natural Resources Office. Monitoring has also increased one additional year, two additional sites per year, and more frequent monitoring each year. In a letter dated December 19, 2018, the EMC's Environmental Officer determined that in consideration of the actions taken by the MAARNG and the CMP issued by MADFW, no additional actions are necessary by the MAARNG for compliance with the requirements of Chapter 47 and the EPSs with regard to this violation.

Please see Section 3.3.4 for further discussion.

Appendix G lists violations reported since TY 2002.

3.19 MITIGATION

There are no outstanding mitigation agreements within the Reserve. New mitigation plans have been developed as part of the Conservation and Management Permit for the roadway repair and clam shrimp relocation project with NHESP. The mitigation plan is a combination of clam shrimp monitoring and a novel investigation of clam shrimp management. The management will have multiple approaches to evaluate effective methods. Methods include "hardening" occupied puddles with rock and leaving clam shrimp in place, relocating clam shrimp from puddles to be filled to "hardened" existing roadway puddles, and relocation of clam shrimp from puddles to be filled to a newly constructed puddle on an old tank trail.

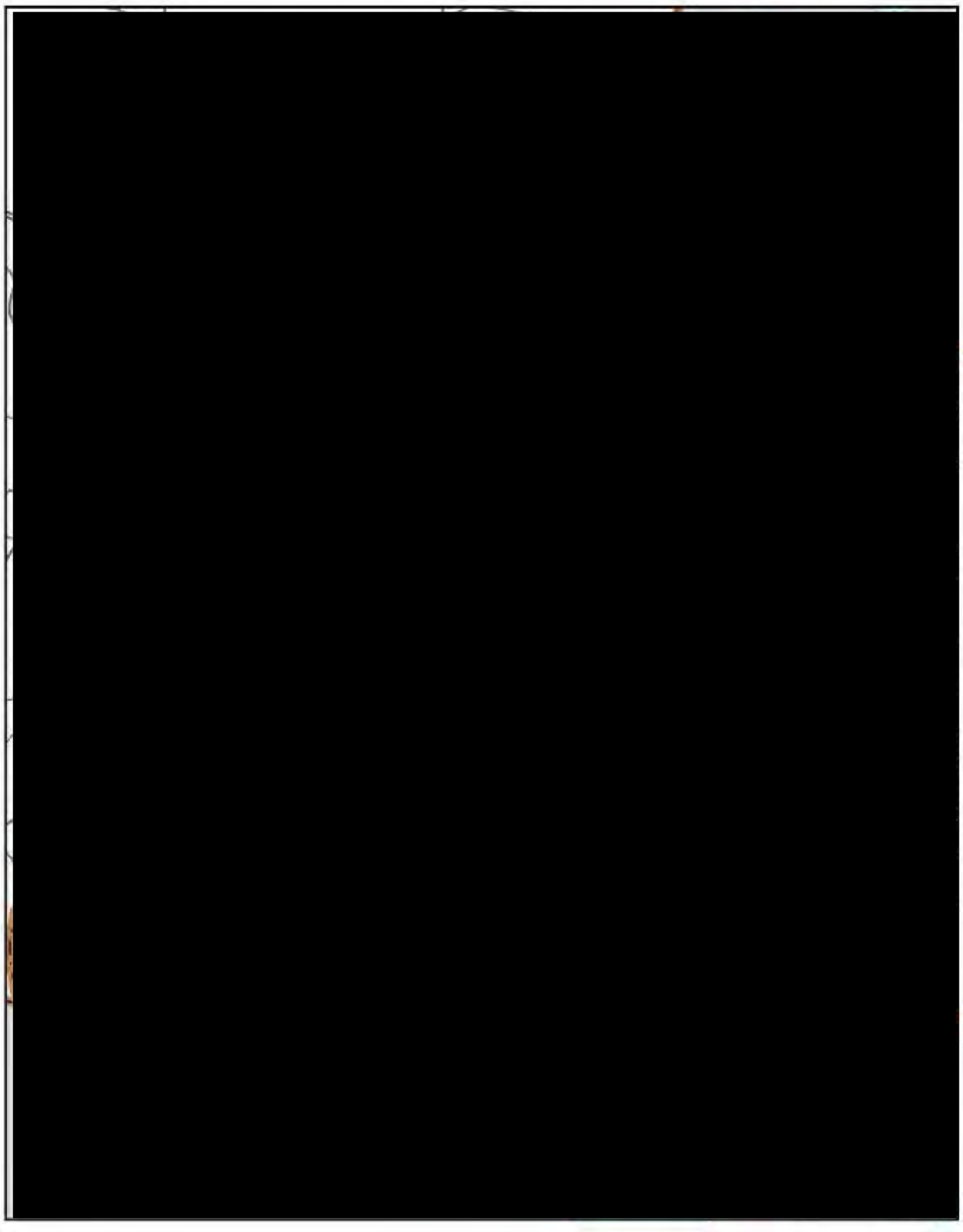
Additional mitigation requirements will be developed through the coming training year with designs for multiple range projects and facility improvement projects being planned within Priority Habitat.

3.19.1 Grasslands Restoration (Otis ANGB)

One of the requirements levied by the Secretary of the Executive Office of Environmental Affairs' July 16, 2001 Certificate approving the Massachusetts Military Reservation (MMR) Master Plan/Environmental Impact Report was a commitment by the MAANG to develop and implement a Grasslands Management Plan for its property in the Cantonment Area on Otis ANGB. The plan was published in August 2002, updated in 2008 and reviewed in 2017, as required. Over the past few years it has completed several projects removing trees and restoring approximately 35 acres of grasslands on its property in the grassland management area section of the Cantonment Area, the area which the MAANG indicated it would initiate efforts to restore. Figure 3-2 identifies the general grassland management area of Otis ANGB in the Cantonment Area.

Questions concerning grasslands on Otis ANGB should be addressed to the point of contact for the 102nd Intelligence Wing listed in Appendix B.

Figure 3-2 Otis ANGB Grassland Management Area



SECTION 4
REMEDIATION PROGRAM ACTIVITIES

4.0 INTRODUCTION

This section of the Annual Report provides summaries on remediation activities in the Reserve during TY 2018.

4.1 INVESTIGATION AND REMEDIATION PROGRAMS

There are two independent cleanup programs operating at JBCC: the IRP and the IAGWSP.

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 Reserve and three Military Munitions Response Program (MMRP) sites in the Reserve (see section 4.2). The MMRP addresses potential threats to human health and the environment from munitions and munitions constituents in non-operational range areas.

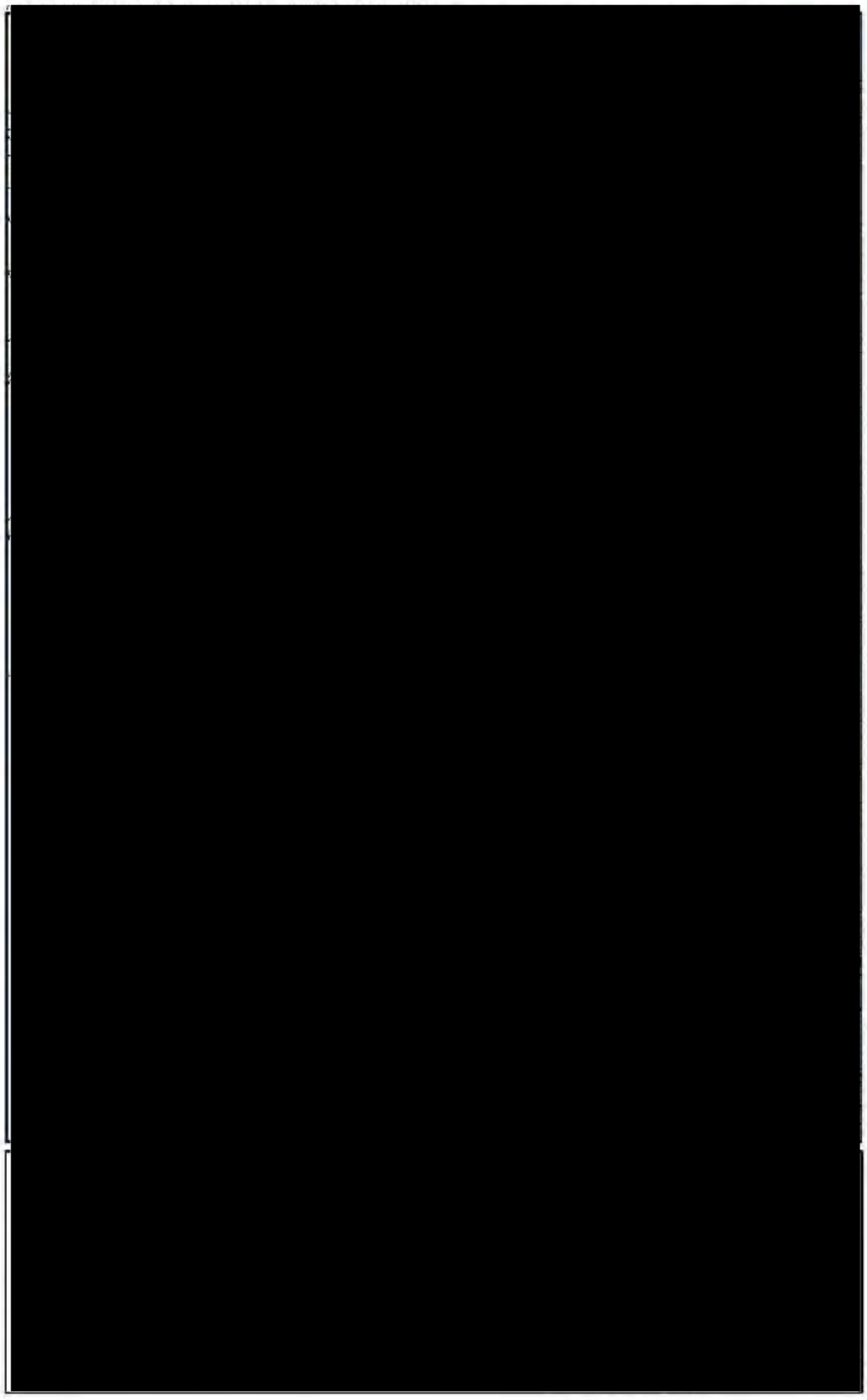
The IAGWSP is being managed by the Army National Guard. Investigation of the environmental impacts of training in the upper 15,000 acres of JBCC began in 1996 and cleanup of groundwater contamination began in 2004. Seventeen treatment systems are currently operating on seven groundwater plumes to clean more than 4.1 million gallons of groundwater per day. More than 12 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 also 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. Figure 4-1 shows the areas of contamination being addressed by the IRP and the IAGWSP in the Reserve.

Figure 4-1 JBCC Groundwater Plume Map



Representatives from the IRP and IAGWSP meet as needed to exchange ideas and information that can make their cleanup efforts more effective and efficient. They share sampling results, equipment, technical innovations, and even a treatment facility.

4.2 INSTALLATION RESTORATION PROGRAM ACTIVITIES IN THE RESERVE

In TY 2018, 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 Reserve. A streamlined Remedial Investigation/Feasibility Study (RI/FS) was recommended for Mock Village. A RI/FS was initiated at the Old K Range and the Otis Gun Club. Numerous 2.36-inch rockets and other ordnance were discovered at the Old K Range during the CSE Phase II field work and the subsequent Remedial Investigation (RI) work.

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

In TY 2018, groundwater monitoring was conducted at CS-19 where the contaminant of concern is RDX. RDX was detected above the EPA risk-based level of 0.7 µg/L in two of six monitoring wells sampled. The highest RDX concentration (2.1 µg/L) was detected at a well located just downgradient of the source area.

AFCEC also manages three 1.5 megawatt (MW) wind turbines at JBCC, two of which are located in the Reserve. Each turbine produces, on average, a credit of $500,000 per year which offsets the energy use in the IRP by 100%. The turbine operation is curtailed for the NLEB from July 15 to October 15, 30 minutes before sunset to 30 minutes after sunrise for wind spends less than 4.5 meters per second. There were no reported bat or bird strikes during TY 2018.

4.3 IMPACT AREA GROUNDWATER STUDY PROGRAM ACTIVITIES

During TY 2018, 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.

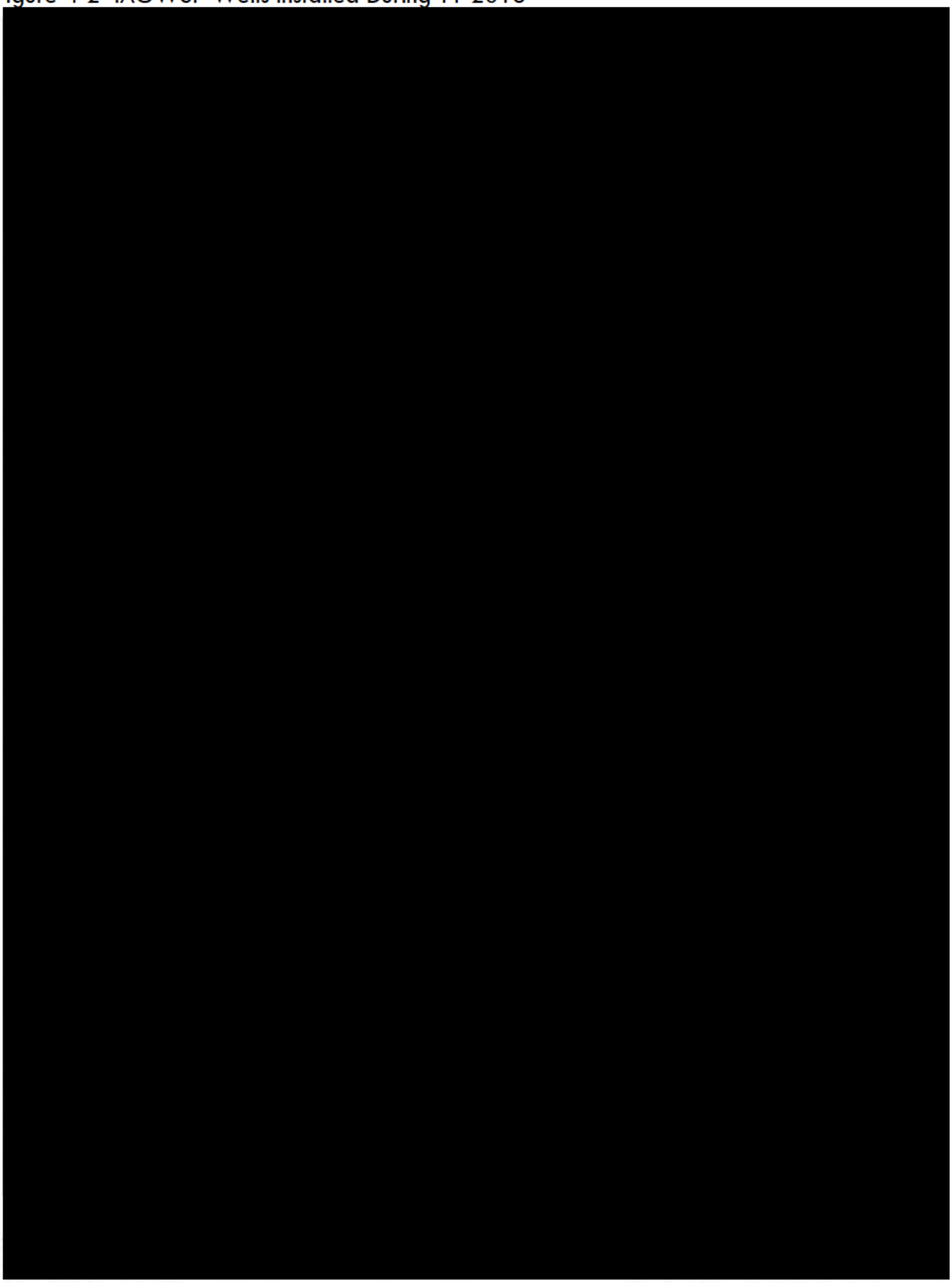
Removal of munitions from the source of the CIA plume continued in TY 2018. Work on Phase III Area I (10 acres) of the CIA long-term source area response is underway. Teams from the Army Corps of Engineers used Metal Mapper, a multi-sensor electromagnetic detection technology, for the removal efforts. 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.

Several new monitoring wells were added in TY 2018 (Figure 4-2) to aid in long-term monitoring of plumes with remedies in place and to provide data to finalize ongoing investigations. The monitoring wells were installed in support of groundwater investigations at the J-2 (northern and eastern), Demolition Area 1, J-3 and Central Impact Area plumes.

The IAGWSP processed Records of Action (ROAs) for monitoring wells, soil sampling, geophysical survey and munitions removal in TY 2018. Several of the new ROAs involved activities in areas of moderate sensitivity for cultural resources and required consultation with federally recognized tribes (Aquinnah and Mashpee Wampanoag). Required consultations with federally recognized tribes and the SHPO are completed in advance of any MAARNG and IAGWSP program undertakings for any actions in areas designated as High or Moderate Sensitivity.

Additional information on the IAGWSP's investigation and cleanup activities is available on its website: http://jbcc-iagwsp.org.

Figure 4-2 IAGWSP Wells Installed During TY 2018



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, the DFW's Southeast District will be posting signage through mitigation money received from Eversource (then NStar) in 2012 for a wetlands-related EPS violation for the transmission lines running through the Reserve. The base border will be signed with language agreed upon by the military and the state. Large signs will be installed near the main entries (such as the former Otis Fish and Game Club) identifying the area as Camp Edwards/the Upper Cape Water Supply Reserve. Contracting and implementation should occur during Fiscal Year 2019.

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 Christopher Faux was appointed JBCC Executive Director in June 2018.

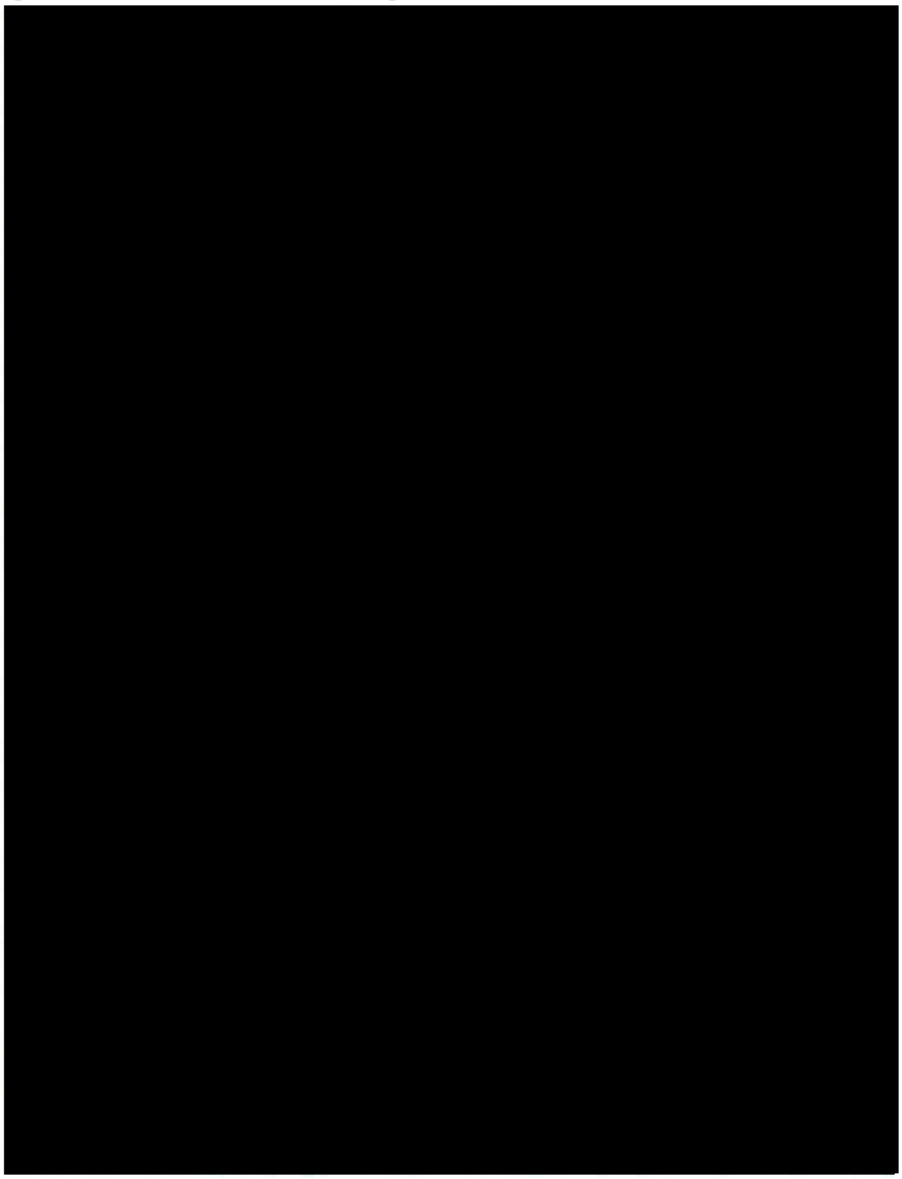
5.3 MISCELLANEOUS CIVILIAN ACTIVITIES

5.3.1 Eversource Switching Station

As part of the Mid Cape Reliability Project, Eversource plans to upgrade an existing Eversource switching station (Bourne Switching Station #917) located on an easement in the Reserve (Figure 5-2). Eversource evaluated several sites for minimal loss of training land and impact to state priority habitat. Eversource will site 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 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 is currently working through the permitting process with NHESP and the property transfer with the MAARNG and DCAM. Eversource submitted an Environmental Notification Form to the MEPA office on December 17, 2018. Over the last six 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.

Figure 5-1 Eversource Switching Station Area



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 transportation study concluded changes be made to the approaches to the bridges, construction of new bridges alongside the old or other changes to existing roadways that could have potential impacts to JBCC and specifically the Camp Edwards Training Site. The Army Corps of Engineers is conducting its own study of the Bourne and Sagamore Bridges: the Major Rehabilitation Evaluation Report, which will ultimately identify a

recommended plan for the bridges. The Army Corps of Engineers held five public and stakeholder involvement meetings in December 2018 to include one in Bourne. A presentation of possible future solutions for the Bourne and Sagamore bridges were made during the meeting; the alternatives still include major rehabilitation of the bridges or replacing the aging bridges with structures built to current standards. Future public involvement includes an additional round of stakeholder meetings and a comment period for the environmental analysis planned for Summer 2019.

MassDOT established a "Working Group" comprised of town and regional officials and interested organizations to obtain input on the study. The Working Group includes representation from the JBCC commands and the EMC. The Working Group met twice during TY 2018.

5.4 ENVIRONMENTAL PROGRAM PRIORITIES

5.4.1 TY 2018 Environmental Program Priorities

The following subsections provide a list of the environmental program priorities established for TY 2018 as published in the TY 2017 Annual Report for its activities associated with the Reserve and the status of achieving them.

Natural Resources Management

- Engage appropriate stakeholders to conduct an INRMP review of operation and effect and update as needed. (On-going)
- 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. (On-going)
- 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, 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 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 firing ranges in accordance with approved range management plans. (Accomplished)

- Provide appropriate support to Camp Edwards for the development of Echo Range, a required combat pistol qualification course. (Accomplished)
- Continue to support Camp Edwards through the environmental process for proposed training venues in the 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 Reserve. (Accomplished)
- Provide information on environmental program activities regarding the Reserve. (Accomplished)
- Publish the final TY 2017 *State of the Reservation Report.* (Accomplished)

5.4.2 TY 2019 Environmental Program Priorities

The following subsections provide a list of environmental program priorities for Camp Edwards for activities associated with the Reserve in TY 2019.

Natural Resources and ITAM Management

- Engage appropriate stakeholders to conduct an INRMP review of operation and effect and update as needed.
- Address potential federal status changes to species at Camp Edwards through interagency consultation and planning.
- 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 offering regional wildland fire training to support regional programs and partner agencies and organizations.
- Continue upscaling of habitat and land management actions, including mechanical work and prescribed burning, through internal actions and partnerships.
- 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 firing 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 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 Reserve.

- Provide information on environmental program activities regarding the 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 2018 *State of the Reservation Report.*

APPENDIX A
ENVIRONMENTAL PERFORMANCE STANDARDS

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 weJl, 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 suppol1 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 IOO-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 with in 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.l The Camp Edwards Training Area will be managed as a unique rare species and wildlife habitat area under n 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 bums 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 contaminates 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

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APPENDIX C
FIRING RANGE AND SOLDIER VALIDATION LANE INFORMATION

Operations Maintenance and Monitoring Activities

OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES
JULIET & KILO RANGE
TY 2018

Date	Juliet	Kilo
8, 9 Oct 17	-----	Soil sampling performed
13, 14 Oct 17	Pre/post fire inspection (9 cm)	Pre/post fire inspection and water level (W .25 cm; E 6.5 cm
15 Oct 17	-----	Pre/post fire inspection and water level (W .25 cm; E 6.5 cm)
17 Oct 17	Detailed inspection and water level (18 cm); maintenance	Detailed inspection and water level (W 20.5 cm; E 6.5 cm); maintenance: 160 gallons pumped out (W 4 cm; E 6.5 cm)
19 Oct 17	Maintenance: repairs (8 cm)	-----
24 Oct 17	Monitoring well sampled	-----
31 Oct 17	Detailed inspection and water level (38 cm); maintenance: 700 gallons pumped (4 cm)	Detailed inspection and water level (W 28 cm; E 6.5 cm); maintenance: 540 gallons (W 1 cm; E 6.5 cm)
2 Nov 17	-----	Pre/post fire inspection (W 1 cm; E 6.5 cm)
17, 19 Nov 17	Pre/post fire inspection (4 cm)	Pre/post fire inspection (W 1 cm; E 6.5 cm)
29 Nov 17	Detailed inspection and water level (11 cm)	Detailed inspection and water level (W 18 cm; E 6.5 cm)
30 Nov 17	Maintenance: 110 gallons pumped (4 cm)	Maintenance: 140 gallons pumped (W 3.5 cm; E 6.5 cm)
24 Jan 18	Detailed inspection and water level (7 cm)	Detailed inspection and water level (W 26 cm; E 6.5 cm); maintenance: 430 gallons pumped (W 4 cm; E 6.5 cm)
4 Feb 18	Detailed inspection and water level (14 cm)	Detailed inspection and water level (W 15 cm; E 6.5 cm)
6 Feb 18	Maintenance: 40 gallons pumped (1 cm)	Maintenance: 60 gallons pumped (W 4 cm; E 6.5 cm)
14 Feb 18	Detailed inspection and water level (4 cm)	Detailed inspection and water level (W 8 cm; E 6.5 cm)
23, 24 Feb 18	-----	Pre/post fire inspection (W 8 cm; E 6.5 cm)
26 Feb 18	Detailed inspection and water level (8 cm)	Detailed inspection and water level (W 13 cm; E 6.5 cm)
1 Mar 18	Detailed inspection and water level (8 cm)	Detailed inspection and water level (W 15 cm; E 6.5 cm)
28 Mar 18	Detailed inspection and water level (7.5 cm)	-----
3 Apr 18	-----	Detailed inspection and water level (W 18 cm; E 6.5 cm); maintenance: 150 gallons pumped (W 2 cm; E 6.5 cm); tarp replaced
6,7 Apr 18	Pre/post fire inspection (7.5 cm)	-----
7, 8 Apr 18	-----	Pre/post fire inspection (W 2 cm; E 6.5 cm)
13, 14 Apr 18	-----	Pre/post fire inspection (W 12 cm; E 6.5 cm)
18 Apr 18	Detailed inspection and water level (9 cm)	Detailed inspection and water level (W 12 cm; E 6.5 cm)

Date	Juliet	Kilo
27 Apr 18	-----	Pre/post fire inspection (W 12 cm; E 6.5 cm)
28, 29 Apr 18	-----	Pre/post fire inspection (W 12 cm; E 6.5 cm)
1 May 18	Detailed inspection and water level (13 cm)	Detailed inspection and water level (W 13; E 6.5 cm)
3 May 18	Maintenance: 90 gallons pumped (3.5 cm)	Maintenance: 40 gallons pumped; pre/post fire inspection (W 1 cm; E 6.5 cm)
4 May 18	Pre/post fire inspection (3.5 cm)	-----
16 May 18	Pre/post fire inspection (3.5 cm)	Pre/post fire inspection (W 1 cm; E 6.5 cm)
18, 19 May 18	Pre/post fire inspection (3.5 cm)	-----
2 Jun 18	Pre/post fire inspection (3.3 cm)	-----
27 Jul 18	-----	Pre/post fire inspection (W 13.5 cm; E 6.5 cm)
31 Jul 18	Maintenance: 60 gallons pumped (8 cm)	Maintenance: 60 gallons pumped (W 3 cm; E 6.5 cm)
4,5 Aug 18	-----	Pre/post fire inspection (W 3 cm; E 6.5 cm)
17 Aug 18	-----	Maintenance: replaced and repaired target frames (W 3 cm; E 6.5 cm)
18 Aug 18	-----	Pre/post fire inspection (W 3 cm; E 6.5 cm)
25, 26 Aug 18	-----	Pre/post fire inspection (W 3 cm; E 6.5 cm)
7, 9 Sep 18	Pre/post fire inspection (8 cm)	Pre/post fire inspection (W 14.5 cm; E 6.5 cm)
13 Sep 18	-----	Maintenance: 70 gallons pumped (W 2 cm; E 6.5 cm)

OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES
SIERRA & INDIA RANGES
TY 2018

Sierra and India Ranges Maintenance Activities for TY 2018		
Date	Sierra	India
5 Oct 17	Environmental monitoring	Environmental monitoring
13, 15 Oct 17	Pre/post fire inspection	Pre/post fire inspection
27, 28 Oct 17	Pre/post fire inspection	Pre/post fire inspection
3, 4 Nov 17	Pre/post fire inspection	Pre/post fire inspection
17 Nov 17	Pre/post fire inspection	Pre/post fire inspection
18 Nov 17	Pre/post fire inspection	-----
7 Apr 18	-----	Pre/post fire inspection
13 Apr 18	Pre/post fire inspection	-----
14 Apr 18	-----	Pre/post fire inspection
20 Apr 18	Pre/post fire inspection	Pre/post fire inspection
21 Apr 18	Pre/post fire inspection	-----
27 Apr 18	-----	Pre/post fire inspection
28 Apr 18	-----	Pre/post fire inspection
4 May 18	Pre/post fire inspection	-----
11, 12 May 18	Pre/post fire inspection	Pre/post fire inspection; detailed inspection
15 May 18	Pre/post fire inspection	-----
16 May 18	-----	Pre/post fire inspection; detailed inspection
18 May 18	Pre/post fire inspection	Pre/post fire inspection; detailed inspection
19 May 18	-----	Pre/post fire inspection
1 Jun 18	Pre/post fire inspection	-----
2 Jun 18	Pre/post fire inspection	Pre/post fire inspection; detailed inspection
3 Jun 18	Pre/post fire inspection	
22 Jun 18	-----	Pre/post fire inspection; detailed inspection
20 Jul 18	-----	Pre/post fire inspection; detailed inspection
3 Aug 18	Pre/post fire inspection	-----
4 Aug 18	-----	Pre/post fire inspection; detailed inspection
24 Aug 18	-----	Pre/post fire inspection; detailed inspection
7 Sep 18	-----	Pre/post fire inspection; detailed inspection
9 Sep 18	-----	Pre/post fire inspection
19 Sep 18	Pre/post fire inspection	-----

OPERATIONS, MAINTENANCE & MONITORING ACTIVITIES
LIMA RANGE
TY 2018

Lima Range Maintenance Activities for TY 2018	
Date	Activity
10 Oct 17	Soil sampling
18 May 18	Pre/post fire inspection; detailed inspection
9 Sep 18	Pre/post fire inspection

Lead Ammunition Use

Juliet, Kilo and Tango 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 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
TOTAL	**8,100**	**142,872**	**9,000**	**271,959**	**0**	**1,000**	**4,200**	**437,131**

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 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
TOTAL	**15,812**	**176,165**	**0**	**591,947**	**0**	**0**	**0**	**783,924**

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
TOTAL	**54,016**	**71,203**	**8,796**	**198,087**	**300**	**6,449**	**4,550**	**625**	**344,026**

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

LEAD AMMUNITION USE HISTORY CUMULATIVE							
Training Year	**Echo Range**	**Sierra Range**	**KD Range**	**Tango Range**	**Juliet Range**	**Kilo Range**	**Total**
TY 2018	0	0	0	0	36,583	119,342	155925
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[1]	0	1,993[3]	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[2]	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[1]	0	0	8,547	0	0	8,647
TOTAL	**474**	**2,120**	**1,993**	**344,026**	**437,131**	**783,924**	**1,569,641**

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

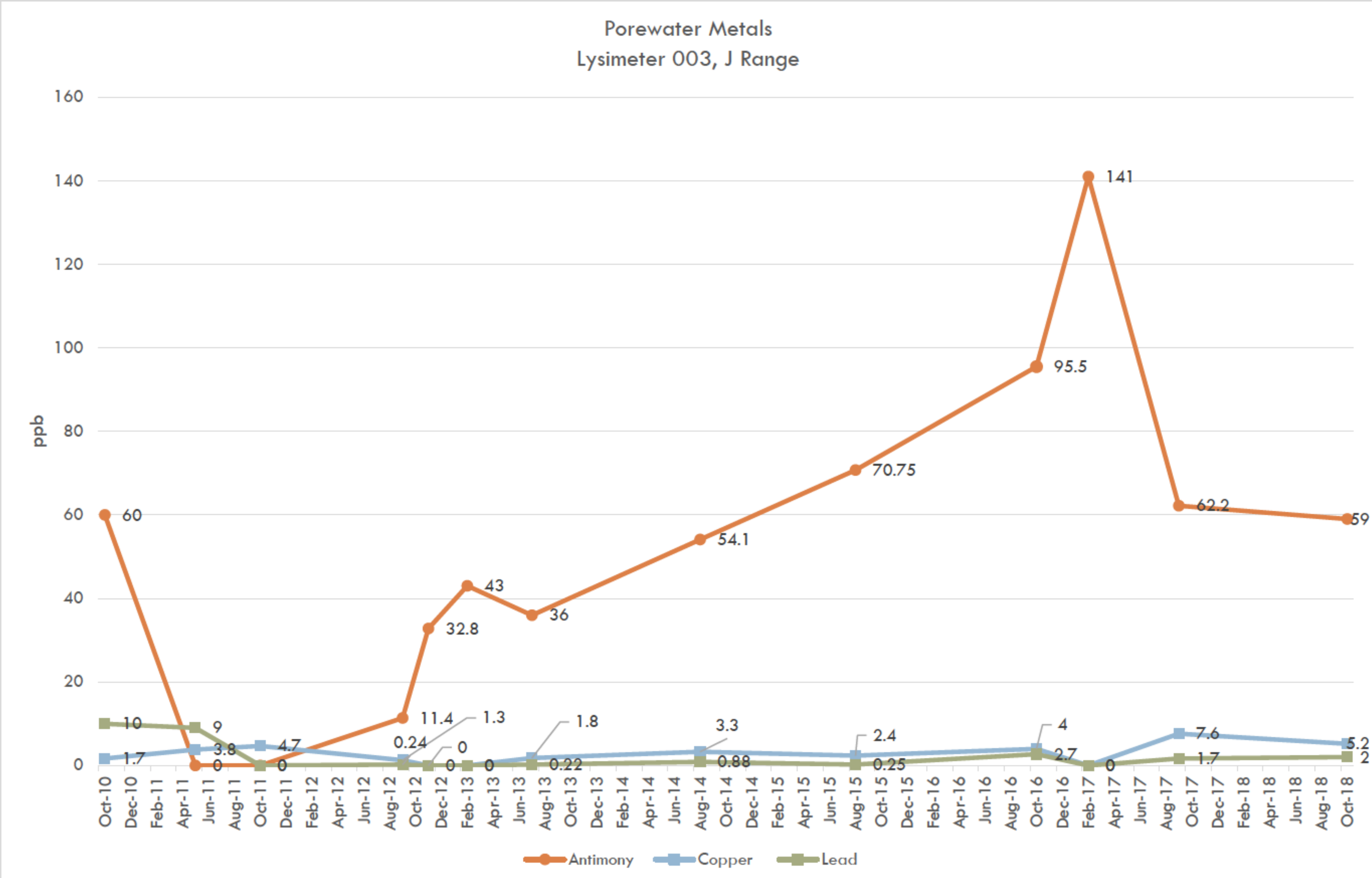
COPPER AMMUNITION USE HISTORY SIERRA AND RANGES			
Training Year	**Sierra Range 5.56 Copper**	**India Range 5.56 Copper**	**Total**
TY 2018	98,393	105,143	203,536
TY 2017	95,905	109,892	205,797
TY 2016	80,747	60,571	141,318
TY 2015	66,086	12,947	79,033
TY 2014	46,804	27,872	74,676
TY 2013	34,493	10,918	45,411
TY 2012	34,359	6,601	40,960
TOTAL	**456,787**	**333,944**	**790,731**

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

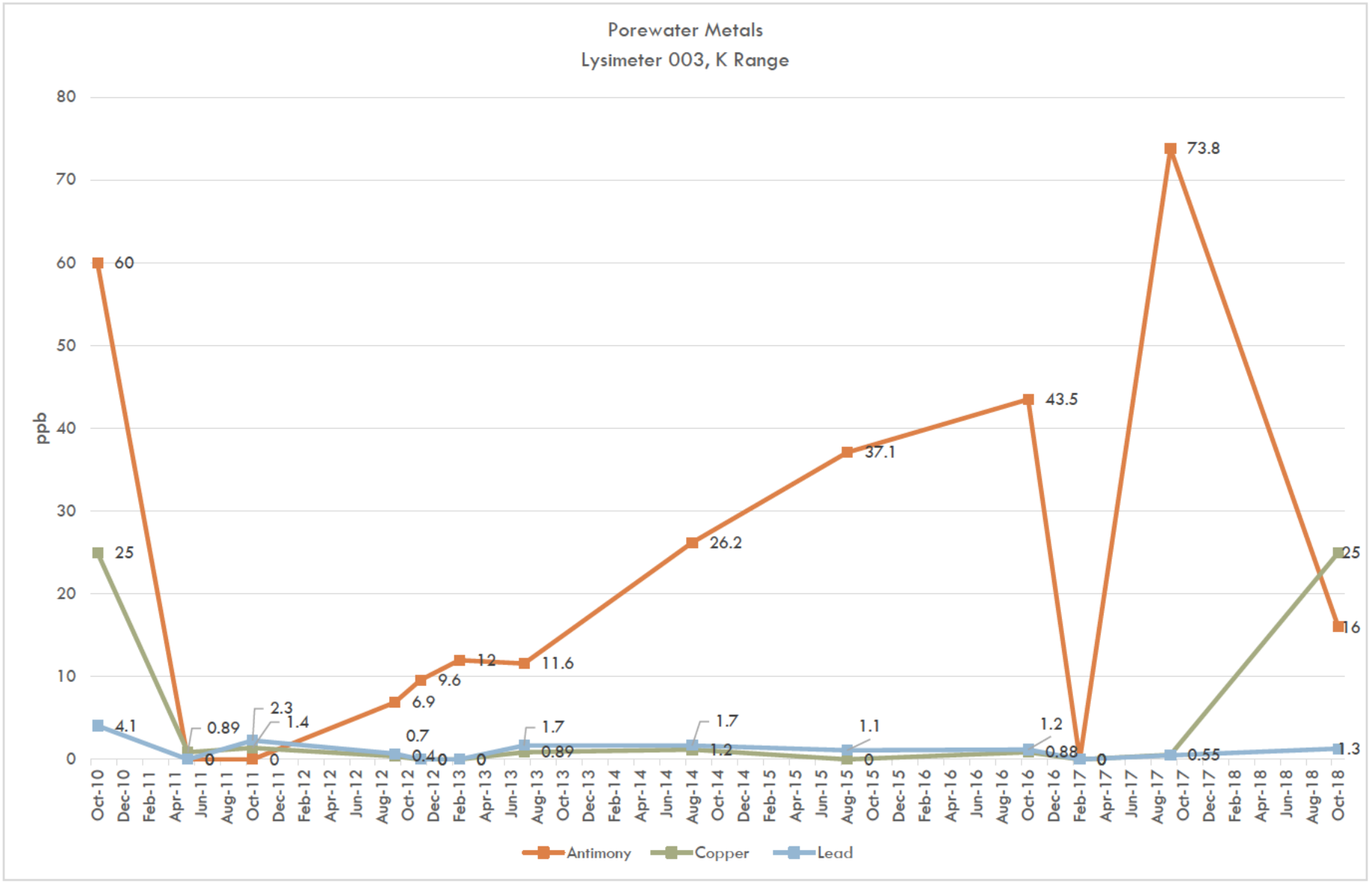
Porewater Graphs

Porewater Metals, Lysimeter 003, J Range

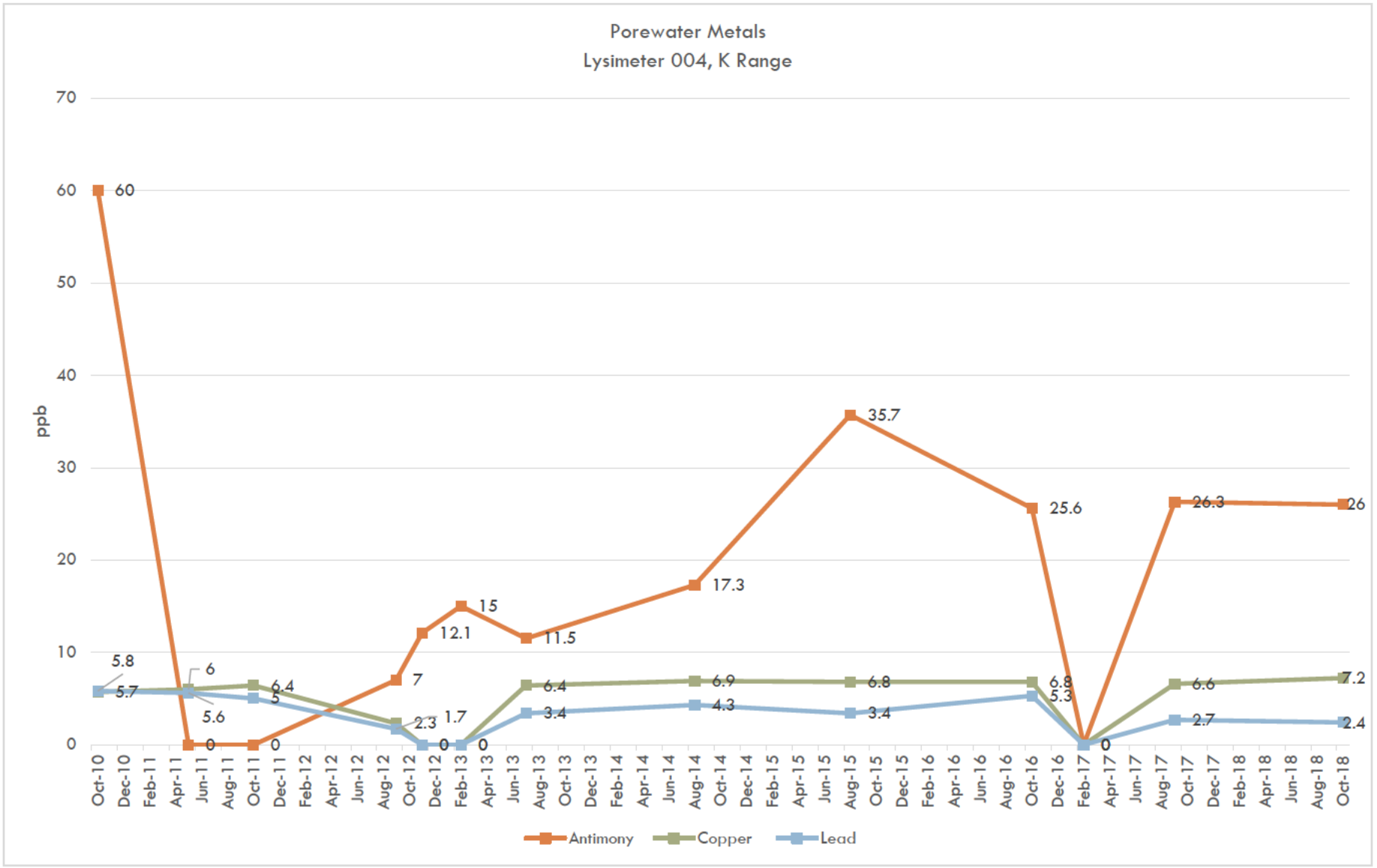


Note: 0 readings are nondetect or not sampled. 141 ppb reading just after system clean out that caused ground disturbance within the drainage area at the base of the berm.

Porewater Metals, Lysimeter 003, K Range



Note: 0 readings are nondetect or not sampled.


Porewater Metals
Lysimeter 004, K Range
ppb
70
60
50
40
30
20
10
0
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Apr-13
Jun-13
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Feb-16
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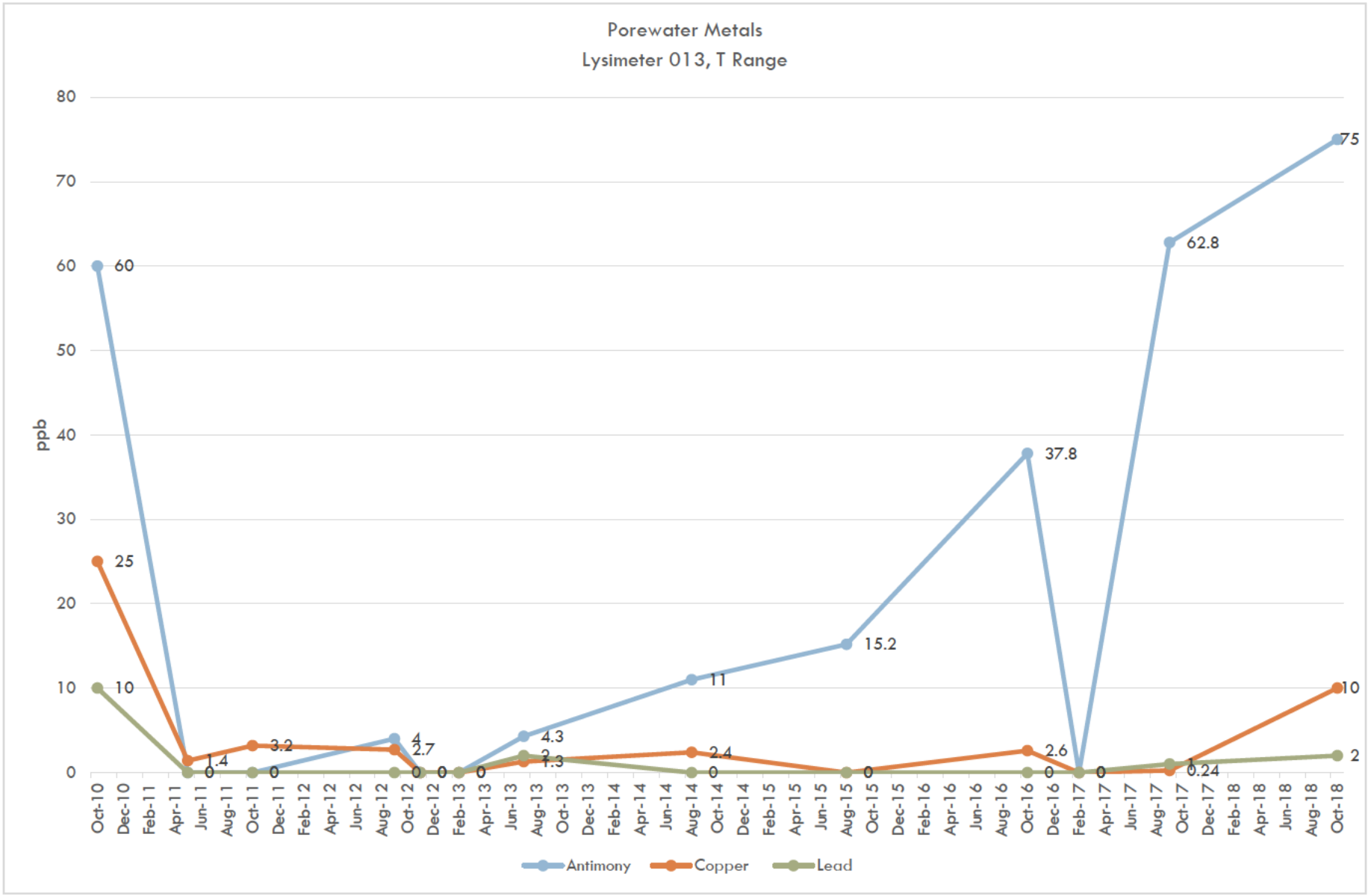
Jun-16
Aug-16
Oct-16
Dec-16
Feb-17
Apr-17
Jun-17
Aug-17
Oct-17
Dec-17
Feb-18
Apr-18
Jun-18
Aug-18
Oct-18
60
5.8
5.7
6
6.4
5
5.6
0
0
7
12.1
2.3
1.7
0
15
0
11.5
6.4
3.4
17.3
6.9
4.3
35.7
6.8
3.4
25.6
6.8
5.3
0
26.3
6.6
2.7
26
7.2
2.4
Antimony
Copper
Lead

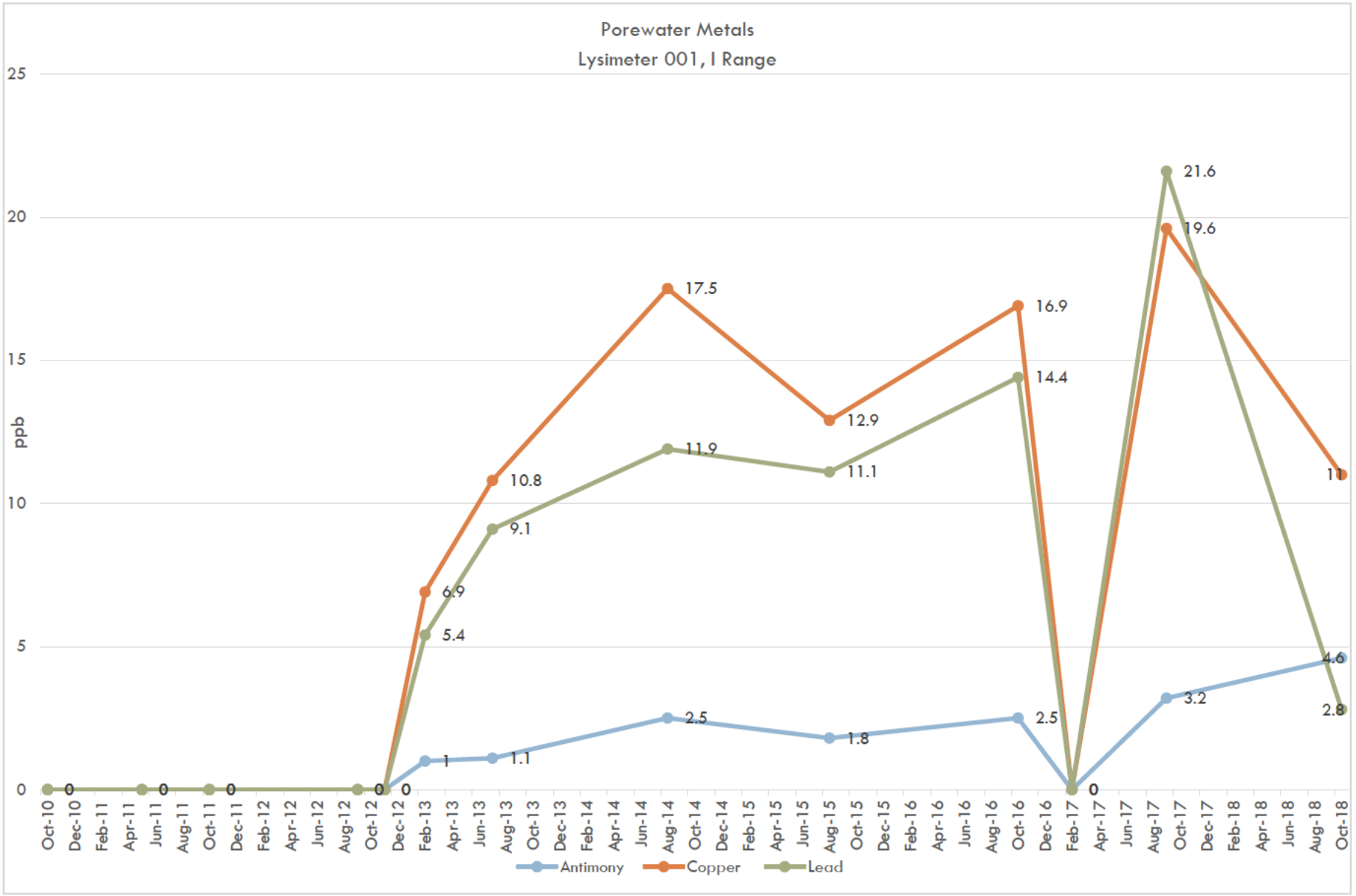
0

Porewater Metals, Lysimeter 013, T Range



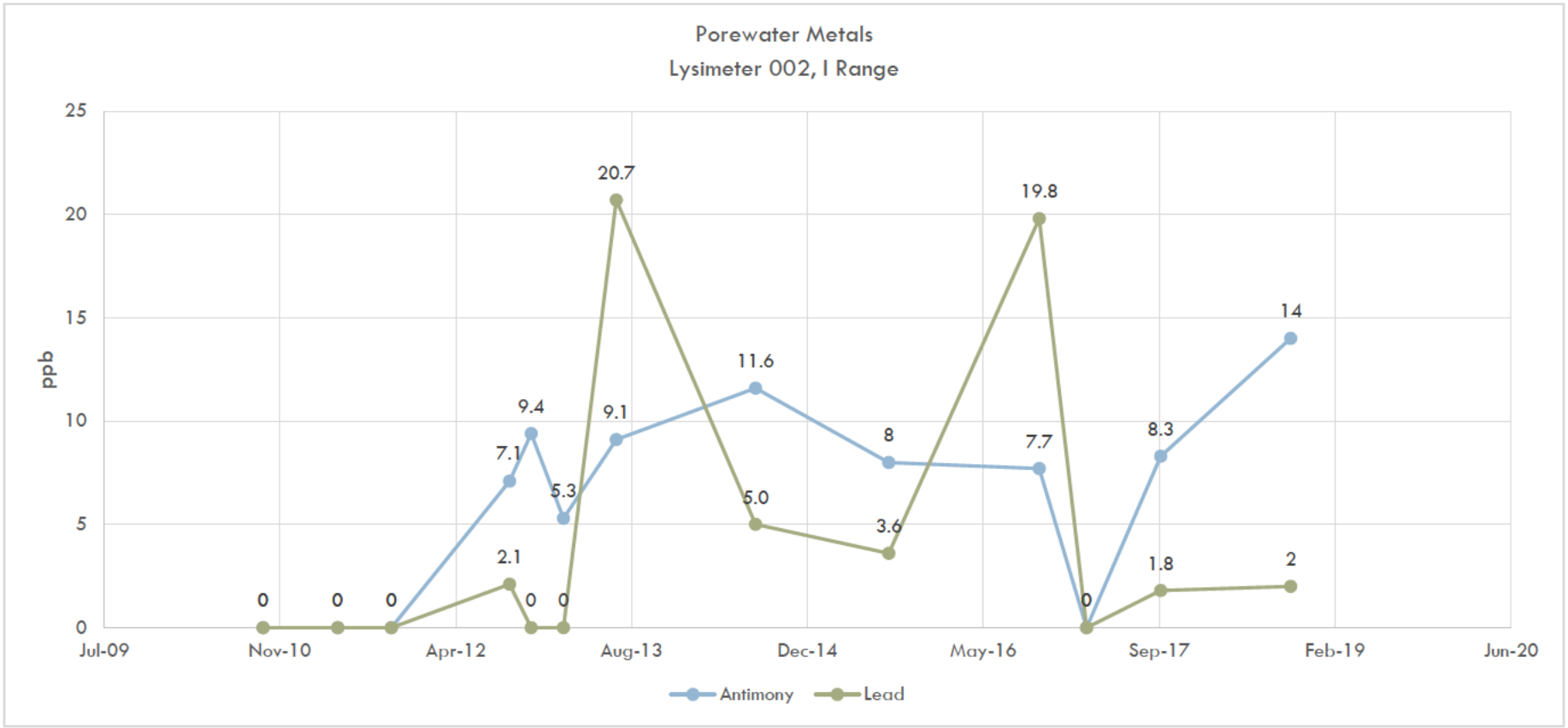
Note: 0 readings are nondetect or not sampled.

Porewater Metals, Lysimeter 001, I Range



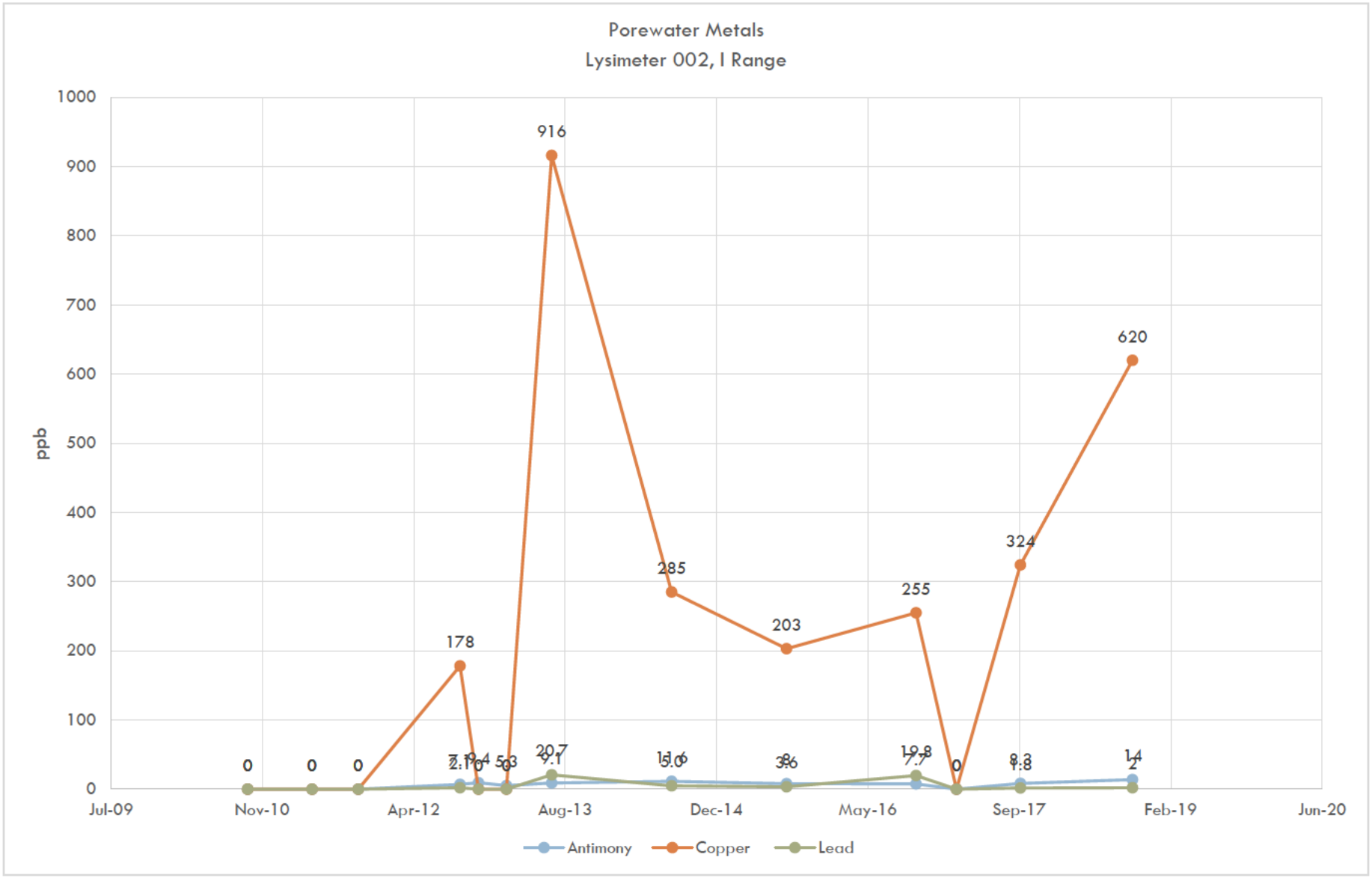
Note: 0 readings are nondetect or not sampled.

Porewater metals, Lysimeter 002, I Range



Note: 0 readings are nondetect or not sampled.

Porewater Metals, Lysimeter 002, I Range



Note: 0 readings are nondetect or not sampled.

Firing Range Sampling Reports

Soil Sampling Results, Multi Increment Samples

Camp Edwards Small Arms Range Annual Soil Monitoring 2018

Field Sample ID	Top Depth (feet bgs)	Bottom Depth (feet bgs)	Date Sampled	Test Method	Analyte	Result Value (mg/kg)	Qualifier	MDL	RL	OMMP Action Levels (mg/kg)	Sample Type	Remarks
SSJRNG001_NOV18A	0	0.25	11/14/2018	SW846 6010C	Antimony	1.1	J	0.43	1.7	300	N	100-pt MIS spl
SSJRNG001_NOV18A	0	0.25	11/14/2018	SW846 6010C	Copper	19		1.3	4.3	10,000	N	100-pt MIS spl
SSJRNG001_NOV18A	0	0.25	11/14/2018	SW846 6010C	Lead	25	J1	0.43	1.7	3,000	N	100-pt MIS spl
SSJRNG001_NOV18B	0	0.25	11/14/2018	SW846 6010C	Antimony	0.90	J	0.43	1.7	300	FR	100-pt MIS spl, FR
SSJRNG001_NOV18B	0	0.25	11/14/2018	SW846 6010C	Copper	27		1.3	4.3	10,000	FR	100-pt MIS spl, FR
SSJRNG001_NOV18B	0	0.25	11/14/2018	SW846 6010C	Lead	38		0.43	1.7	3,000	FR	100-pt MIS spl, FR
SSJRNG001_NOV18C	0	0.25	11/14/2018	SW846 6010C	Antimony	0.67	J	0.43	1.7	300	FR	100-pt MIS spl, FR
SSJRNG001_NOV18C	0	0.25	11/14/2018	SW846 6010C	Copper	24		1.3	4.3	10,000	FR	100-pt MIS spl, FR
SSJRNG001_NOV18C	0	0.25	11/14/2018	SW846 6010C	Lead	29		0.43	1.7	3,000	FR	100-pt MIS spl, FR
SSJRNG002_NOV18	0	0.25	11/14/2018	SW846 6010C	Antimony	0.63	J	0.49	2.0	300	N	100-pt MIS spl
SSJRNG002_NOV18	0	0.25	11/14/2018	SW846 6010C	Copper	9.2		1.5	4.9	10,000	N	100-pt MIS spl
SSJRNG002_NOV18	0	0.25	11/14/2018	SW846 6010C	Lead	50		0.49	2.0	3,000	N	100-pt MIS spl
SSJRNG003_NOV18	0	0.25	11/14/2018	SW846 6010C	Antimony	0.49	J	0.43	1.7	300	N	100-pt MIS spl
SSJRNG003_NOV18	0	0.25	11/14/2018	SW846 6010C	Copper	8.7		1.3	4.3	10,000	N	100-pt MIS spl
SSJRNG003_NOV18	0	0.25	11/14/2018	SW846 6010C	Lead	68		0.43	1.7	3,000	N	100-pt MIS spl
SSJRNG004_NOV18	0	0.25	11/14/2018	SW846 6010C	Antimony	0.80	J	0.43	1.7	300	N	100-pt MIS spl

Field Sample ID	Top Depth (feet bgs)	Bottom Depth (feet bgs)	Date Sampled	Test Method	Analyte	Result Value (mg/kg)	Qualifier	MDL	RL	OMMP Action Levels (mg/kg)	Sample Type	Remarks
SSJRNG004_NOV18	0	0.25	11/14/2018	SW846 6010C	Copper	24		1.3	4.3	10,000	N	100-pt MIS spl
SSJRNG004_NOV18	0	0.25	11/14/2018	SW846 6010C	Lead	65		0.43	1.7	3,000	N	100-pt MIS spl
SSJRNG005_NOV18	0	0.25	11/14/2018	SW846 6010C	Antimony	ND	UJ	0.43	1.7	300	N	100-pt MIS spl
SSJRNG005_NOV18	0	0.25	11/14/2018	SW846 6010C	Copper	8.3		1.30	4.3	10,000	N	100-pt MIS spl
SSJRNG005_NOV18	0	0.25	11/14/2018	SW846 6010C	Lead	41		0.43	1.7	3,000	N	100-pt MIS spl
SSJRNG006_NOV18	0	0.25	11/14/2018	SW846 6010C	Antimony	0.80	J	0.44	1.7	300	N	100-pt MIS spl
SSJRNG006_NOV18	0	0.25	11/14/2018	SW846 6010C	Copper	7.3		1.3	4.4	10,000	N	100-pt MIS spl
SSJRNG006_NOV18	0	0.25	11/14/2018	SW846 6010C	Lead	35		0.44	1.7	3,000	N	100-pt MIS spl
SSSRNG001_OCT18	0	0.25	10/26/2018	SW846 6010C	Antimony	ND	UJ	1.2	4.8	300	N	100-pt MIS spl
SSSRNG001_OCT18	0	0.25	10/26/2018	SW846 6010C	Copper	11	J	3.6	12	10,000	N	100-pt MIS spl
SSSRNG001_OCT18	0	0.25	10/26/2018	SW846 6010C	Lead	27		1.2	4.8	3,000	N	100-pt MIS spl

ND/U = non-detectable value
OMMP = Operations, Maintenance and Monitoring Plan
RL = reporting limit
SLX = location

Bold Results Value = ABOVE OMMP ACTION LEVEL

Firing Range Sampling Reports

Lysimeter Sampling Results

Camp Edwards Small Arms Range Annual Porewater Monitoring Results 2018

Field Sample ID	Date Sampled	Test Method	Analyte	Result Value (µg/L)	Qualifier	MDL	RL	OMMP Action Levels (µg/L)	Sample Type
LYIRNG001_OCT18	10/24/2018	SW846 6020A	Antimony	4.6	J	2.0	5.0	6	N
LYIRNG001_OCT18	10/24/2018	SW846 6020A	Copper	11		1.9	3.0	1,300	N
LYIRNG001_OCT18	10/24/2018	SW846 6020A	Lead	2.8	J	1.0	3.0	15	N
LYIRNG002_OCT18	10/25/2018	SW846 6020A	Antimony	**14**		2.0	5.0	6	N
LYIRNG002_OCT18	10/25/2018	SW846 6020A	Copper	620		1.9	3.0	1,300	N
LYIRNG002_OCT18	10/25/2018	SW846 6020A	Lead	2.0	J	1.0	3.0	15	N
LYJRNG001_OCT18	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYJRNG001_OCT18	10/25/2018	SW846 6020A	Copper	3.9		1.9	3.0	1,300	N
LYJRNG001_OCT18	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYJRNG002_OCT18	10/25/2018	SW846 6020A	Antimony	2.0	J	2.0	5.0	6	N
LYJRNG002_OCT18	10/25/2018	SW846 6020A	Copper	4.6		1.9	3.0	1,300	N
LYJRNG002_OCT18	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYJRNG003_OCT18	10/25/2018	SW846 6020A	Antimony	**59**		2.0	5.0	6	N
LYJRNG003_OCT18D	10/25/2018	SW846 6020A	Antimony	**57**		2.0	5.0	6	N, FR
LYJRNG003_OCT18	10/25/2018	SW846 6020A	Copper	5.2		1.9	3.0	1,300	N
LYJRNG003_OCT18D	10/25/2018	SW846 6020A	Copper	5.2		1.9	3.0	1,300	N, FR
LYJRNG003_OCT18	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYJRNG003_OCT18D	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N, FR
LYKRBGD01_OCT18	--	--	Antimony	--	--	--	--	6	Dry or malfunctioning
LYKRBGD01_OCT18	--	--	Copper	--	--	--	--	1,300	Dry or malfunctioning
LYKRBGD01_OCT18	--	--	Lead	--	--	--	--	15	Dry or malfunctioning
LYKRNG001_OCT18	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYKRNG001_OCT18	10/25/2018	SW846 6020A	Copper	ND	U	1.9	3.0	1,300	N
LYKRNG001_OCT18	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYKRNG002_OCT18	10/26/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYKRNG002_OCT18	10/26/2018	SW846 6020A	Copper	ND	U	1.9	3.0	1,300	N
LYKRNG002_OCT18	10/26/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYKRNG003_OCT18	10/26/2018	SW846 6020A	Antimony	**16**		2.0	5.0	6	N
LYKRNG003_OCT18	10/26/2018	SW846 6020A	Copper	25		1.9	3.0	1,300	N
LYKRNG003_OCT18	10/26/2018	SW846 6020A	Lead	1.3	J	1.0	3.0	15	N
LYKRNG004_OCT18	10/26/2018	SW846 6020A	Antimony	**26**		2.0	5.0	6	N
LYKRNG004_OCT18	10/26/2018	SW846 6020A	Copper	7.2		1.9	3.0	1,300	N
LYKRNG004_OCT18	10/26/2018	SW846 6020A	Lead	2.4	J	1.0	3.0	15	N

LYLRNG001_OCT18	10/26/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYLRNG001_OCT18	10/26/2018	SW846 6020A	Copper	14		1.9	3.0	1,300	N
LYLRNG001_OCT18	10/26/2018	SW846 6020A	Lead	1.0	J	1.0	3.0	15	N
LYLRNG002_OCT18	10/26/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYLRNG002_OCT18	10/26/2018	SW846 6020A	Copper	ND	U	1.9	3.0	1,300	N
LYLRNG002_OCT18	10/26/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYSRBGD01_OCT18	10/24/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYSRBGD01_OCT18	10/24/2018	SW846 6020A	Copper	2.6	J	1.9	3.0	1,300	N
LYSRBGD01_OCT18	10/24/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYSRNG001_OCT18	10/24/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYSRNG001_OCT18	10/24/2018	SW846 6020A	Copper	6.6		1.9	3.0	1,300	N
LYSRNG001_OCT18	10/24/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYSRNG002_OCT18	10/24/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYSRNG002_OCT18	10/24/2018	SW846 6020A	Copper	2.7	J	1.9	3.0	1,300	N
LYSRNG002_OCT18	10/24/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYTRBG001_OCT18	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	6	N
LYTRBG001_OCT18	10/25/2018	SW846 6020A	Copper	ND	U	1.9	3.0	1,300	N
LYTRBG001_OCT18	10/25/2015	SW846 6020A	Lead	ND	U	1.0	3.0	15	N
LYTRNG011_OCT18	--	--	Antimony	--	--	--	--	6	Confirmed destroyed
LYTRNG011_OCT18	--	--	Copper	--	--	--	--	1,300	Confirmed destroyed
LYTRNG011_OCT18	--	--	Lead	--	--	--	--	15	Confirmed destroyed
LYTRNG012_OCT18	--	--	Antimony	--	--	--	--	6	Confirmed destroyed
LYTRNG012_OCT18	--	--	Copper	--	--	--	--	1,300	Confirmed destroyed
LYTRNG012_OCT18	--	--	Lead	--	--	--	--	15	Confirmed destroyed
LYTRNG013_OCT18	10/25/2018	SW846 6020A	Antimony	**75**		2.0	5.0	6	N
LYTRNG013_OCT18	10/25/2018	SW846 6020A	Copper	10		1.9	3.0	1,300	N
LYTRNG013_OCT18	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	15	N

MDL = method detection limit **Bold Results Value = ABOVE OMMP ACTION LEVEL**
N = native sample
ND/U = non-detectable value
OMMP = Operations, Maintenance and Monitoring Plan
RL = reporting limit

SLX = location

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

Firing Range Sampling Reports

Groundwater Sampling Results

Camp Edwards Small Arms Range Annual Groundwater Monitoring Results October 2018

Field Sample ID	Top Depth (feet bgs)	Bottom Depth (feet bgs)	Date Sampled	Test Method	Analyte	Result Value (µg/L)	Qualifier	MDL	RL	OMMP Action Levels (µg/L)	Sample Type	Remarks
MW-639S_OCT18	84.32	92.51	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	7.5	N	Low Flow
MW-639S_OCT18D	84.32	92.51	10/25/2018	SW846 6020A	Lead	ND	U	1.0	3.0	7.5	N	Low Flow, FR
MW-639S_OCT18	84.32	92.51	10/25/2018	SW846 6020A	Copper	ND	U	1.9	3.0	650	N	Low Flow
MW-639S_OCT18D	84.32	92.51	10/25/2018	SW846 6020A	Copper	ND	U	1.9	3.0	650	N	Low Flow, FR
MW-639S_OCT18	84.32	92.51	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow
MW-639S_OCT18D	84.32	92.51	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow, FR
MW-471S_OCT18	88.30	92.45	10/26/2018	SW846 6020A	Lead	ND	U	1.0	3.0	7.5	N	Low Flow
MW-471S_OCT18D	88.30	92.45	10/26/2018	SW846 6020A	Lead	ND	U	1.0	3.0	7.5	N	Low Flow, FR
MW-471S_OCT18	88.30	92.45	10/26/2018	SW846 6020A	Copper	ND	U	1.9	3.0	650	N	Low Flow
MW-471S_OCT18D	88.30	92.45	10/26/2018	SW846 6020A	Copper	ND	U	1.9	3.0	650	N	Low Flow, FR
MW-471S_OCT18	88.30	92.45	10/26/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow
MW-471S_OCT18D	88.30	92.45	10/26/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow, FR
MW-472S_OCT18	90.19	94.76	10/25/2018	SW846 6020A	Lead	ND	U	1.9	3.0	7.5	N	Low Flow
MW-472S_OCT18	90.19	94.76	10/25/2018	SW846 6020A	Copper	ND	U	2.0	5.0	650	N	Low Flow
MW-472S_OCT18	90.19	94.76	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow
MW-474S_OCT18	90.18	96.00	10/25/2018	SW846 6020A	Lead	ND	U	1.9	3.0	7.5	N	Low Flow
MW-474S_OCT18	90.18	96.00	10/25/2018	SW846 6020A	Copper	ND	U	2.0	5.0	650	N	Low Flow
MW-474S_OCT18	90.18	96.00	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow
MW-465S_OCT18	140.77	146.94	10/26/2018	SW846 6020A	Lead	ND	J	1.9	3.0	7.5	N	Low Flow
MW-465S_OCT18	140.77	146.94	10/26/2018	SW846 6020A	Copper	10		2.0	5.0	650	N	Low Flow
MW-465S_OCT18	140.77	146.94	10/26/2018	SW846 6020A	Antimony	**4.4**	J	2.0	5.0	3	N	Low Flow
MW-466S_OCT18	122.60	137.87	10/26/2018	SW846 6020A	Lead	ND	U	1.9	3.0	7.5	N	Low Flow
MW-466S_OCT18	122.60	137.87	10/26/2018	SW846 6020A	Copper	ND	U	2.0	5.0	650	N	Low Flow
MW-466S_OCT18	122.60	137.87	10/26/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow
MW-467S_OCT18	128.81	135.00	10/25/2018	SW846 6020A	Lead	3.3		1.9	3.0	7.5	N	Low Flow
MW-467S_OCT18	128.81	135.00	10/25/2018	SW846 6020A	Copper	53		2.0	5.0	650	N	Low Flow
MW-467S_OCT18	128.81	135.00	10/25/2018	SW846 6020A	Antimony	ND	U	2.0	5.0	3	N	Low Flow

MDL = method detection limit
N = native sample
ND/U = non-detectable value
OMMP = Operations, Maintenance and Monitoring Plan
RL = reporting limit
SLX = location

Bold Results Value = ABOVE OMMP ACTION LEVEL

Firing Range Sampling Reports

XRF Results

Camp Edwards Small Arms Range XRF Copper Reading Results 2018

Sierra Range

10/24/2018

Sample ID	Reading #1	Reading #2	Reading #3
SSSRNGXRF001	152 ± 13	171 ± 13	178 ± 13
SSSRNGXRF002	125 ± 12	135 ± 12	133 ± 12
SSSRNGXRF003	28 ± 9	38 ± 10	28 ± 13
Background *	48 ± 12	38 ± 12	28 ± 11

Notes:
All readings in parts per million (ppm)
* - Background Copper reading taken from concrete floor of
S Range bleachers to eliminated background interference.

Soldier Validation Lane Annual Report

Camp Edwards — Massachusetts Army National Guard

Soldier Validation Lane Annual Monitoring Report

November 2018

(NHESP Tracking No.: 08-24210)

Soldier Validation Lane Use

No containers were placed or moved in soldier validation lanes (SVL) in 2018. All maneuver activities associated with the lanes were limited to established roads, road shoulders, and roadways within the power line right of ways.

SVL Assessments after 2018 Training Season

All SVL sites with conex containers were visited in November 2018 to evaluate training impacts at sites in the last training season. The assessment methodology matched the assessment performed in the Baseline Condition Assessment Report and FYs 12-17, to provide a means of comparison. The conex containers replicate buildings and prop materials are utilized to create a more realistic setting, such as barrels, bicycles, grills, tires, wall sections, etc. Some of these items were moved around the sites, and possibly a few were added in 2018, but there were no major additions or subtractions made in 2018. The chain link fence around SVL 3 is in the process of being replaced/repaired (Fig. 1), and a small group of pitch pines were removed at SVL 21 (Fig. 2). The erosion control implemented in 2016-2017 at SVL3 remains unchanged, but the erosion along the pathway hasn't worsened (Fig. 3). There is one less material pile at SVL 17 than there was in 2017, and there is one section of dirt road where rutting has worsened (Fig. 4).

Conclusion

All regulatory conditions were followed during use of the SVLs 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. The dirt roads in SVL 17 will be targeted for repair of rutting and erosion. Currently, the site is not used as an SVL, as the conex containers were removed in 2016. No areas were repaired in 2018 other than the ongoing fence replacement at SVL 3. Based on a renewed LRAM emphasis on managing pitch pine before it can choke out training areas, all SVLs 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: Fence replacement in progress at SVT. 3.

Figure 2: Small patch of pitch pine in 2017 (left), and no longer there in 2018 (right).

Figure 3: Erosion control at SVI. 3, no additional erosion since 2017.

Figure 4: Increased rutting at one of the entrances to SVI. 17.

APPENDIX D
ENVIRONMENTAL LAWS AND REGULATIONS

ENVIRONMENTAL LAWS AND REGULATIONS GOVERNING MAARNG ACTIVITIES IN THE RESERVE			
Reserve EPS	**Federal Law / Regulation**	**State Law / Regulation**	**DoD Regulation**
Groundwater Resources	Clean Water Act Safe Drinking Water Act	Drinking Water Quality Standards (310 CMR 22.00) State Wellhead Protection (310 CMR 22.21) Water Management Act (310 CMR 36.00)	AR 200-1 AR 200-2 Camp Edwards Regulation (CER) 385-63
Wetlands and Surface Water	Clean Water Act 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)	Massachusetts Wetlands Protection Act (M.G.L. c. 131, s40; 310 CMR 100.00)	AR 200-2 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 Soils and Water Conservation Act Use of Off-Road Vehicles on Public Lands (EO 11989)		AR 200-1 AR 200-2 AR 200-3 CER 385-63
Vegetation Management	American Indian Religious Freedom Act Environmental Justice (EO 12898) Exotic Organisms (EO 11987) Sikes Act		AR 200-1 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 Migratory Bird Conservation Act Migratory Bird Treaty Act Sikes Act		AR 200-1 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 RESERVE			
Reserve EPS	**Federal Law / Regulation**	**State Law / Regulation**	**DoD Regulation**
Noise Management	Federal Interagency Committee 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 200-1 AR 200-2
Pest Management	Animal Damage Control Act Federal Insecticide, Fungicide, and Rodenticide Act Noxious Weed Act Resource Conservation and Recovery Act Sikes Act Toxic Substances Control Act		DoD 4150.7 AR 200-1 AR 200-2 AR 200-5 AR 420-47
Fire Management	Clean Air Act Sikes Act The National Fire Code Uniform Fire Code	State Air Quality Regulations (310 CMR 4.00)	AR 200-1 AR 200-2 AR 200-3 AR 420-90 CER 385-63
Storm Water Management	Clean Water Act NPDES discharge permitting and limitations	Massachusetts Wetlands Protection Act (M.G.L. c. 131 s.40, 310 CMR 10.00.)	AR 200-1 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 Toxic Substances Control Act	State Solid Waste Handling and Disposal (310 CMR 16.00/19.00)	AR 200-1 AR 200-2 AR 420-47 CER 385-63
Hazardous Materials	Asbestos Hazard Emergency Response (40 CFR 763) Federal Insecticide, Fungicide and Rodenticide Act Hazard Communication Standard Program (29 CFR 1910.1200) Lead Contamination Control Act OSHA (29 CFR 1910, 29 USC 91-596) Poison Prevention Packaging Act Toxic Substances Control Act	Hazardous Substances Labeling Law (105 CMR 650.00)	AR 200-1 AR 200-2 CER 385-63

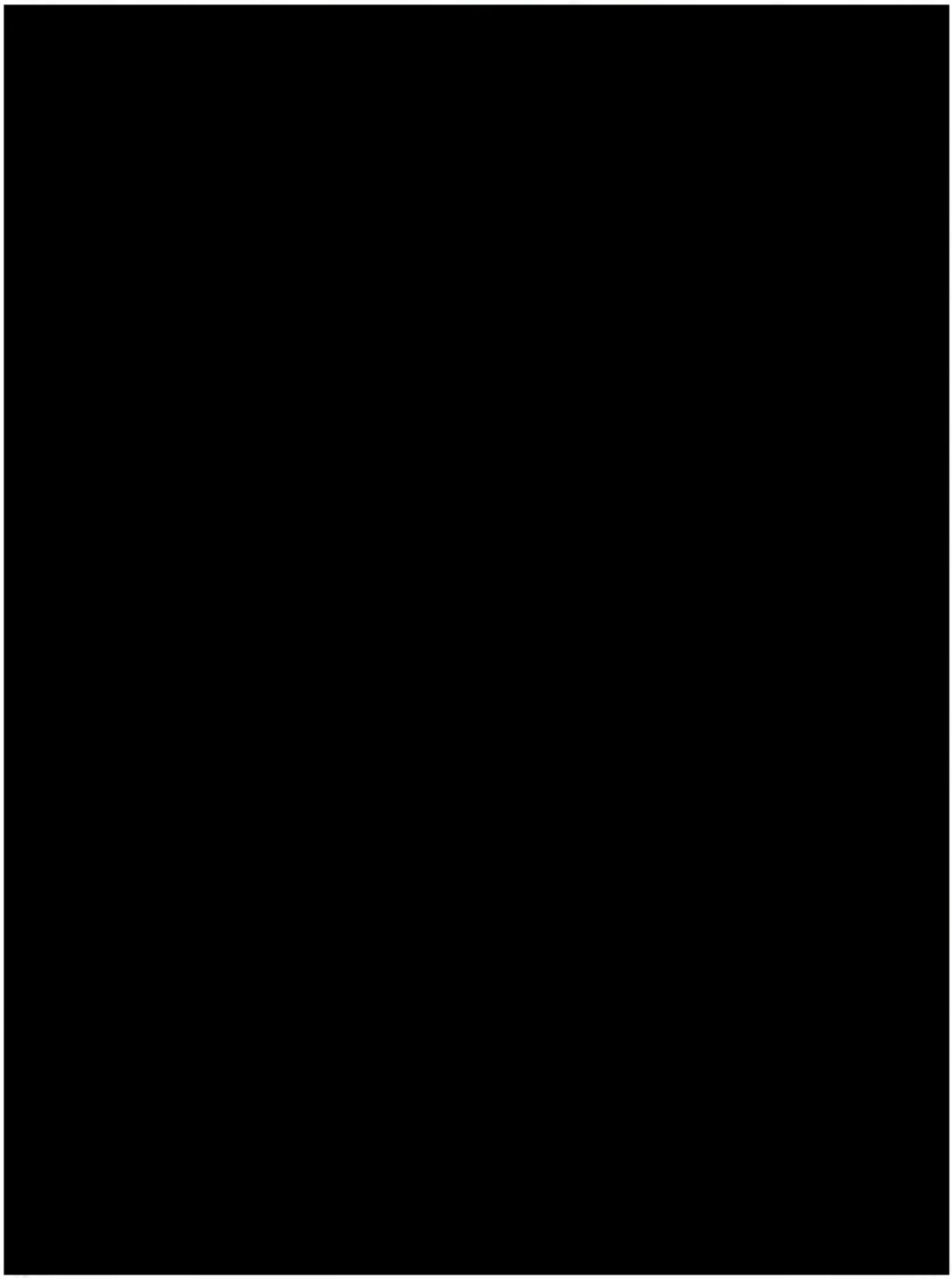
ENVIRONMENTAL LAWS AND REGULATIONS GOVERNING MAARNG ACTIVITIES IN THE RESERVE			
Reserve EPS	**Federal Law / Regulation**	**State Law / Regulation**	**DoD Regulation**
Hazardous Waste	Clean Air Act Clean Water Act Emergency Preparedness and Community Right-To-Know Act Federal Facilities Compliance Act Hazardous Waste Operations and Emergency Response Medical Waste Tracking National Fire Code Oil Pollution Act Pollution Prevention Act Resource Conservation and Recovery Act The National Contingency Plan Underground Storage Tank Program (RCRA, Title I) Uniform Building and Fire Codes Comprehensive Environmental Response, Compensation, and Liability Act	Department of Transportation regulations regarding shipping and transportation, Hazardous Waste Management and Transportation (310 CMR 30.000) Management of Medical Waste (105 CMR 480) Pesticide use (333 CMR 1.00 – 12.00) Solid waste facilities management (310 CMR 16.00/19.00) State right-to-know requirements (105 CMR 670.00) Title V (310 CMR 15.00) 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)	AR 200-1 AR 200-2 AR 420-47 CER 385-63
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 RESERVE			
Reserve EPS	**Federal Law / Regulation**	**State Law / Regulation**	**DoD Regulation**
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

2018 Long Term Monitoring Sentry Well Sampling Results
Upper Cape Regional Water Supply Cooperative



Watermark
175 Labot Street • Lowell, MA 01854
Office 978.452.9696 Fax 978.453.9908

LETTER OF TRANSMITTAL

DATE:	08/22/2018	JOB NO:	17006-00
ATTENTION:	Mr. Gerard Martin		
RE:	Sentry Well Sampling Results – 2018 Sampling Round		
Upper Cape Regional Water Supply (UCRWS)			
Long-Term Monitoring Sentry Well Sampling Results			

TO: MassDEP
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

WE ARE SENDING YOU:

✓ Attached ____ Under separate cover via ☐ FedEx ☐ UPS ☐ USPS the following items:

____ Shop Drawings ____ Prints ____ Plans ____ Samples ✓ Reports

____ Copy of Letter ____ Change Order No. ____

NO.	ITEM	QUANTITY	DESCRIPTION
1	Hard Copy	1	UCRWS Long-Term Monitoring Sentry Well Sampling Results – 2018 Sampling Round

THESE ARE TRANSMITTED as checked below:

____ For approval ____ Approved as submitted ____ Resubmit ____ Copies for approval

✓ For your use ____ Approved as noted ____ Submit ____ Copies for distribution

____ As requested ____ Returned for corrections ____ Return ____ Corrected prints

____ For review and comment ____ For bids due ____ Prints returned after loan to Watermark

REMARKS:

Hi Gerard,

Attached are the results for the Upper Cape Regional Water Supply Cooperative 2018 Sentry Well Sampling Round of the shallow screens.

If you have any questions or require additional information, please give me a call at 978-452-9696.

Thank you,

Olaf Westphalen

COPY TO: Jane Nolan – USEPA, w/ Attachments (via email)
Leonard Pinaud – MassDEP, w/ Attachments
Dan Mahoney – UCRWS, w/ Attachments
File17006-00/WLC3409

SIGNED:

If enclosures are not as noted, kindly notify us at once.

Thank You!

Form No. 002 (Rev 2009)

Watermark
Engineering • Construction • Operations

Environmental
Infrastructure
Buildings & Facilities

August 22, 2018

Mr. Dan Mahoney, Chair
Upper Cape Regional Water Supply Cooperative (UCRWS)
P.O. Box 373
Mashpee, MA 02649-0373

Subject: **Results of 2018 Sampling Round**
Long-Term Monitoring Well Sampling Services
Upper Cape Regional Water Supply (UCRWS) Cooperative –
Long-Term Monitoring Plan

Dear Mr. Mahoney:

In accordance with our proposal dated July 29, 2015, and as authorized by the UCRWS on March 28, 2018, we are pleased to submit the results of the 2018 Sampling Round that was performed by Watermark Environmental, Inc. (Watermark) on May 23 and 24, 2018. Draft results were provided on July 27, 2018. During the 2018 Sampling Round, seven shallow well screens (C-1S through C-7S) were sampled in accordance with the UCRWS Long-Term Monitoring (LTM) Plan, as amended on October 22, 2007. The groundwater sample analyses were performed by Envirotech Laboratories Inc. of Sandwich, Massachusetts (Envirotech), TestAmerica Laboratories, Inc. of Savannah, Georgia and its subsidiaries (TestAmerica), and their subcontractor Chemserve Environmental Laboratory, of Milford, New Hampshire (subcontracted to Alpha Analytical of Westborough, Massachusetts).

We have completed a review of the Sample Data Summary and Extended Data Packages provided by TestAmerica and by Envirotech and have confirmed that the quality control objectives established for field sampling and laboratory analyses efforts have been effectively met. The laboratory results of the sampling effort have been tabulated in the attached 2018 Sampling Results Tables (Attachment A). Results for all volatile organic compounds (VOCs), 1,2-dibromoethane (EDB), perchlorate, and explosives compounds were non-detect, with the exception of RDX and chloroform. The results are consistent with historic data for these monitoring wells with the exception of RDX.

RDX was detected slightly above the laboratory reporting limit of 0.00025 mg/L at C-1S and C-4S. There is no Massachusetts Maximum Contaminant Level (MMCL) for RDX; however, United States Environmental Protection Agency (EPA) Office of Water's 2018 Edition of the Drinking Water Standards (EPA 822-F-18-001) provides a Lifetime Health Advisory of 0.002 mg/L for RDX. In response to the RDX detections, these two wells were resampled by Watermark on August 1, 2018, and tested for explosives under contract with the United States Army Corps of Engineers (USACE). Based on the non-validated preliminary data, these RDX detections were not repeatable.

The chloroform detections at C-1S, C-2S, C-3S, and C-7S were all below its Massachusetts Drinking Water Guideline. Water quality results were at or below their respective standards, with the exception of pH; pH measured slightly more acidic than the acceptable range of Massachusetts Secondary Maximum Contaminant Levels (SMCL) in each of the well screens. Note: The SMCL is only a guideline and the pH results are consistent with historic and local data.

175 Cabot Street • Lowell, MA 01854 • Office 978.452.9696 • Fax 978.453.9988 • www.watermarkenv.com

Once again, we appreciate this opportunity to be of service to the UCRWS and we look forward to working with you in the future. If you have any questions regarding this submittal, please do not hesitate to contact me at (978) 452-9696.

Sincerely,
WATERMARK

Olaf Westphalen, PG, LSP
Project Manager

Attachments:
Attachment A 2018 Sampling Results Tables
Attachment B Chain of Custody Forms, Low Flow Data – Field Results, 2018 Sampling Event

cc: J. Spangenberger (Watermark)
File 17006-00/WLC3499

ATTACHMENT A

2018 Sampling Results Tables

Table 1-1
Physical-Chemical Parameters
Shallow Screens at Sentry Wells
2018 Sampling Results
Upper Cape Regional Water Supply

Watermark

Sample ID	Water Quality Standard Level[1]	Laboratory Reporting Limit	C-1S	C-2S	C-3S	C-4S	C-5S	C-6S	C-7S
Sample Date			05/23/2018	05/23/2018	05/24/2018	05/24/2018	05/23/2018	05/23/2018	05/24/2018
Physical-Chemical									
pH Method SM 4500 H-B	6.5 - 8.5[2]	NA	6.05	6.11	6.06	6.30	6.22	6.14	6.17
Alkalinity - Total, as $CaCO_3$ (mg/L) Method SM 2320 B	NE	2.5	6.1	5.6	5.7	6.7	9.3	11.0	5.7
Turbidity (NTU) Method SM 2130 B	TT	1.0	1.2	<1.0	2.0	3.5	1.1	3.5	<1.0
Specific Conductance (umhos/cm @ 25 °C) Method EPA 120.1	NE	10.0	54	18	46	43	50	51	47

Notes:

Samples were analyzed by Environtech Laboratories Inc. of Sandwich, Massachusetts.

(1) Water Quality Standard Levels are the Massachusetts Maximum Contaminant Level (MMCL, 2016) unless otherwise noted.

(2) Water Quality Standard Levels are from the Secondary Maximum Contaminant Levels (SMCL, 2016).

NE = Not Established
NA = Not Applicable
TT = Treatment Technique
mg/L = Milligrams per Liter
°C = degrees Celsius
< = Less Than
NTU = Nephelometric Turbidity Units
umhos/cm = Micromhos per Centimeter

Prepared By: AEG
Checked By: OW

Table 1-2
Volatile Organic Compounds – EPA Method 524.2 (mg/L)
Shallow Screens at Sentry Wells
2018 Sampling Results
Upper Cape Regional Water Supply

Sample ID / Sample Date	Water Quality Standard Level[1] (mg/L)	Laboratory Reporting Limit (mg/L)	C-1S 05/21/2018	C-2S 05/21/2018	C-3S 05/24/2018	C-4S 05/30/2018	C-5S 05/21/2018	C-6S 05/23/2018	C-7S 05/24/2018
Trans-1,3-Dichloropropene	0.0004[2,4]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ethylbenzene	0.7	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Trichlorofluoromethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Hexachlorobutadiene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Isopropylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
p-Isopropyltoluene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Methylene chloride (Dichloromethane)	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Naphthalene	0.140[2]	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
n-Propylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Styrene	0.1	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1,1,2-Tetrachloroethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1,2,2-Tetrachloroethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Tetrachloroethylene	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	1	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2,3-Trichlorobenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2,4-Trichlorobenzene	0.07	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1,1-Trichloroethane	0.2	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1,2-Trichloroethane	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Trichloroethylene	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2,3-Trichloropropane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2,4-Trimethylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3,5-Trimethylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vinyl chloride	0.002	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
o-Xylene	10[3]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
m-Xylene & p-Xylene	10[3]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bromobenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bromodichloromethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bromoform	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bromomethane	0.010[2]	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl tert-butyl ether (MTBE)	0.070[2]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
n-Butylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
sec-Butylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
tert-Butylbenzene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Carbon tetrachloride	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chlorobenzene	0.1	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dibromochloromethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chloroethane	NE	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform	0.07[2]	0.0005	**0.0010**	**0.0012**	**0.00099**	<0.0005	<0.0005	<0.0005	**0.0030**
Chloromethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2-Chlorotoluene (o-Chlorotoluene)	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
4-Chlorotoluene (p-Chlorotoluene)	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dibromomethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2-Dichlorobenzene (o-DCB)	0.6	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3-Dichlorobenzene (m-DCB)	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dichlorodifluoromethane	1.4[2]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1-Dichloroethane	0.070[2]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2-Dichloroethane	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1-Dichloroethylene	0.007	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
cis-1,2-Dichloroethylene	0.07	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Trans-1,2-Dichloroethylene	0.1	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2-Dichloropropane	0.005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3-Dichloropropane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2,2-Dichloropropane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1-Dichloropropene	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
cis-1,3-Dichloropropene	0.0004[2,4]	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2-Butanone (MEK)	4[2]	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Methyl-2-pentanone (MIBK)	0.35[2]	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromochloromethane	NE	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Notes:

Samples analyzed by TestAmerica Laboratories, Inc. of Savannah, Georgia.

Bold means the sample exceeded laboratory reporting limits.

[1] Water Quality Standard Levels are the Massachusetts Maximum Contaminant Level (MMCL, 2018) unless otherwise noted.

[2] Water Quality Standard Levels are the Massachusetts Drinking Water Guidelines developed by the Office of Research and Development.

[3] Xylene Standard based on Total Xylene.

[4] Water Quality Standard listed is for 1,3-dichloropropene (i.e., the sum of cis-1,3-dichloropropene and trans-1,3-dichloropropene).

NE = Not Established mg/L = Milligrams per Liter < = Less Than

Prepared By: ABC
Checked By: DW

UPCO Long-Term Monitoring Well Sampling Results
Upper Cape Regional Water Supply Cooperative, Mashpee, MA

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August 2018
WL52423

Table 1-3
Explosive Compounds – EPA Method SW8330 (mg/L)
Shallow Screens at Sentry Wells
2018 Sampling Results
Upper Cape Regional Water Supply

Sample ID / Sample Date	Water Quality Standard Level[1] (mg/L)	Laboratory Reporting Limit (mg/L)	C-1S	C-2S	C-3S	C-4S	C-5S	C-6S	C-7S
Sample Date			05/23/2018	05/23/2018	05/24/2018	05/24/2018	05/25/2018	05/23/2018	05/24/2018
2,6-Diamino-4-nitrotoluene	NE	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4-Diamino-6-nitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
HMX	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
RDX	NE	0.00025	0.00043	< 0.00025	< 0.00025	0.00027	< 0.00025	< 0.00025	< 0.00025
Picric acid	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
1,3,5-Trinitrobenzene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
1,3-Dinitrobenzene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
Nitrobenzene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
Tetryl	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
Nitroglycerin	NE	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2,4,6-Trinitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
4-Amino-2,6-dinitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2-Amino-4,6-dinitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,6-Dinitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2,4-Dinitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
3-Nitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
2-Nitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
4-Nitrotoluene	NE	0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025	< 0.00025
PETN	NE	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes:
Samples analyzed by TestAmerica Laboratories, Inc. of South Burlington, Vermont.
[1] Water Quality Standard Levels are the Massachusetts Maximum Contaminant Level (MMCL, 2016) unless otherwise noted.

NE = Not Established mg/L = Milligrams per Liter < = Less Than

Prepared By: ABC
Checked By: GW

17306.20 Long Term Monitoring Well Sampling Services
Upper Cape Regional Water Supply Cooperative, [illegible], MA
Page 1 of 1
August 2018
[illegible]

Table 1-4
Perchlorate – EPA Method 314.0 and EDB – EPA Method 504.1 (mg/L)
Shallow Screens at Sentry Wells
2018 Sampling Results
Upper Cape Regional Water Supply

Sample ID / Sample Date	Water Quality Standard Level[1] (mg/L)	Laboratory Reporting Limit (mg/L)	C-1S	C-2S	C-3S	C-4S	C-5S	C-6S	C-7S
			05/23/2018	05/23/2018	05/24/2018	05/24/2018	05/23/2018	05/23/2018	05/24/2018
Perchlorate	0.002	0.0005	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromoethane (EDB)	0.00002	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002

Notes:

Perchlorate analyzed by Chemserve Environmental Laboratory of Milford, New Hampshire.

EDB analyzed by TestAmerica Laboratories, Inc of Savannah, Georgia.

[1] Water Quality Standard Levels are the Massachusetts Maximum Contaminant Level (MMCL, 2016), unless otherwise noted.

mg/L = Milligrams per Liter

< = Less Than

Prepared By: ATC
Checked By: UW

17006.00 Long Term Monitoring Well Sampling Services
Upper Cape Regional Water Supply Cooperative, Bourne, MA

Page 1 of 1

August 2018
[illegible]

ATTACHMENT B

Chain of Custody Forms, Low Flow Data – Field Results, 2018 Sampling Event

TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Phone: 912.354.7858 Fax:

Chain of Custody Record 233509

Explosives Shipped To TA in VT, The Rest to TA in GA.
(Perchlorate analyzed by Chem Serve)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other: [illegible]

Client Contact	
Company Name:	Watermark
Address:	175 Cabot Street
City/State/Zip:	Lowell, MA 01854
Phone:	978-452-9696
Fax:	978-453-9988
Project Name:	UCAWS - 2018
Site:	JBCC, Cape Cod, MA
PO#	W17-10540C01

Project Manager: Olaf Westphalen
Tel/Fax: olaf.westphalen@watermarkcorp.com
Site Contact: [illegible]
Lab Contact: [illegible]
Date: 5/23/18
Carrier: [illegible]/FedEx
COC No: 1 of 1 COCs
Sampler: MA + AN
For Lab Use Only: Walk-in Client: Lab Sampling:
Job / SDG No.:

Analysis Turnaround Time: ☐ CALENDAR DAYS ☑ WORKING DAYS
TAT if different from Below: 14 Days
☐ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS/MSD (Y/N)	VOCs (E524.2) Ascorbic Acid/HCl	EDB (E504.1) Sodium Thiosulfate	Perchlorate ** (E314.0) Filtered	Explosives (SW8330B) ***	EDB (E504.1) * Hold	Sample Specific Notes
C2-S_2018	5/23/18	0835	G	WG		Y/N	N	3	3	1	2		Perchlorate is Field Filtered
TB_052318	5/23/18	0700	N/A	WQ		N	N	2					
TB_052318	5/23/18	0700	N/A	WQ		N	N					3	
C1-S_2018	5/23/18	1015	G	WG		Y/N	N	3	3	1	2		
C5-S_2018	5/23/18	1200	G	WG		Y/N	N	3	3	1	2		
C6-S_2018	5/23/18	1335	G	WG		Y/N	N	3	3	1	2		
C7-S_2018	5/24/18	0830	G	WG		Y/N	N	3	3	1	2		
C4-S_2018	5/24/18	1015	G	WG		Y/N	N	3	3	1	2		
C3-S_2018	5/24/18	1310	G	WG		Y/N	N	3	3	1	2		
													All Samples @ 4°C (±2°C)

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other $Na_2S_2O_3$, [illegible] — 2,1 | 6 | 1 | 1 | 6

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Months

Special Instructions/QC Requirements & Comments: ** Perchlorate To Chemserve; *** Explosives Shipped to TA in VT (30 Community Dr. Suite #11 South Burlington, VT 05403)
* Hold (If EDB is detected in any sample, Call PM to discuss analyzing Trip Blank)

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: ____ Corr'd: ____ | Therm ID No.:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Watermark	5/24/18 1530	[signature]	Absolute Delivery	5/24/18 15:30
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Data To: Email: olaf.westphalen@watermarkenv.com
aimee.comeau@watermarkenv.com

CHAIN OF CUSTODY FORM

ENVIROTECH LABS, INC.
8 Jan Sebastian Dr., Unit 12
Sandwich, MA 02563
(508)888-6460/1-800-339-6460
FAX (508)888-6446
Invoice: UCRWS

Client: Watermark Environmental
Address: ~~2150 Washington Street~~ 175 Cabot Street
~~Hanover, MA 02339~~ Lowell, MA 01854
Phone#: 978-452-9696 X ~~3~~ 213
Fax #: 978-453-9988

Proj. No.:
Project Name: Upper Cape Regional Water Supply - 2018
Sampler: Michael Augustyniak, Alex Nunes

Lab ID #	Date	Time	Comp	Grab	Sample location	container	Pres.	Analysis Requested
WL-180930A	5/23/18	0835		X	C2-S_2018	1x500mL Plas	4°C	pH, Alkalinity, Turbidity, Spec Conductance
B	5/23/18	1015		X	C1-S_2018	1x500mL Plas	4°C	pH, Alkalinity, Turbidity, Spec Conductance
C	5/23/18	1200		X	C5-S_2018	1x500mL Plas	4°C	pH, Alkalinity, Turbidity, Spec Conductance
D	5/23/18	1335		X	C6-S_2018	1x500mL Plas	4°C	pH, Alkalinity, Turbidity, Spec Conductance

pH Method SM4500 H-B/150.1
Alkalinity (Total $CaCO_3$) SM2320 B
Turbidity SM2130 B/180.1
Specific Conductance SM2510 B

TAT - 21 Days

Relinquished:	Date/Time	Received:	Relinquished:	Date/Time	Received:
Michael E Augustyniak	5/23/18 1600				
Relinquished:	Date/Time	Received:	Relinquished:	Date/Time	Received:

Data To: Email: [illegible].westphalen@watermarkenv.com
[illegible].comeau@watermarkenv.com

CHAIN OF CUSTODY FORM

ENVIROTECH LABS, INC.
8 Jan Sebastian Dr., Unit 12
Sandwich, MA 02563
(508)888-6460/1-800-339-6460
FAX (508)888-6446
Invoice: UCRWS

Client: Watermark Environmental
Address: 175 Cabot Street
Lowell, MA 01854
~~2100 Washington Street~~
~~Hanover, MA 02339~~
Phone#: 978 452 9696 X ~~[illegible]~~ 213
Fax #: 978-453-9988

Proj. No.:

Project Name: Upper Cape Regional Water Supply - 2018

Sampler: Michael Augustyniak, Alex Nines

Lab ID #	Date	Time	Comp	Grab	Sample location	container	Pres.	Analysis Requested
[illegible] A	5/24/18	0830		X	C7-S-2018	1x500 mL	4°C	pH, Alkalinity, Turbidity, Spec Conductance
B	5/24/18	1015		X	C4-S-2018	1x500 mL	4°C	pH, Alkalinity, Turbidity, Spec Conductance
C	5/24/18	1210		X	C3-S-2018	1x500 mL	4°C	pH, Alkalinity, Turbidity, Spec Conductance

pH Method SM4500 H-B | 150.1
Alkalinity (Total $CaCO_3$) SM2320 B
Turbidity SM2130 B 180.1
Specific Conductance SM2510 B

TAT - 21 Days

Relinquished:	Date/Time	Received:	Relinquished:	Date/Time	Received:
Michael E. Augustyniak	5/24/18 1600	[signature]			
Relinquished:	Date/Time	Received:	Relinquished:	Date/Time	Received:

Sample ID: C1-S.2018

Pump Start Time: 0915

Sample Collection Time: 1015

Watermark

Well I.D.: C1-S

Well Depth (from TOC): 150' bgs. ft

Static Water Level (WL) = (From TOC): 106.05' ft TOC

Height of Water in Well (T):
T = depth (ft) - Static Water Level (ft)
T = 150 - 106.05
T = 43.95 ft

Well Volume: 2 X 0.04 x 43.95 x 3.785 = 27.3 Liters (gallons)

Date: 5/23/18

Well Diameter (d) = 2" inches
Screen Depth 110' to 150' bgs. Feet below grade
Sampler(s): Mike Augustyniak, Alex Nunez

Low Flow: Yes X No
Purging Device: MP10 Pump Controller Dedicated bladder pump
Sampling Device: YSI 650 MDS Teflon-lined tubing
Pump Intake (depth below TOC): Feet
Actual Purge Volume: 27.0 Liters Turbidity: No

Time:	Temp. (°C) (±3%)	pH (SU) (±0.1)	Specific Conductance (±3%) (uS/cm)	Turbidity (NTUs) (±10% if >5)	D.O. (mg/l) (±10% if >0.5)	ORP (mV) (±10)	Flow Rate (ml/min)	Static water Level	Color/ Clarity	Comments
0915	11.75	6.06	52	1.33	11.61	206.1	450	106.05	clear	
0920	10.41	6.01	60	4.60	11.62	204.7	450	106.05	clear	
0925	9.90	5.94	60	3.43	11.63	203.6	450	106.05	clear	
0930	9.87	5.92	60	3.55	11.64	201.1	450	106.05	clear	
0935	9.90	5.84	60	2.97	11.66	203.9	450	106.05	clear	
0940	9.88	5.85	60	2.22	11.66	205.0	450	106.05	clear	
0945	9.89	5.94	60	2.41	11.65	203.7	450	106.05	clear	
0950	9.93	5.81	60	2.61	11.66	205.2	450	106.05	clear	
0955	9.87	5.77	59	2.22	11.56	213.7	450	106.05	clear	
1000	9.86	5.80	59	2.76	11.50	221.1	450	106.05	clear	
1005	9.87	5.81	60	2.08	11.49	223.4	450	106.05	clear	
1010	9.89	5.82	60	1.79	11.47	224.9	450	106.05	clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.652, 6-inch = 1.468

Sample ID: C2-S_2018

Notes:

Watermark

Sample Collection Time: 6835

Well I.D.: C2-S

Date: 5/23/18

Well Depth (from BGS) = 130' bgs. ft

Well Diameter (d) = 2" inches

Static Water Level (WL) = (From T.O.C.) 102.83 ft TOC

Screen Depth: 90' to 130' bgs Feet below grade

Sampler(s): Mike Augustyniak, Alex Nunes

Height of Water in Well (T):
T = depth (ft) - Static Water Level (ft)
T = 130 - 102.83
T = 27.17 ft

Well Volume: $2^2 \times 0.041 \times 27.17 \times 3.785$ L = 16.87 Liters

Low Flow: Yes X No

Purging Device: Micro Pump Controller, Dedicated bladder pump, teflon-lined tubing

Sampling Device: YSI 650 MDS

Pump Intake (depth below TOC): Feet

Actual Purge Volume: 27.0 Liters

Time	Temp. (°C) (± 3%)	pH (SU) (± 0.1)	Specific Conductance (± 3%) (uS/cm)	Turbidity (NTUs) (± 10% T>5)	D.O. (mg/l) (± 10%) (T>0.5)	ORP (mV) (± 10)	Flow Rate (ml/min)	Water Level	Color/Clarity	Comments
0735	9.68	6.08	55	1.12	11.53	133.7	450	102.83	Clear	
0740	9.76	6.02	54	1.10	11.47	147.1	450	102.83	Clear	
0745	9.69	5.98	54	1.08	11.51	158.7	450	102.83	Clear	
0750	9.68	5.96	54	1.20	11.52	169.5	450	102.83	Clear	
0755	9.75	5.95	54	1.03	11.51	177.6	450	102.83	Clear	
0800	9.74	5.95	54	1.07	11.47	183.6	450	102.83	Clear	
0805	9.69	5.94	54	0.86	11.42	188.7	450	102.83	Clear	
0810	9.67	5.94	54	1.03	11.40	194.2	450	102.83	Clear	
0815	9.69	5.93	54	0.80	11.38	199.7	450	102.83	Clear	
0820	9.68	5.95	54	1.07	11.40	200.5	450	102.83	Clear	
0825	9.67	5.95	54	0.99	11.42	200.8	450	102.83	Clear	
0830	9.68	5.95	54	0.95	11.43	202.4	450	102.83	Clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.652, 6-inch = 1.468

Sample ID: C3-S_2018

Pump Start Time: 1110

Sample Collection Time: 1210

Watermark

Well I.D.: C3-S

Well Depth (from ~~T.O.C.~~ BGS) = 183' bgs. ft

Static Water Level (WL) = (From T.O.C.) 103.33' TOC ft

Date 5/24/18

Well Diameter (d) = 2" inches

Screen Depth 133' to 183' bgs. Feet below grade

Sampler(s): Mike Augustyniak, Alex Nunez

Height of Water in Well (T):
T= depth (ft) - Static Water Level (ft)
T= 183 - 103.33
T= 79.67 ft

Well Volume: $2 \times 0.041 \times 79.67 \times 3.785$ liters (gallons) $= 49.45$ Liters

Low Flow: Yes X No

Purging Device: MP10 Pump Controller

Sampling Device: YSI 650 MDS

Pump Intake (depth below TOC): Dedicated bladder pump Teflon-lined tubing

Actual Purge Volume: 27.0 Liters Gal. (Gallons) 40

Time:	Temp. (°C) (± 3%)	pH (SU) (± 0.1)	Specific Conductance ~~(umhos/cm)~~ (± 3%) (uS/cm)	Turbidity (NTUs) (±10 if >10)	D.O. (mg/l) (± 10% if >0.5)	ORP (mV) (± 10)	Flow Rate (ml/min)	Static Water Level	Color/ Clarity	Comments
1110	10.22	5.57	44	1.18	12.49	233.3	450	103.33	Clear	
1115	10.21	5.62	51	1.21	12.26	257.0	450	103.33	Clear	
1120	10.12	5.68	51	1.06	12.13	268.0	450	103.33	Clear	
1125	10.11	5.72	51	1.18	12.01	274.1	450	103.33	Clear	
1130	10.01	5.73	51	1.58	11.86	279.0	450	103.33	Clear	
1135	10.06	5.76	51	1.40	11.97	283.1	450	103.33	Clear	
1140	10.10	5.79	51	0.82	11.79	282.6	450	103.33	Clear	
1145	10.02	5.83	51	0.93	11.74	275.0	450	103.33	Clear	
1150	9.99	5.86	51	1.29	11.66	277.0	450	103.33	Clear	
1155	9.94	5.88	51	1.09	11.80	278.3	450	103.33	Clear	
1200	9.93	5.89	51	1.01	11.78	280.1	450	103.33	Clear	
1205	9.92	5.89	51	0.85	11.78	279.7	450	103.33	Clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.652, 6-inch = 1.468

Sample ID: C4-S_2018

Pump Start Time: 0915

Sample Collection Time: 1015

Watermark

Well I.D.: C4-S

Date: 5/24/18

Well Depth (from BGS) = 250' bgs ft

Static Water Level (WL) = (From T.O.C.) 132.29' TOC ft

Well Diameter (d) = 2" inches

Screen Depth: 200' to 250' bgs. Feet below grade

Sampler(s): Mike [illegible], Alex Nunes

Height of Water in Well (T):
T = depth (ft) - Static Water Level (ft)
T = 250 - 132.29
T = 117.71 ft

Well Volume: 2²x0.041x117.71x3.785 (gallons) = 73.07 Liters

Low Flow: Yes X No

Purging Device: MP10 Pump Controller — Dedicated bladder pump

Sampling Device: YSI 650 MDS — Teflon-lined tubing

Pump Intake (depth below TOC): Feet

Actual Purge Volume: 27.0 Liters

Time	Temp. (°C) (±3%)	pH (SU) (±0.1)	Specific Conductance (µS/cm) (±3%)	Turbidity (NTUs) (±10% at ≥5)	D.O. (mg/l) (±10% if ≥0.5)	ORP (mV) (±10)	Flow Rate (ml/min)	Static water Level	Color/ Clarity	Comments
0915	10.53	6.54	47	7.35	13.26	209.1	450	132.29	Clear	
0920	10.19	6.16	49	1.84	11.57	213.1	450	132.29	Clear	
0925	10.19	6.15	49	1.01	11.57	215.3	450	132.29	Clear	
0930	10.21	6.15	49	0.81	11.49	219.6	450	132.29	Clear	
0935	10.16	6.16	47	0.85	11.46	222.6	450	132.29	Clear	
0940	10.20	6.15	49	1.01	11.43	224.1	450	132.29	Clear	
0945	10.32	6.16	49	0.92	11.37	225.6	450	132.29	Clear	
0950	10.26	6.17	49	0.98	11.34	228.0	450	132.29	Clear	
0955	10.30	6.18	49	1.02	11.33	229.4	450	132.29	Clear	
1000	10.36	6.18	49	1.07	11.29	230.6	450	132.29	Clear	
1005	10.38	6.18	49	1.22	11.27	231.5	450	132.29	Clear	
1010	10.38	6.18	49	1.25	11.25	232.4	450	132.29	Clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.652, 6-inch = 1.463

Sample ID: C5-S-2018

Pump Start Time: 1100

Sample Collection Time: 1200

Watermark

Well I.D.: C5-S

Well Depth (from BGS) = 180' bgs ft

Static Water Level (WL) = (from T.O.C.) 136.47' TOC ft

Height of Water in Well (T):
T = depth (ft) - Static Water Level (ft)
T = 180 - 136.47
T = 43.53 ft

Well Volume: 2² x 0.041 x 43.53 x 3.785 = 27.02 Liters

Date: 5/23/18

Well Diameter (d) = 2" inches

Screen Depth: 150' to 180' bgs. Feet below grade

Sampler(s): Mike Augustyniak, Alex Nunez

Low Flow: Yes X No

Purging Device: MP10 Pump Controller

Sampling Device: YSI 650 MDS

Pump Intake (depth below TOC):

Actual Purge Volume: 27.0 Liters

Dedicated bladder pump Teflon-Lined tubing

Time	Temp. (°C) (± 3%)	pH (SU) (± 0.1)	Specific Conductance (µS/cm) (± 3%)	Turbidity (NTUs) (±10% if >5)	D.O. (mg/L) (± 10% if >0.5)	ORP (mV) (± 10)	Flow Rate (ml/min)	Water Level	Color/ Clarity	Comments
1100	10.32	6.04	55	2.12	11.47	207.9	450	136.47	clear	
1105	10.65	6.03	54	1.33	11.42	214.4	450	136.47	clear	
1110	10.35	6.02	55	2.14	11.47	218.8	450	136.47	clear	
1115	10.36	6.01	55	1.05	11.49	221.7	450	136.47	clear	
1120	10.41	6.01	55	0.96	11.46	222.1	450	136.47	clear	
1125	10.43	6.01	55	0.89	11.44	223.7	450	136.47	clear	
1130	10.43	6.00	55	0.86	11.41	224.3	450	136.47	clear	
1135	10.36	6.01	55	0.97	11.42	227.1	450	136.47	clear	
1140	10.31	6.03	55	0.90	11.42	228.3	450	136.47	clear	
1145	10.30	6.04	55	0.69	11.40	229.6	450	136.47	clear	
1150	10.28	6.04	55	0.92	11.42	231.7	450	136.47	clear	
1155	10.27	6.04	55	0.67	11.43	232.6	450	136.47	clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.652, 6-inch = 1.468

Sample ID: C6-S_2018

Pump Start Time: 1235

Sample Collection Time: 1335

Watermark

Well I.D.: C6-S

Well Depth (from ~~TOC~~ BGS): 183' bgs. ft

Static Water Level (WL) = (From T.O.C.): 143.20' TOC ft

Height of Water in Well (T):
T = depth (ft) - Static Water Level (ft)
T = 183 - 143.20
T = 39.80 ft

Well Volume: 2 x 0.041 x 39.80 x 3.785 (~~gallons~~) = 24.71 Liters

Date: 5/23/18

Well Diameter (d) = 2" inches

Screen Depth: 153' to 183' bgs. Feet below grade

Sampler(s): [illegible], Rick Nunes

Low Flow: Yes X No

Purging Device: MP10 Pump Controller — Dedicated bladder pump

Sampling Device: YSI 650 MDS — Teflon-Lined Tubing

Pump Intake (depth below TOC): Feet

Actual Purge Volume: 27.0 Liters (~~Gallons~~)

Time	Temp. (°C) (± 3%)	pH (SU) (± 0.1)	Specific Conductance (~~umhos/cm~~) (± 3%) (uS/cm)	Turbidity (NTUs) (≤10% if >5)	D.O. (mg/l) (± 10% if >0.5)	ORP (mV) (± 10)	Flow Rate (ml/min)	~~Static~~ water Level	Color/Clarity	Comments
1235	10.73	6.30	54	15.0	11.95	217.4	450	143.20	Slightly Cloudy	
1240	10.34	5.92	54	8.36	11.37	224.1	450	143.20	clear	
1245	10.30	5.92	55	5.83	11.41	230.4	450	143.20	clear	
1250	10.35	5.92	55	3.91	11.39	235.1	450	143.20	clear	
1255	10.29	5.93	56	2.85	11.38	242.7	450	143.20	clear	
1300	10.38	5.92	56	2.08	11.37	246.9	450	143.20	clear	
1305	10.26	5.94	56	1.64	11.38	249.9	450	143.20	clear	
1310	10.32	5.96	56	1.43	11.37	253.0	450	143.20	clear	
1315	10.32	5.98	56	1.13	11.29	257.0	450	143.20	clear	
1320	10.31	6.01	55	1.11	11.26	259.6	450	143.20	clear	
1325	10.28	6.02	55	1.36	11.21	261.4	450	143.20	clear	
1330	10.31	6.02	55	1.68	11.23	262.9	450	143.20	clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.653, 6-inch = 1.468

Sample ID: C7-S_2018

Pump Start Time: 0730

Sample Collection Time: 0830

Watermark

Well I.D.: C7-S

Well Depth (from ~~TOC~~ BGS): 239' bgs ft

Static Water Level (WL) = (From T.O.C.): 157.21' TOC ft

Date: 5/24/18

Well Diameter (d) = 2" inches

Screen Depth: 199' to 239' bgs. Feet below grade

Sample(s): Miriam Augustyniak, Alex Nunez

Height of Water in Well (T):

T = depth (ft) - Static Water Level (ft)

T = 239 - 157.21

T = 81.79 ft

Well Volume: 2 x 0.04 x 81.79 x 3.785 = 50.77 L (gallons)

Low Flow: Yes X No

Purging Device: MP10 Pump Controller

Sampling Device: YSI 650 MDS

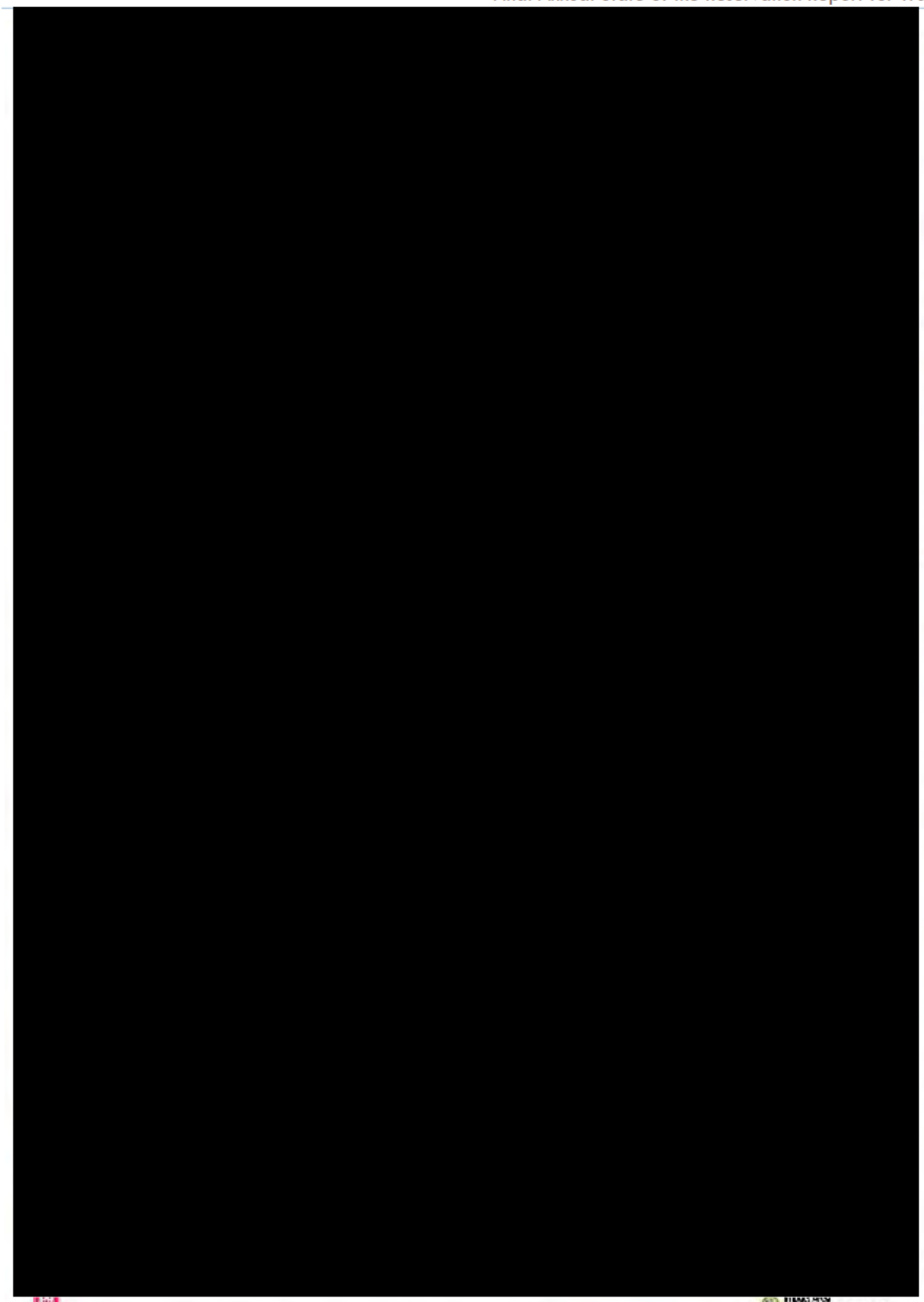
Pump Intake (depth below TOC): Dedicated Bladder pump Teflon-Lined Tubing

Actual Purge Volume: 27.0 Liters Feet (Gallons)

Time	Temp. (°C) (±3%)	pH (SU) (±0.1)	Specific Conductance (±3%) (uS/cm)	Turbidity (NTUs) (±10% if >5)	D.O. (mg/l) (± 10% if >0.5)	ORP (mV) (± 10)	Flow Rate (ml/min)	Static water Level	Color/ Clarity	Comments
0730	10.12	6.32	53	0.68	10.46	167.7	450	157.21	clear	
0735	10.05	6.17	54	0.64	11.20	166.8	460	157.21	clear	
0740	10.04	6.12	54	0.58	11.28	174.3	450	157.21	clear	
0745	10.04	6.10	54	0.61	11.31	185.1	450	157.21	clear	
0750	10.03	6.10	54	0.63	11.34	191.6	450	157.21	clear	
0755	10.04	6.10	54	0.66	11.34	197.5	450	157.21	clear	
0800	10.04	6.10	54	0.79	11.33	201.8	450	157.21	clear	
0805	10.00	6.10	54	0.70	11.32	209.7	450	157.21	clear	
0810	10.01	6.10	54	0.68	11.33	211.1	450	157.21	clear	
0815	10.03	6.10	54	0.68	11.36	212.7	450	157.21	clear	
0820	10.02	6.10	54	0.78	11.33	215.4	450	157.21	clear	
0825	10.01	6.10	54	0.75	11.32	216.1	450	157.21	clear	

Volume in gallons/feet for common monitoring well sizes: 1-inch = 0.041, 2-inch = 0.163, 3-inch = 0.367, 4-inch = 0.653, 6-inch = 1.468

Impact Area Groundwater Study Program
Upper Cape Water Supply Cooperative Sentry Well Sampling
August 2018



Wells and Plumes Vicinity of Sandwich Water Supply Sentry Wells C1-A, C3-B and C4-A

FIGURE
1

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

Job Number: 200-44619-1

SDG Number: 44619

Job Description: MMR Groundwater Monitoring

For:
WaterMark Environmental, Inc.
175 Cabot Street
Lowell, MA 01854

Attention: David DiCesare

Approved for release
James W Madison
Senior Project Manager
8/9/2018 8:39 AM

James W Madison, Senior Project Manager
30 Community Drive, South Burlington, VT, 05403
(802)660-1990
jim.madison@testamericainc.com
08/09/2018

cc: Aimee Comeau
Mr. Jackson Kiker

The test results in this report relate only to sample(s) as received by the laboratory. These test results were derived under a quality system that adheres to the requirements of NELAC. Pursuant to NELAC, this report may not be produced in full without written approval from the laboratory

CASE NARRATIVE

Client: WaterMark Environmental, Inc.

Project: MMR Groundwater Monitoring

Report Number: 200-44619-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 08/03/2018; the samples arrived in good condition, properly preserved and on ice.

PERCHLORATES
Samples C-4S_F18 and C-1S_F18 were analyzed for Perchlorates in accordance with EPA SW-846 6850. The samples were analyzed on 08/06/2018.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

EXPLOSIVES
Samples C-4S_F18 and C-1S_F18 were analyzed for explosives in accordance with 8330. The samples were prepared on 08/03/2018 and analyzed on 08/07/2018.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

METHOD SUMMARY

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
SDG Number: 44619

Description	Lab Location	Method	Preparation Method
Matrix: Water			
Nitroaromatics and Nitramines (HPLC)	TAL BUR	EPA 8330B	
Solid Phase Extraction (Explosives)	TAL BUR		SW846 8330 Prep
Perchlorate by LC/MS or LC/MS/MS	TAL BUR	EPA 6850	

Lab References:

TAL BUR = TestAmerica Burlington

Method References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

METHOD / ANALYST SUMMARY

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Method	Analyst	Analyst ID
EPA 8850	Drumm, Erik L	ELD
EPA 8330B	Drumm, Erik L	ELD

SAMPLE SUMMARY

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
200-44619-1	C-4S_F18	Water	08/01/2018 1300	08/03/2018 1010
200-44619-2	C-1S_F18	Water	08/01/2018 1550	08/03/2018 1010

SAMPLE RESULTS

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44619-1
Sdg Number: 44619

Client Sample ID: **C-4S_F18**

Lab Sample ID: 200-44619-1
Client Matrix: Water

Date Sampled: 08/01/2018 1300
Date Received: 08/03/2018 1010

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132606	Instrument ID:	CH1453
Prep Method:	8330-Prep	Prep Batch:	200-132488	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/07/2018 1522			Injection Volume:	750 uL
Prep Date:	08/03/2018 1545			Result Type:	SECONDARY

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	105		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44619-1
Sdg Number: 44619

Client Sample ID: C-4S_F18

Lab Sample ID: 200-44619-1
Client Matrix: Water

Date Sampled: 08/01/2018 1300
Date Received: 08/03/2018 1010

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132607	Instrument ID:	CH1208
Prep Method:	8330-Prep	Prep Batch:	200-132488	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/07/2018 1608			Injection Volume:	150 uL
Prep Date:	08/03/2018 1545			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.018	0.20
Nitrobenzene	0.20	U	0.050	0.20
Tetryl	0.20	U	0.054	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.016	0.20
2,6-Dinitrotoluene	0.20	U	0.034	0.20
2,4-Dinitrotoluene	0.20	U	0.054	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	104		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44619-1
Sdg Number: 44619

Client Sample ID: C-1S_F18

Lab Sample ID: 200-44619-2
Client Matrix: Water

Date Sampled: 08/01/2018 1550
Date Received: 08/03/2018 1010

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132606	Instrument ID:	CH1483
Prep Method:	8330-Prep	Prep Batch:	200-132488	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/07/2018 1557			Injection Volume:	750 uL
Prep Date:	08/03/2018 1545			Result Type:	SECONDARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
RDX	0.049	J p	0.038	0.20

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	102		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44619-1
Sdg Number: 44619

Client Sample ID: C-1S_F18

Lab Sample ID: 200-44619-7
Client Matrix: Water

Date Sampled: 08/01/2018 1550
Date Received: 08/03/2018 1010

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132807	Instrument ID:	CH1208
Prep Method:	8330-Prep	Prep Batch:	200-132488	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/07/2018 1648			Injection Volume:	150 uL
Prep Date:	08/03/2018 1545			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U p	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.018	0.20
Nitrobenzene	0.20	U	0.050	0.20
Tetryl	0.20	U	0.064	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.016	0.20
2,6-Dinitrotoluene	0.20	U	0.064	0.20
2,4-Dinitrotoluene	0.20	U	0.064	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	103		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Client Sample ID: C-4S_F18

Lab Sample ID: 200-44619-1
Client Matrix: Water

Date Sampled: 08/01/2018 1300
Date Received: 08/03/2018 1010

6850 Perchlorate by LC/MS or LC/MS/MS

Analysis Method:	6850	Analysis Batch:	200-132556	Instrument ID:	LC3062
	N/A	Prep Batch:	N/A	Lab File ID:	P080618B12.d
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	08/06/2018 1652			Final Weight/Volume	
Prep Date:	N/A			Injection Volume:	50 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Perchlorate	0.018	J	0.012	0.20

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Client Sample ID: C-1S_F18

Lab Sample ID: 200-44619-2
Client Matrix: Water

Date Sampled: 08/01/2018 1550
Date Received: 08/03/2018 1010

6850 Perchlorate by LC/MS or LC/MS/MS

Analysis Method:	6850	Analysis Batch:	200-132556	Instrument ID:	LC3062
	N/A	Prep Batch:	N/A	Lab File ID:	P080618B13.d
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	08/06/2018 1707			Final Weight/Volume	
Prep Date:	N/A			Injection Volume:	50 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Perchlorate	0.043	J	0.012	0.20

DATA REPORTING QUALIFIERS

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Lab Section	Qualifier	Description
HPLC/IC		
	U	Indicates the analyte was analyzed for but not detected.
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
	p	The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
LCMS		
	U	Indicates the analyte was analyzed for but not detected.
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

QUALITY CONTROL RESULTS

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
LCMS					
Analysis Batch:200-132556					
LCS 200-132556/4	Lab Control Sample	T	Water	6850	
MB 200-132556/6	Method Blank	T	Water	6850	
200-44619-1	C-4S_F18	T	Water	6850	
200-44619-2	C-1S_F18	T	Water	6850	
Report Basis T = Total					
HPLC/IC					
Prep Batch: 200-132488					
LCS 200-132488/2-A	Lab Control Sample	T	Water	8330-Prep	
MB 200-132488/1-A	Method Blank	T	Water	8330-Prep	
200-44619-1	C-4S_F18	T	Water	8330-Prep	
200-44619-2	C-1S_F18	T	Water	8330-Prep	
Analysis Batch:200-132606					
LCS 200-132488/2-A	Lab Control Sample	T	Water	8330B	200-132488
MB 200-132488/1-A	Method Blank	T	Water	8330B	200-132488
200-44619-1	C-4S_F18	T	Water	8330B	200-132488
200-44619-2	C-1S_F18	T	Water	8330B	200-132488
Analysis Batch:200-132607					
LCS 200-132488/2-A	Lab Control Sample	T	Water	8330B	200-132488
MB 200-132488/1-A	Method Blank	T	Water	8330B	200-132488
200-44619-1	C-4S_F18	T	Water	8330B	200-132488
200-44619-2	C-1S_F18	T	Water	8330B	200-132488

Report Basis
T = Total

TestAmerica Burlington

Page 13 of 23

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Surrogate Recovery Report

8330B Nitroaromatics and Nitramines (HPLC)

Client Matrix: Water

Lab Sample ID	Client Sample ID	12DNB1 %Rec	12DNB2 %Rec
200-44619-1	C-4S_F18	104	
200-44619-1	C-4S_F18		105
200-44619-2	C-1S_F18	103	
200-44619-2	C-1S_F18		102
MB 200-132488/1-A		104	
MB 200-132488/1-A			99
LCS 200-132488/2-A		114	
LCS 200-132488/2-A			100

Surrogate	Acceptance Limits
12DNB = 1,2-Dinitrobenzene	83-119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	99	83 - 119

Method Blank - Batch: 200-132488

Method: 8330B
Preparation: 8330-Prep

Lab Sample ID:	MB 200-132488/1-A	Analysis Batch:	200-132607	Instrument ID:	CH1208
Client Matrix:	Water	Prep Batch:	200-132488	Lab File ID:	31661049.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	500 mL
Analysis Date:	08/07/2018 1453	Units:	ug/L	Final Weight/Volume:	10 mL
Prep Date:	08/03/2018 1545			Injection Volume:	150 ul
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Result	Qual	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.019	0.20
Nitrobenzene	0.20	U	0.050	0.20
Tetryl	0.20	U	0.054	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.018	0.20
2,6-Dinitrotoluene	0.20	U	0.034	0.20
2,4-Dinitrotoluene	0.20	U	0.054	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	104	83 - 119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	100	83 - 119

Lab Control Sample - Batch: 200-132488

Method: 8330B
Preparation: 8330-Prep

Lab Sample ID:	LCS 200-132488/2-A	Analysis Batch:	200-132607	Instrument ID:	CH208
Client Matrix:	Water	Prep Batch:	200-132488	Lab File ID:	31661050.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	500 mL
Analysis Date:	08/07/2018 1531	Units:	ug/L	Final Weight/Volume:	10 mL
Prep Date:	08/03/2018 1545			Injection Volume:	150 uL
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Spike Amount	Result	% Rec	Limit	Qual
2,6-diamino-4-nitrotoluene	4.00	3.381	84	72 - 122	
HMX	4.00	3.651	91	66 - 135	
2,4-diamino-6-nitrotoluene	4.00	3.191	80	68 - 122	
RDX	4.00	3.724	93	66 - 130	
2,4,6-Trinitrophenol	4.00	3.826	96	80 - 120	
1,3,5-Trinitrobenzene	4.00	3.654	91	75 - 125	
1,3-Dinitrobenzene	4.00	3.738	93	76 - 120	
Nitrobenzene	4.00	3.794	95	65 - 134	
Tetryl	4.00	3.076	77	64 - 128	p
Nitroglycerin	80.0	87.97	110	74 - 127	
2,4,6-Trinitrotoluene	4.00	3.722	93	71 - 123	
4-Amino-2,6-dinitrotoluene	4.00	4.021	101	76 - 125	
2-Amino-4,6-dinitrotoluene	4.00	3.917	98	79 - 120	
2,6-Dinitrotoluene	4.00	3.997	100	77 - 127	
2,4-Dinitrotoluene	4.00	3.759	94	78 - 120	p
o-Nitrotoluene	4.00	3.280	82	70 - 127	
p-Nitrotoluene	4.00	3.821	96	71 - 127	p
m-Nitrotoluene	4.00	3.671	92	73 - 125	p
PETN	80.0	70.86	89	73 - 127	

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	114	83 - 119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44619-1
Sdg Number: 44619

Method Blank - Batch: 200-132556

Method: 6850
Preparation: N/A

Lab Sample ID:	MB 200-132556/3	Analysis Batch:	200-132556	Instrument ID:	LC3062
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	P080618B03.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10 mL
Analysis Date:	08/06/2018 1437	Units:	ug/L	Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
Perchlorate	0.20	U	0.012	0.20

Lab Control Sample - Batch: 200-132556

Method: 6850
Preparation: N/A

Lab Sample ID:	LCS 200-132556/4	Analysis Batch:	200-132556	Instrument ID:	LC3062
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	P080618B04.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10 mL
Analysis Date:	08/06/2018 1452	Units:	ug/L	Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Perchlorate	0.200	0.194	97	80 - 120	

Watermark Environmental
175 Cabot Street, Lowell, MA 01854
Office: (978) 452-9696, Fax: (978) 453-9988

COC # WM-SPM

CHAIN-OF-CUSTODY RECORD

Project Name:	CENAE MMR O&M/LTM	**Laboratory:**	Test America, Inc	**Deliver Data to:**	
Project Number:	J2 North SPM (12404-06-00180)	**Point of contact:**	Jim Madison (802) 660-1990		Aimee Comeau: Aimee.comeau@watermarkenv.com
Purchase Order #:	W17-10672	**Ship to:**	30 Community Dr; Suite 11; South Burlington, VT 05403		Jackson Kiker: Jkiker@ecc.net

Comments: "C"= Composited, "H"= Hold Analysis Request, "X"= Analyze
AC= Aimee Comeau, MA= Mike Augustyniak, TB= Tim Byrne, RG= Russ Garrison, SO= Samson Ogungbile, KO= Kelsey Ouellette, EP= Ethan Peck, JD= Jeff Donovan, CG= Catherine Guido

EDMS Event ID: "Watermark 2018 SPM Fall".

Two-Week TAT PLEASE.

200-44818 COC

	Sample ID	Matrix	Date	Time	Sampler Init.	SW8260B VOCs (strlist A)	SW8270D SVOCs (strlist A)	SW8270D PCNs (SIM strlist B)	SW8081B Pesticides (strlist A)	SW8082A PCBs (strlist A)	SW8330 Exp(+MNX,DNX,TNX,NIC)	SW8330 Explosives (strlist B)	SW6850 Perchlorate (strlist A)	SW6010B/6020A TAL metals	SW7470A Mercury (strlist A)	SW8151A Herbicides (strlist A)	E365.2 Phosphorous (strlist A)	E353.2 (N)-Nitrate/Nitrite (strlist A)	E350.2 (N)-Ammonia (strlist A)	E300 Chloride/Sulfate	A5310B TOC (strlist A)	Location ID	Sample Type	Depth (ft bgs) Top-Bottom	
						1							2	3	4										
1	C-4S_F18	WG	8/1/18	1300	TB								X	X									C4-A	N1	200.0	250.0
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Cooler # | **Turnaround Time: 14 Days** | **Equipment: Dedicated bladder pump; Low-flow method (LF)**

Relinquished by: (Signature)	Date	Time
	8/2/18	1530
	8/2/18	17:00
	8/2/18	17:00

Received by: (Signature)	Date	Time
	8/2/18	1530
	8/2/18	17:00

Code	Container/Preservative
1	
2	2* 1 liter ambers @ 4°C
3	1* 250 mL plastic @ 4°C
4	
5	
6	
7	
8	

Shipping Date / Carrier

Received by Laboratory: (Signature, Date, Time & Condition)
8/3/18 1010

Watermark Environmental
175 Cabot Street, Lowell, MA 01854
Office: (978) 452-9696, Fax: (978) 453-9988

COC # WM-SPM

CHAIN-OF-CUSTODY RECORD

Project Name:	CENAE MMR O&M/LTM	Laboratory:	Test America, Inc	Deliver Data to:	
Project Number:	J2 North SPM (12404-06-00180)	Point of contact:	Jim Madison (802) 660-1990	Aimee Comeau: Aimee.comeau@watermarkenv.com	
Purchase Order #:	W17-10672	Ship to:	30 Community Dr, Suite 11; South Burlington, VT 05403	Jackson Kiker: Jkiker@ecc.net	

Comments: "C"= Composited, "H"= Hold Analysis Request, "X"= Analyze
AC= Aimee Comeau, MA= Mike Augustyniak, TB= Tim Byrne, RG= Russ Garrison, SO= Samson Ogungbile, KO= Kelsey Ouellette, EP= Ethan Peck, JD= Jeff Donovan, CG= Catherine Guido

EDMS Event ID: "Watermark 2018 SPM Fall".

Two-Week TAT PLEASE.

	Sample ID	Matrix	Date	Time	Sampler Init.	SW8260B VOCs (strlist A)	SW8270D SVOCs (strlist A)	SW8270D PCNs (SIM strlist B)	SW8081B Pesticides (strlist A)	SW8082A PCBs (strlist A)	SW8330 Expl+MNX,DNX,TNX,IlisIC)	SW8330 Explosives (strlist B)	SW6850 Perchlorate (strlist A)	SW8015B/8020A TAL metals	SW7470A Mercury (strlist A)	SW8151A Herbicides (strlist A)	E365.2 Phosphorous (strlist A)	E353.2 (N)-Nitrate/Nitrite (strlist A)	E350.2 (N)-Ammonia (strlist A)	E300 Chloride/Sulfate	A5310B TOC (strlist A)	Location ID	Sample Type	Depth (ft bgs) Top-Bottom	
						1							2	3	4										
1	C-1S_F18	WG	8/1/18	1550	TB								X	X									C1-A	N1	110.0	150.0
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Cooler #

Turnaround Time: 14 Days

Equipment: Dedicated bladder pump; Low-flow method (LF)

Relinquished by: (Signature)	Date	Time
	8/2/18	1530
	8/2/18	1700
	8/2/18	0700

Received by: (Signature)	Date	Time
	8/2/18	1530
	8/2/18	1700

Code	Container/Preservative
1	
2	2* 1 liter ambers @ 4°C
3	1* 250 mL plastic @ 4°C
4	
5	
6	
7	
8	

Shipping Date / Carrier

Received by Laboratory: (Signature, Date, Time & Condition)

TA BL 8/3/18 1016


ORIGIN ID:BWCA (781) 466-8500
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 10A
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 02AUG18
ACTWGT: 82.70 LB
CAD: 5906887/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1900
REF:
DEPT:
FedEx Express
1 of 2
TRK# 4258 8393 4462
0201
MASTER
FRI - 03 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV
ORIGIN ID:BWCA (781) 466-8500
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 10A
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 02AUG18
ACTWGT: 54.30 LB
CAD: 5906887/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1900
REF:
DEPT:
FedEx Express
2 of 2
TRK# 4258 8393 4473
0201
Meter# 4258 8393 4462
FRI - 03 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
0540
VT-US BTV

Login Sample Receipt Checklist

Client: WaterMark Environmental, Inc

Job Number: 200-44619-1
SDG Number: 44619

Login Number: 44619
List Number: 1
Creator: Nye, Elizabeth A

List Source: TestAmerica Burlington

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	Seal present with no number.
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.2, 0.2° C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	N/A	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Impact Area Groundwater Study Program

Upper Cape Regional Water Supply Cooperative Water Supply Well Sampling

August 2018

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

Job Number: 200-44708-1

SDG Number: 44708

Job Description: MMR Groundwater Monitoring

For:
WaterMark Environmental, Inc.
175 Cabot Street
Lowell, MA 01854

Attention: David DiCesare

Approved for release
James W Madison
Senior Project Manager
8/10/2018 9:25 AM

James W Madison, Senior Project Manager
30 Community Drive, South Burlington, VT, 05403
(802)660-1990
jim.madison@testamericainc.com
08/10/2018

cc: Aimee Comeau
Mr. Jackson Kiker

The test results in this report relate only to sample(s) as received by the laboratory. These test results were derived under a quality system that adheres to the requirements of NELAC. Pursuant to NELAC, this report may not be produced in full without written approval from the laboratory

CASE NARRATIVE

Client: WaterMark Environmental, Inc.

Project: MMR Groundwater Monitoring

Report Number: 200-44708-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 08/08/2018; the samples arrived in good condition, properly preserved and on ice.

PERCHLORATES
Samples WS-1_F18, WS-2_F18 and WS-3_F18 were analyzed for Perchlorates in accordance with EPA SW-846 6850. The samples were analyzed on 08/09/2018.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

EXPLOSIVES
Samples WS-1_F18, WS-2_F18 and WS-3_F18 were analyzed for explosives in accordance with 8330. The samples were prepared on 08/08/2018 and analyzed on 08/09/2018.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

METHOD SUMMARY

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Description	Lab Location	Method	Preparation Method
Matrix: Water			
Nitroaromatics and Nitramines (HPLC)	TAL BUR	EPA 8330B	
Solid Phase Extraction (Explosives)	TAL BUR		SW846 8330 Prep
Perchlorate by LC/MS or LC/MS/MS	TAL BUR	EPA 6850	

Lab References:

TAL BUR = TestAmerica Burlington

Method References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

METHOD / ANALYST SUMMARY

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Method	Analyst	Analyst ID
EPA 8850	Drumm, Erik L	ELD
EPA 8330B	Drumm, Erik L	ELD

SAMPLE SUMMARY

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
200-44708-1	WS-1_F18	Water	08/06/2018 1015	08/08/2018 1415
200-44708-2	WS-2_F18	Water	08/06/2018 0950	08/08/2018 1415
200-44708-3	WS-3_F18	Water	08/06/2018 0915	08/08/2018 1415

SAMPLE RESULTS

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-I_F18

Lab Sample ID: 200-44708-1
Client Matrix: Water

Date Sampled: 08/08/2018 1015
Date Received: 08/08/2018 1415

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132713	Instrument ID:	CH1208
Prep Method:	8330-Prep	Prep Batch:	200-132683	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1152			Injection Volume:	150 uL
Prep Date:	08/08/2018 1530			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.018	0.20
Nitrobenzene	0.20	U	0.060	0.20
Tetryl	0.20	U	0.054	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.016	0.20
2,6-Dinitrotoluene	0.20	U	0.054	0.20
2,4-Dinitrotoluene	0.20	U	0.054	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	101		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-I_F18

Lab Sample ID: 200-44708-1
Client Matrix: Water

Date Sampled: 08/08/2018 1015
Date Received: 08/08/2018 1415

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132714	Instrument ID:	CH1483
Prep Method:	8330-Prep	Prep Batch:	200-132683	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1348			Injection Volume:	750 uL
Prep Date:	08/08/2018 1530			Result Type:	SECONDARY

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	97		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-2_F18

Lab Sample ID: 200-44708-2
Client Matrix: Water

Date Sampled: 08/08/2018 0950
Date Received: 08/08/2018 1415

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132713	Instrument ID:	CH1208
Prep Method:	8330-Prep	Prep Batch:	200-132683	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1229			Injection Volume:	150 uL
Prep Date:	08/08/2018 1530			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.018	0.20
Nitrobenzene	0.20	U	0.060	0.20
Tetryl	0.20	U	0.054	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.016	0.20
2,6-Dinitrotoluene	0.20	U	0.054	0.20
2,4-Dinitrotoluene	0.20	U	0.054	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	106		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-2_F18

Lab Sample ID: 200-44708-2
Client Matrix: Water

Date Sampled: 08/08/2018 0950
Date Received: 08/08/2018 1415

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132714	Instrument ID:	CH1453
Prep Method:	8330-Prep	Prep Batch:	200-132683	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1420			Injection Volume:	750 uL
Prep Date:	08/08/2018 1530			Result Type:	SECONDARY

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	102		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-3_F18

Lab Sample ID: 200-44708-3
Client Matrix: Water

Date Sampled: 08/08/2018 0915
Date Received: 08/08/2018 1415

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132713	Instrument ID:	CH1208
Prep Method:	8330-Prep	Prep Batch:	200-132683	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1422			Injection Volume:	150 uL
Prep Date:	08/08/2018 1530			Result Type:	PRIMARY

Analyte	Result (ug/L)	Qualifier	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.018	0.20
Nitrobenzene	0.20	U	0.050	0.20
Tetryl	0.20	U	0.054	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.016	0.20
2,6-Dinitrotoluene	0.20	U	0.034	0.20
2,4-Dinitrotoluene	0.20	U	0.054	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	105		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-3_F18

Lab Sample ID: 200-44708-3
Client Matrix: Water

Date Sampled: 08/08/2018 0915
Date Received: 08/08/2018 1415

8330B Nitroaromatics and Nitramines (HPLC)

Analysis Method:	8330B	Analysis Batch:	200-132714	Instrument ID:	CH1453
Prep Method:	8330-Prep	Prep Batch:	200-132683	Initial Weight/Volume:	500 mL
Dilution:	1.0			Final Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1605			Injection Volume:	750 uL
Prep Date:	08/08/2018 1530			Result Type:	SECONDARY

Surrogate	%Rec	Qualifier	Acceptance Limits
1,2-Dinitrobenzene	100		83 - 119

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-I_F18

Lab Sample ID: 200-44708-1
Client Matrix: Water

Date Sampled: 08/08/2018 1015
Date Received: 08/08/2018 1415

6850 Perchlorate by LC/MS or LC/MS/MS

Analysis Method:	6850	Analysis Batch:	200-132729	Instrument ID:	LC3062
	N/A	Prep Batch:	N/A	Lab File ID:	P080918B06.d
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1339			Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Perchlorate	0.20	U	0.012	0.20

Analytical Data

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-2_F18

Lab Sample ID: 200-44708-2
Client Matrix: Water

Date Sampled: 08/08/2018 0950
Date Received: 08/08/2018 1415

6850 Perchlorate by LC/MS or LC/MS/MS

Analysis Method:	6850	Analysis Batch:	200-132729	Instrument ID:	LC3062
	N/A	Prep Batch:	N/A	Lab File ID:	P080818B08.d
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1424			Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Perchlorate	0.20	U	0.012	0.20

Analytical Data

Client: WaterMark Environmental, Inc

Job Number: 200-44708-1
Sdg Number: 44708

Client Sample ID: WS-3_F18

Lab Sample ID: 200-44708-3
Client Matrix: Water

Date Sampled: 08/08/2018 0915
Date Received: 08/08/2018 1415

6850 Perchlorate by LC/MS or LC/MS/MS

Analysis Method:	6850	Analysis Batch:	200-132729	Instrument ID:	LC3062
	N/A	Prep Batch:	N/A	Lab File ID:	P080818B09.d
Dilution:	1.0			Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1439			Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Perchlorate	0.078	J	0.012	0.20

DATA REPORTING QUALIFIERS

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Lab Section	Qualifier	Description
HPLC/IC		
	U	Indicates the analyte was analyzed for but not detected.
	p	The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
LCMS		
	U	Indicates the analyte was analyzed for but not detected.
	I	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

QUALITY CONTROL RESULTS

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
LCMS					
Analysis Batch:200-132729					
LCS 200-132729/4	Lab Control Sample	T	Water	6850	
MB 200-132729/3	Method Blank	T	Water	6850	
200-44708-1	WS-1_F18	T	Water	6850	
200-44708-1MS	Matrix Spike	T	Water	6850	
200-44708-1MSD	Matrix Spike Duplicate	T	Water	6850	
200-44708-2	WS-2_F18	T	Water	6850	
200-44708-3	WS-3_F18	T	Water	6850	

Report Basis
T = Total

HPLC/IC					
Prep Batch: 200-132683					
LCS 200-132683/2-A	Lab Control Sample	T	Water	8330-Prep	
MB 200-132683/1-A	Method Blank	T	Water	8330-Prep	
200-44708-1	WS-1_F18	T	Water	8330-Prep	
200-44708-2	WS-2_F18	T	Water	8330-Prep	
200-44708-2MS	Matrix Spike	T	Water	8330-Prep	
200-44708-2MSD	Matrix Spike Duplicate	T	Water	8330-Prep	
200-44708-3	WS-3_F18	T	Water	8330-Prep	
Analysis Batch:200-132713					
LCS 200-132683/2-A	Lab Control Sample	T	Water	8330B	200-132683
MB 200-132683/1-A	Method Blank	T	Water	8330B	200-132683
200-44708-1	WS-1_F18	T	Water	8330B	200-132683
200-44708-2	WS-2_F18	T	Water	8330B	200-132683
200-44708-2MS	Matrix Spike	T	Water	8330B	200-132683
200-44708-2MSD	Matrix Spike Duplicate	T	Water	8330B	200-132683
200-44708-3	WS-3_F18	T	Water	8330B	200-132683
Analysis Batch:200-132714					
LCS 200-132683/2-A	Lab Control Sample	T	Water	8330B	200-132683
MB 200-132683/1-A	Method Blank	T	Water	8330B	200-132683
200-44708-1	WS-1_F18	T	Water	8330B	200-132683
200-44708-2	WS-2_F18	T	Water	8330B	200-132683
200-44708-2MS	Matrix Spike	T	Water	8330B	200-132683
200-44708-2MSD	Matrix Spike Duplicate	T	Water	8330B	200-132683
200-44708-3	WS-3_F18	T	Water	8330B	200-132683

Report Basis
T = Total

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Surrogate Recovery Report

8330B Nitroaromatics and Nitramines (HPLC)

Client Matrix: Water

Lab Sample ID	Client Sample ID	12DNB1 %Rec	12DNB2 %Rec
200-44708-1	WS-1_F18	101	
200-44708-1	WS-1_F18		97
200-44708-2	WS-2_F18	106	
200-44708-2	WS-2_F18		102
200-44708-3	WS-3_F18	105	
200-44708-3	WS-3_F18		100
MB 200-132683/1-A		110	
MB 200-132683/1-A			103
LCS 200-132683/2-A		115	
LCS 200-132683/2-A			109
200-44708-2 MS	WS-2_F18 MS	117	
200-44708-2 MS	WS-2_F18 MS		99
200-44708-2 MSD	WS-2_F18 MSD	118	
200-44708-2 MSD	WS-2_F18 MSD		100

Surrogate	Acceptance Limits
12DNB = 1,2-Dinitrobenzene	83-119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Method Blank - Batch: 200-132683

Method: 8330B
Preparation: 8330-Prep

Lab Sample ID:	MB 200-132683/1-A	Analysis Batch:	200-132713	Instrument ID:	CH1206
Client Matrix:	Water	Prep Batch:	200-132683	Lab File ID:	31724002.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	500 mL
Analysis Date:	08/09/2018 1037	Units:	ug/L	Final Weight/Volume:	10 mL
Prep Date:	08/08/2018 1530			Injection Volume:	150 uL
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Result	Qual	MDL	RL
2,6-diamino-4-nitrotoluene	0.20	U	0.031	0.20
HMX	0.20	U	0.025	0.20
2,4-diamino-6-nitrotoluene	0.20	U	0.039	0.20
RDX	0.20	U	0.036	0.20
2,4,6-Trinitrophenol	0.20	U	0.020	0.20
1,3,5-Trinitrobenzene	0.20	U	0.024	0.20
1,3-Dinitrobenzene	0.20	U	0.019	0.20
Nitrobenzene	0.20	U	0.050	0.20
Tetryl	0.20	U	0.054	0.20
Nitroglycerin	4.00	U	1.60	4.00
2,4,6-Trinitrotoluene	0.20	U	0.027	0.20
4-Amino-2,6-dinitrotoluene	0.20	U	0.015	0.20
2-Amino-4,6-dinitrotoluene	0.20	U	0.016	0.20
2,6-Dinitrotoluene	0.20	U	0.034	0.20
2,4-Dinitrotoluene	0.20	U	0.054	0.20
o-Nitrotoluene	0.20	U	0.051	0.20
p-Nitrotoluene	0.20	U	0.053	0.20
m-Nitrotoluene	0.20	U	0.053	0.20
PETN	10.0	U	2.60	10.0

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	110	83 - 119

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	103	83 - 119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Lab Control Sample - Batch: 200-132683

Method: 8330B
Preparation: 8330-Prep

Lab Sample ID:	LCS 200-132683/2-A	Analysis Batch:	200-132713	Instrument ID:	CH1206
Client Matrix:	Water	Prep Batch:	200-132683	Lab File ID:	31724003.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	500 mL
Analysis Date:	08/09/2018 1114	Units	ug/L	Final Weight/Volume:	10 mL
Prep Date:	08/08/2018 1530			Injection Volume:	150 uL
Leach Date:	N/A			Column ID:	PRIMARY

Analyte	Spike Amount	Result	% Rec.	Limit	Qua
2,6-diamino-4-nitrotoluene	4.00	3.357	84	72 - 122	
HMX	4.00	3.683	92	85 - 135	
2,4-diamino-6-nitrotoluene	4.00	3.238	81	68 - 122	
RDX	4.00	3.672	92	68 - 130	
2,4,6-Trinitrophenol	4.00	3.845	96	80 - 120	
1,3,5-Trinitrobenzene	4.00	3.655	91	73 - 125	
1,3-Dinitrobenzene	4.00	3.711	93	78 - 120	
Nitrobenzene	4.00	3.730	93	65 - 134	
Tetryl	4.00	3.252	81	64 - 128	
Nitroglycerin	80.0	80.19	100	74 - 127	
2,4,6-Trinitrotoluene	4.00	3.686	92	71 - 123	
4-Amino-2,6-dinitrotoluene	4.00	3.986	100	76 - 125	
2-Amino-4,6-dinitrotoluene	4.00	3.857	96	79 - 120	
2,6-Dinitrotoluene	4.00	3.911	98	77 - 127	
2,4-Dinitrotoluene	4.00	3.752	94	78 - 120	
o-Nitrotoluene	4.00	3.287	82	70 - 127	
p-Nitrotoluene	4.00	3.779	94	71 - 127	
m-Nitrotoluene	4.00	3.753	94	73 - 125	
PETN	80.0	78.99	98	73 - 127	

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	115	83 - 119

Surrogate	% Rec	Acceptance Limits
1,2-Dinitrobenzene	106	83 - 119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 200-132683

Method: 8330B
Preparation: 8330-Prep

MS Lab Sample ID:	200-44708-2	Analysis Batch:	200-132713	Instrument ID:	CH1209
Client Matrix:	Water	Prep Batch:	200-132683	Lab File ID:	31724006.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	500 mL
Analysis Date:	08/09/2018 1307			Final Weight/Volume:	10 mL
Prep Date:	08/08/2018 1530			Injection Volume:	150 uL
Leach Date:	N/A			Column ID:	PRIMARY

MSD Lab Sample ID:	200-44708-2	Analysis Batch:	200-132713	Instrument ID:	CH1209
Client Matrix:	Water	Prep Batch:	200-132683	Lab File ID:	31724007.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	500 mL
Analysis Date:	08/09/2018 1344			Final Weight/Volume:	10 mL
Prep Date:	08/08/2018 1530			Injection Volume:	150 uL
Leach Date:	N/A			Column ID:	PRIMARY

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
2,6-diamino-4-nitrotoluene	85	87	72 - 122	3	20		
HMX	92	95	65 - 135	3	20		
2,4-diamino-6-nitrotoluene	80	82	68 - 122	2	20		
RDX	93	95	68 - 130	3	20		
2,4,6-Trinitrophenol	89	93	80 - 120	4	20		
1,3,5-Trinitrobenzene	91	95	73 - 125	4	20		
1,3-Dinitrobenzene	92	96	78 - 120	4	20		
Nitrobenzene	96	99	65 - 134	3	20		
Tetryl	79	83	64 - 128	5	20	p	p
Nitroglycerin	105	104	74 - 127	0	20		
2,4,6-Trinitrotoluene	91	94	71 - 123	3	20		
4-Amino-2,6-dinitrotoluene	96	100	76 - 125	2	20		
2-Amino-4,6-dinitrotoluene	96	98	79 - 120	2	20		
2,6-Dinitrotoluene	99	102	77 - 127	2	20		
2,4-Dinitrotoluene	91	94	78 - 120	3	20	p	p
o-Nitrotoluene	84	85	70 - 127	1	20		
p-Nitrotoluene	94	98	71 - 127	4	20	p	p
m-Nitrotoluene	94	101	73 - 125	7	20	p	p
PETN	90	95	73 - 127	18	20		

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
1,2-Dinitrobenzene	117	118	53 - 119

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
1,2-Dinitrobenzene	99	100	53 - 119

Quality Control Results

Client: WaterMark Environmental, Inc.

Job Number: 200-44708-1
Sdg Number: 44708

Method Blank - Batch: 200-132729

Method: 6850
Preparation: N/A

Lab Sample ID:	MB 200-132729/3	Analysis Batch:	200-132729	Instrument ID:	LC3062
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	P080918B03.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1309	Units:	ug/L	Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
Perchlorate	0.20	U	0.012	0.20

Lab Control Sample - Batch: 200-132729

Method: 6850
Preparation: N/A

Lab Sample ID:	LCS 200-132729/4	Analysis Batch:	200-132729	Instrument ID:	LC3062
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	P080918B04.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1324	Units:	ug/L	Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Perchlorate	0.200	0.185	93	80 - 120	

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 200-132729

Method: 6850
Preparation: N/A

MS Lab Sample ID:	200-44708-1	Analysis Batch:	200-132729	Instrument ID:	LC3062
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	P080918B06.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1354			Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL
Leach Date:	N/A				

MSD Lab Sample ID:	200-44708-1	Analysis Batch:	200-132729	Instrument ID:	LC3062
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	P080918B07.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	10 mL
Analysis Date:	08/09/2018 1409			Final Weight/Volume:	
Prep Date:	N/A			Injection Volume:	50 uL
Leach Date:	N/A				

Analyte	% Rec. MS	% Rec. MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Perchlorate	102	107	80 - 120	5	15		

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360325-Boston

COC # WM-SPM

360325-Boston **CHAIN-OF-CUSTODY RECORD**

Project Name:	CENAE MMR O&M/LTM	**Laboratory:**	Test America, Inc	**Deliver Data to:**	
Project Number:	UCRWS (12404-06-00180)	**Point of contact:**	Jim Madison (802) 660-1990		Aimee Comeau: Aimee.comeau@watermarkenv.com
Purchase Order #:	W17-10672	**Ship to:**	30 Community Dr, Suite 11; South Burlington, VT 05403		Jackson Kiker: Jkiker@ecc.net

Comments: "C"= Composited, "H"= Hold Analysis Request, "X"= Analyze
AC= Aimee Comeau, MA= Mike Augustyniak, TB= Tim Byrne, RG= Russ Garrison, SO= Samson Ogungbile, EP= Ethan Peck, JD= Jeff Donovan, CG= Catherine Guido

EDMS Event ID: "Watermark 2018 SPM Fall".

48-Hour TAT PLEASE.

200-44708 CCC

	Sample ID	Matrix	Date	Time	Sample Init.	SW8260B VOCs (strlist A)	SW8270D SVOCs (strlist A)	SW8270D PCNs (SIM strlist B)	SW8081B Pesticides (strlist A)	SW8082A PCBs (strlist A)	SW8330 Explosives (strlist B)	SW8330 Explosives (strlist A)	SW6850 Perchlorate (strlist B)	SW6010B/6020A TAL metals (strlist A)	SW7470A Mercury (strlist A)	SW8151A Herbicides (strlist A)	E365.2 Phosphorous (strlist A)	E353.2 (N)-Nitrate/Nitrite (strlist A)	E350.2 (N)-Ammonia (strlist A)	E325 Chloride-Sulfate	A5310B TOC (strlist A)	Location ID	Samp Type	Depth (ft bgs) Top-Bottom	
						1						2	3	4											
1	WS-1_F18	WG	8/6/18	1015	MA							X	X										WS-1	N1	150.0	175.0
2	WS-2_F18	WG	8/6/18	0950	MA							X	X										WS-2	N1	267	297
3	WS-3_F18	WG	8/6/18	0915	MA							X	X										WS-3	N1	190.0	215.0
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Cooler #

Turnaround Time: 2 Days

Equipment: Extraction well port (WF) of Water Supply pumping station

Relinquished by: (Signature)	Date	Time
Michael E. Augustyniak	8/6/18	1515
	8/6/18	1700
	8-7-	800

Received by: (Signature)	Date	Time
	8/6/18	1515
	8-6-18	17a

Code	Container/Preservative
1	
2	2* 1 liter ambers @ 4°C
3	1* 250 mL plastic @ 4°C
4	
5	
6	
7	
8	

Shipping Date / Carrier

Received by Laboratory: (Signature, Date, Time & Condition)
8/8/18 1415 intact


ORIGIN ID:BXCA (781) 466-6900
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 52.50 LB
CAD: 5906B7/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 860-1890
FedEx Express
4 of 4
MPS# 4258 8393 4635
Mstr# 4258 8393 4602
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV
ORIGIN ID:BXCA (781) 466-6900
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 28.20 LB
CAD: 5906B7/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 860-1890
FedEx Express
1 of 4
TRK# 4258 8393 4646
MASTER
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV
TAPE
ORIGIN ID:BXCA (781) 466-6900
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 51.45 LB
CAD: 5906B7/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 860-1890
FedEx Express
2 of 4
MPS# 4258 8393 4657
Mstr# 4258 8393 4646
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV


ORIGIN ID:BXCA (781) 486-8900
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 57.35 LB
CAD: 580687/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1990
FedEx Express
1 of 4
TRK# 0201 4258 8393 4602
MASTER
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV
ORIGIN ID:BXCA (781) 486-8900
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 58.40 LB
CAD: 580687/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1990
FedEx Express
2 of 4
MPS# 0263 4258 8393 4613
Mstr# 4258 8393 4602
0201
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV
ORIGIN ID:BXCA (781) 486-8900
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 58.25 LB
CAD: 580687/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1990
FedEx Express
3 of 4
MPS# 0263 4258 8393 4624
Mstr# 4258 8393 4602
0201
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
05403
VT-US BTV


ORIGIN ID:BXCA (781) 466-6800
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 54.00 LB
CAD: 590887/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1990
REF
DEPT
FedEx
Express
3 of 4
MPS# 4258 8393 4668
Mstr# 4258 8393 4646
WED - 08 AUG 10:30
PRIORITY OVERNIGH
NC BTVA
0201
05403
VT-US BTV
ORIGIN ID:BXCA (781) 466-6800
PAUL HOBART
TESTAMERICA
240 BEAR HILL ROAD
SUITE 104
WALTHAM, MA 02451
UNITED STATES US
SHIP DATE: 07AUG18
ACTWGT: 55.20 LB
CAD: 590887/CAFE3210
BILL RECIPIENT
TO SAMPLE RECEIVING
TESTAMERICA BURLINGTON
30 COMMUNITY DRIVE
SUITE 11
SOUTH BURLINGTON VT 05403
(802) 660-1990
REF
DEPT
FedEx
Express
4 of 4
MPS# 4258 8393 4679
Mstr# 4258 8393 4646
WED - 08 AUG 10:30A
PRIORITY OVERNIGHT
NC BTVA
0201
05403
VT-US BTV

Login Sample Receipt Checklist

Client: WaterMark Environmental, Inc

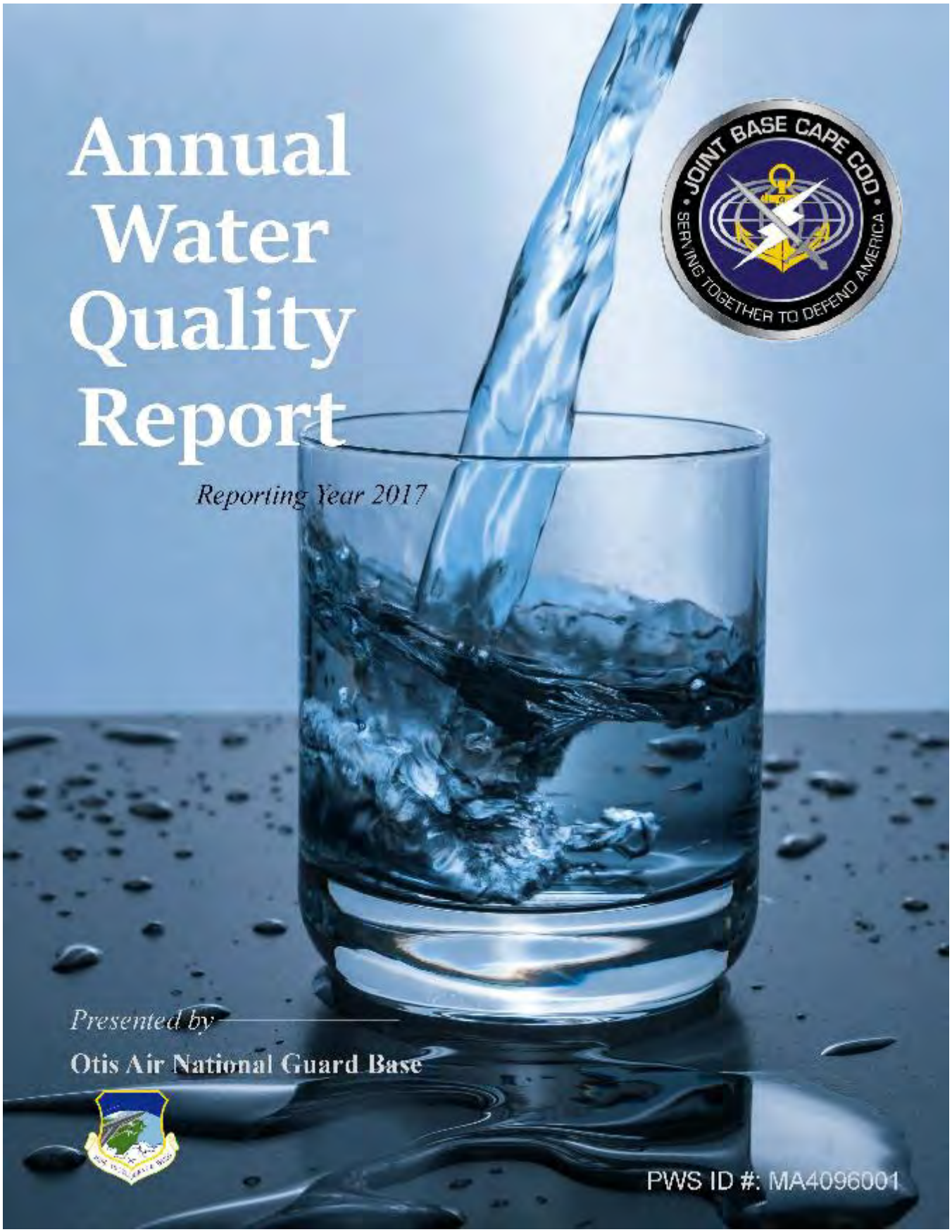
Job Number: 200-44708-1
SDG Number: 44708

Login Number: 44708
List Number: 1
Creator: Nye, Elizabeth A

List Source: TestAmerica Burlington

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	Seal present with no number.
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.5, 1.3, 0.6, 1.0, 5.1, 1.1, 0.9, 0.8 Degrees C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	N/A	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

102nd Intelligence Wing
Water Quality Report


Annual
Water
Quality
Report
Reporting Year 2017
JOINT BASE CAPE COD
SERVING TOGETHER TO DEFEND AMERICA
Presented by
Otis Air National Guard Base
PWS ID #: MA4096001

Continued Commitment

We are once again proud to present our annual water quality report covering all testing performed between January 1 and December 31, 2017. Over the year, we have dedicated ourselves to producing drinking water that meets all state and federal standards. We continually strive to adopt new methods for delivering the best-quality drinking water to you. As new challenges to drinking water safety emerge, we remain vigilant in meeting the goals of source water protection, water conservation, and community education while continuing to serve the needs of all our water users. Please remember that we are always available to assist you should you ever have any questions or concerns about your water.

How is My Water Treated and Purified?

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.

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.

Where Does My 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. EPA's Surf Your Watershed Web site at http://cfpub.epa.gov/surf/locate/index.cfm.

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, 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 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 their Web site at:
www.nrdc.org/water/drinking/qbw.asp

The Benefits of Fluoridation

Fluoride is a naturally occurring element in many water supplies in trace amounts. In our system, the fluoride level is adjusted to an optimal level averaging one part per million (ppm) to improve oral health in children. At this level, it is safe, odorless, colorless, and tasteless. There are over 3.9 million people in 140 Massachusetts water systems and 184 million people in the U.S. who receive the health and economic benefits of fluoridation.

QUESTIONS?

For more information about this report, or for any questions relating to your drinking water, please call the water supply superintendent, Mr. Richard Souza, at (508) 968-4102.

Source Water Assessment and Protection

SWAP Explanation

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.

What is my system's ranking?

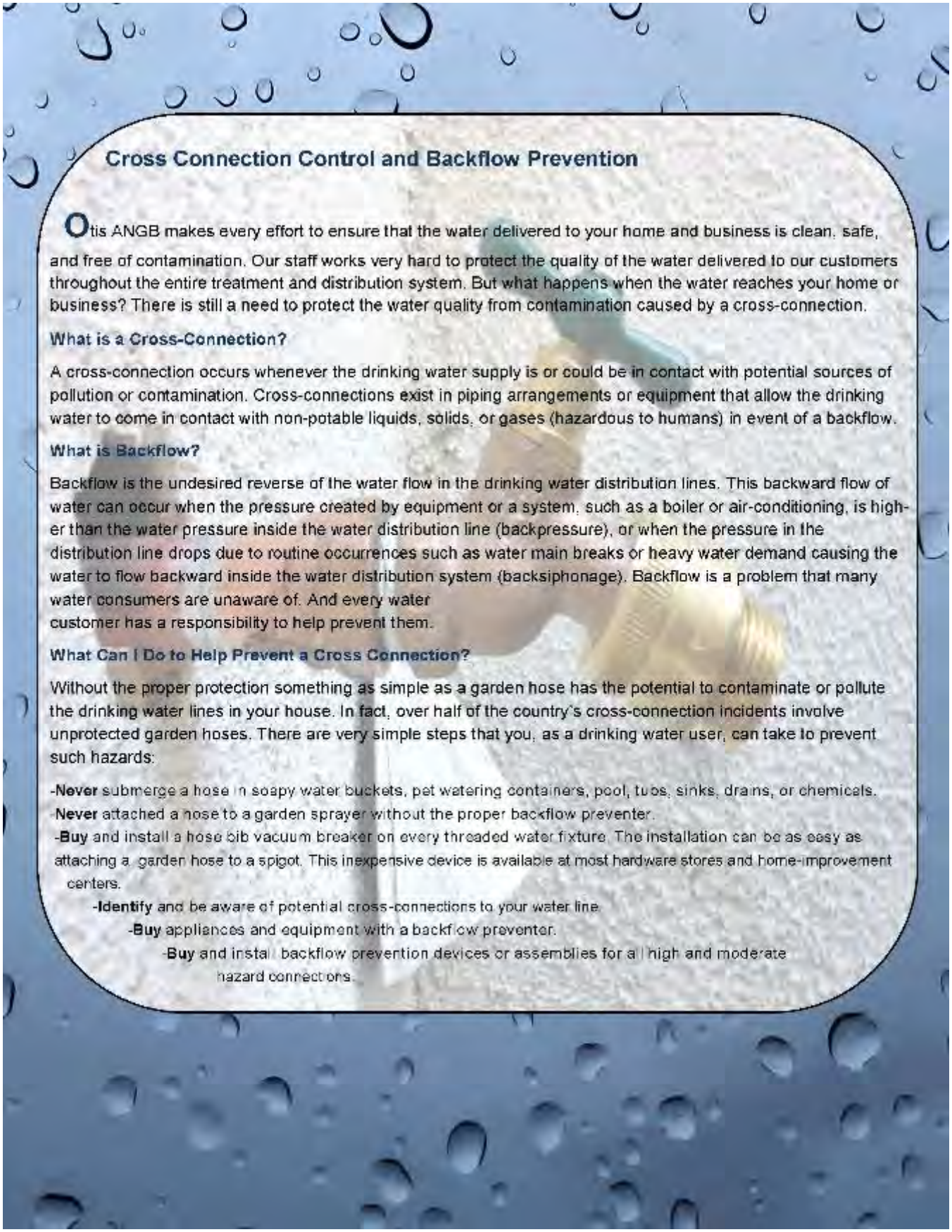
A susceptibility ranking of high was assigned to this system due to the absence hydrogeological barriers (i.e., clay) that can prevent contaminant migration.

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. The report is also available online at http://mass.gov/eea/docs/dep/water/drinking/swap/serp/4096001.pdf

Potential Sources of Contamination

Being a military facility, Otis ANG Base, has the potential of having fuel, chemicals, and other material(s) as possible sources of contamination.



Cross Connection Control and Backflow Prevention

Otis ANGB 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 throughout the entire treatment and distribution system. But what happens when the water reaches your home or business? There is still a need to protect the water quality from contamination caused by a cross-connection.

What is a Cross-Connection?

A cross-connection occurs whenever the drinking water supply is or could be in contact with potential sources of pollution or contamination. Cross-connections exist in piping arrangements or equipment that allow the drinking water to come in contact with non-potable liquids, solids, or gases (hazardous to humans) in event of a backflow.

What is Backflow?

Backflow is the undesired reverse of the water flow in the drinking water distribution lines. This backward flow of water can occur when the pressure created by equipment or a system, such as a boiler or air-conditioning, is higher than the water pressure inside the water distribution line (backpressure), or when the pressure in the distribution line drops due to routine occurrences such as water main breaks or heavy water demand causing the water to flow backward inside the water distribution system (backsiphonage). Backflow is a problem that many water consumers are unaware of. And every water customer has a responsibility to help prevent them.

What Can I Do to Help Prevent a Cross Connection?

Without the proper protection something as simple as a garden hose has the potential to contaminate or pollute the drinking water lines in your house. In fact, over half of the country's cross-connection incidents involve unprotected garden hoses. There are very simple steps that you, as a drinking water user, can take to prevent such hazards:

-**Never** submerge a hose in soapy water buckets, pet watering containers, pool, tubs, sinks, drains, or chemicals.
-**Never** attached a hose to a garden sprayer without the proper backflow preventer.
-**Buy** and install a hose bib vacuum breaker on every threaded water fixture. The installation can be as easy as attaching a garden hose to a spigot. This inexpensive device is available at most hardware stores and home-improvement centers.
-**Identify** and be aware of potential cross-connections to your water line.
-**Buy** appliances and equipment with a backflow preventer.
-**Buy** and install backflow prevention devices or assemblies for all high and moderate hazard connections.

Substances That Could Be in Water

To ensure that tap water is safe to drink, the Department of Environmental Protection (MassDEP) and the U.S. Environmental Protection Agency (U.S. EPA) prescribe regulations limiting 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, which must provide the same protection for public health. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk. The 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 and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Substances 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, or wildlife;

Inorganic Contaminants, such as salts and metals, which can be naturally occurring or may result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or 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 which may also come from gas stations, urban stormwater runoff, and septic systems;

Radioactive Contaminants, which can be naturally occurring or may be the result of oil and gas production and mining activities.

More information about contaminants and potential health effects can be obtained by calling the U.S. EPA's Safe Drinking Water Hotline at (800) 426-4791.

Lead in Drinking Water

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. We are responsible for providing you with high-quality drinking water but we 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 on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at www.epa.gov/safewater/lead.

Important Health Information

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 http://water.epa.gov/drink/hotline

REGULATED SUBSTANCES							
SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	MCL [MRDL]	MCLG [MRDLG]	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Asbestos (MFL)	2013	7	7	ND	NA	No	Decay of asbestos cement water mains; Erosion of natural deposits
Chlorine (ppm)	2017	[4]	[4]	1.64	0.07-1.63	No	Water additive used to control microbes
Fluoride[1] (ppm)	2016	2	2	0.99	0.33-0.99	No	Water additive that promotes strong teeth
Haloacetic Acids [HAAs] (ppb)	2017	60	NA	5.85	ND-4.24	No	By-product of drinking water disinfection
TTHMs [Total Trihalomethanes] (ppb)	2017	80	NA	25.4	2.58-[illegible]	No	By-product of drinking water disinfection
Perchlorate (ppb)	2017	2	NA	ND	NA	No	Rocket propellants, munitions, flares, fireworks, blasting agents
Nitrate (ppm)	2017	10	10	1.73	0.07-1.73	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Nitrite (ppm)	2017	1.0	1.0	ND	NA	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Barium (ppm)	2015	2	0.002	0.002	NA	No	Natural erosion; drilling wastes
Gross Alpha (pCi/L)	2012	15	NA	1.07	NA	No	Natural erosion
Combined Radium (pCi/L)	2015	5	0	1.10	0.623-1.10	No	Natural erosion
Total Coliform Bacteria	2017	0	0	0	NA	No	Naturally present in the environment

Tap water samples were collected for lead and copper analyses from sample sites throughout the community

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AL	MCLG	AMOUNT DETECTED (90TH PERCENTILE)	SITES ABOVE AL/ TOTAL SITES	EXCEEDANCE	TYPICAL SOURCE
Copper (ppm)	2015	1.3	1.3	0.600 (Q2) 0.295 (Q4)	1/40 (Q2) 0/40 (Q4)	No	Corrosion of household plumbing systems; Erosion of natural deposits
Lead (ppb)	2015	15	0	0.00 (Q2) 1.00 (Q4)	1/40 (Q2) 1/40 (Q4)	No	Corrosion of household plumbing systems; Erosion of natural deposits

UNREGULATED SUBSTANCES[2]			
SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AMOUNT DETECTED	TYPICAL SOURCE
Methyl Tertiary Butyl Ether (ppb)	2016	0.63	Fuel additive; leaks and spills from gasoline storage tanks
Sodium (ppm)	2015	19.6	Some sodium is always expected to be present in groundwater
Chloroform (ppb)	2017	10.1	Trihalomethane; by-product of drinking water chlorination
Bromodichloromethane (ppb)	2015	2.70	Trihalomethane, by-product of drinking water chlorination
Dibromochloromethane (ppb)	2015	3.40	Trihalomethane; by-product of drinking water chlorination
Manganese (ppm)	2017	0.015	Erosion of natural deposits
Chromium (ppb)	2015	310	Discharge from pulp mills; erosion of natural deposits
Hexavalent Chromium (ppb)	2015	0.29	Industrial activities or from naturally occurring sources

[1] EPA set 4 ppm as the MCL. Our state has a secondary contaminant level (SMCL) of 2 ppm for fluoride to better protect human health

[2] Unregulated contaminants are those for which the U.S. EPA has not established drinking water standards. The purpose of monitoring unregulated contaminants is to assist the U.S. EPA in determining their occurrence in drinking water and whether future regulations are warranted.

Definitions

90th Percentile: Out of every 10 homes sampled, 9 were at or below this level.

AL (Action Level): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

MCL (Maximum Contaminant Level): 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.

MCLG (Maximum Contaminant Level Goal): 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.

MRDL (Maximum Residual Disinfectant Level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG (Maximum Residual Disinfectant Level Goal): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

ND (Not detected): Indicates that the substance was not found by laboratory analysis.

NA: Not applicable

MFL: Million Fibers per Liter

pCi/L: picocuries per liter (a measure of radioactivity)

ppb (parts per billion): One part substance per billion parts water (or micrograms per liter)

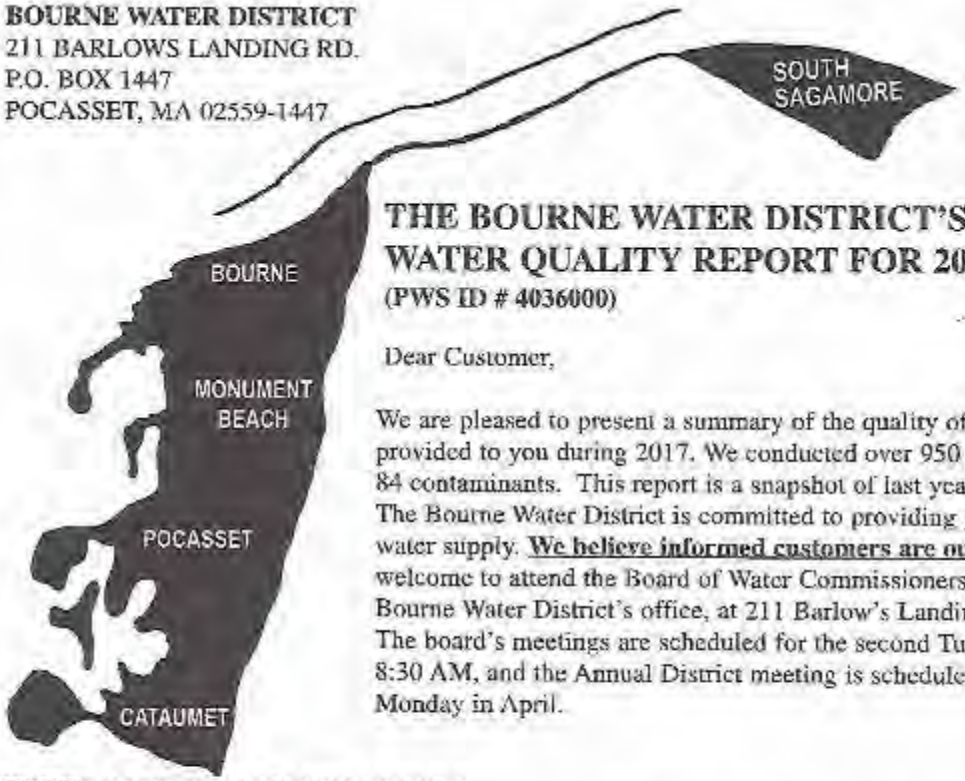
ppm (parts per million): One part substance per million parts water (or milligrams per liter).

NTU: Nephelometric Turbidity Units

Bourne Water District

Water Quality Report 2017

BOURNE WATER DISTRICT
211 BARLOWS LANDING RD.
P.O. BOX 1447
POCASSET, MA 02559-1447



THE BOURNE WATER DISTRICT'S WATER QUALITY REPORT FOR 2017

(PWS ID # 4036000)

Dear Customer,

We are pleased to present a summary of the quality of the drinking water provided to you during 2017. 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

KEY TO TABLE

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ppt = parts per trillion, or nanograms per liter
ppq = parts per quadrillion, or picograms per liter

	DISTRIBUTION SYSTEM WATER QUALITY: This report summarizes only those items detected during sampling and all contaminants that are monitored					
Microbial Results	Highest detect in a month	Range Detected	MCL	MCLG	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	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)	5/31/2017 thru 12/31/2017	4	15	0	120	0	No	Corrosion of household plumbing systems; Erosion of natural deposits
Copper (ppm)	5/31/2017 thru 12/31/2017	1.51	1.3	1.3	120	7	Yes	Corrosion of household plumbing systems; erosion of natural deposits

TEST NO 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. Bois no 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 http://www.epa.gov/safewater/lead.

	SUMMARY OF FINISHED WATER CHARACTERISTICS						
Regulated Contaminants	Date(s) collected	Highest Detect Value	Range Detected	MCL	MCGL	Violation	
Inorganic Contaminants:							
Barium (ppm)	11/2/2016	0.016	0.016	2	2	No	Discharge of drilling waste; discharge from metal refineries; erosion of natural deposits
Sodium(ppm)***	10/11/2017	21***	0-21	-	20	NO	Road salting;erosion of natural deposits
Nitrate * (ppm)	10/11/2017	0.79	0.09 - 0.79	10	10	No	Runoff from fertilizer use;leaching from septic tanks;sewage;erosion of natural deposits
Perchlorate ** (ppb)	10/11/2017	0	0	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 advice from your healthcare provider.
**Perchlorate (Note: Chemical Abstract Service Registry Numbers (CASN)for different chemical forms	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. 7 values are required when the results are above the MDL(0.013) and below the MRL(0.05)

***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 various diseases , including congestive heart failure and hypertension. 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.

Organic Contaminants

Tetrachloroethylene(PCE) (ppb)	1/19/2017	1.59	ND - 1.59	5	-	No	Discharge from factories and dry cleaners
Chloroform (ppb)	10/11/2017	1.88	ND-1.88	ORSG 70	NA	No	By-product of drinking water chlorination
1,4-Dichlorobenzene (ppb)	2016	2.77	ND - 2.77	75	NA	No	By-product of drinking water chlorination

Secondary Contaminants	Date(s) collected	Highest Detect Value	Range Detected	SMCL	ORSG	Possible Source of Contamination
Magnesium (ppm)	10/11/2017	2.8	.09-2.8	-	-	Natural Mineral and Organic Matter
Chloride (ppm)	10/11/2017	42	7.4-42	250	NA	Natural Mineral, Road Salt
Calcium (ppm)	10/11/2017	18	3.7-18	-	-	Natural Mineral and Organic Matter
Aluminum (ppm)	11/2/2016	1.99	1.99	0.2	NA	Natural Mineral and Organic Matter
Iron (ppb)	10/11/2017	1.88	0.02-1.88	300	NA	Naturally occurring deposits and corrosion of iron components
Manganese (ppb)*	10/11/2017	0.041	ND-.041	50	NA	Erosion of Natural Deposits
Potassium (ppm)	10/11/2017	1.5	.06-1.5	-	-	Natural Mineral and Organic Matter
Sulfate (ppm)	10/11/2017	7.2	4.4-7.2	250	250	Natural Sources
Zinc (ppm)	10/11/2017	0.022	ND-.022	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

Radionuclides	Date(s) collected	Highest Detect Value	Range Detected	Violation	Possible Source of Contamination
Gross Alpha (pCi/l)	2015	0.28	-0.28	NO	Erosion of Natural Deposits
Radium 226 (pCi/l)	2015	0.04	0.34	NO	Erosion of Natural Deposits
Radium 228 (pCi/l)	2015	2.25	2.25	NO	Erosion of Natural Deposits

UCMR3 EPA unregulated contaminants	Date(s) collected	Highest Detect Value	Range Detected	ORSG/ppb	Possible Source of Contamination
1,4 Dioxane(ppb)	2016	0.17	ND - .17	0.3	Solvent or stabilizer used in processing of paper, cosmetics, shampoos and coolant
Chlorate	2014	53	ND - 53	ND	Natural occurring element
Dichloroethane	2014	2.77	ND - 2.77	ND	Natural occurring element
Chromium (ug/L)	2014	0.41	0.30 - 0.41	ND	Prevalent natural element
Strontium (ug/L)	2014	32	21 - 32	ND	Natural occurring element
Vanadium (ug/L)	2014	0.20	ND – 0.20	ND	Natural occurring element
Chromium VI (ug/L)	2014	0.29	ND-0.29	ND	Industries that process or use chromium or chromium compounds
Hexavalent Chromium	2014	0.51	.13 – .51	ND	Natural occurring element

Third Unregulated Contaminant Rule (UCMR3) IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER - Availability of Monitoring Data for Unregulated Contaminants for Bourne Water District. As required by US Environmental Protection Agency (EPA), our water system has sampled for a series of unregulated contaminants. Unregulated contaminants are those that don't yet have a standard set by EPA. The purpose of monitoring for these contaminants is to help EPA decide whether the contaminants should have a public health protection standard. As our customers you have a right to know that this data is available. If you are interested in examining the results, please contact [illegible] at (508)775-0063 x2502 or 47 Old Yarmouth Rd. Hyannis, MA [illegible]. This notice is made available to you from the Bourne Water District. State Water System [illegible]

Table includes Upper Cape Regional water supply results.

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 2017.

In December of 2017 Bourne Water District exceeded the action level of copper with the 90th percentile sample being 1.51ppm. Bourne Water District does a new round of lead and copper samples in May, 2018. Exposure to high levels of copper can cause health problems. Short term exposure to high levels of copper can cause gastrointestinal distress. Long term exposure and severe cases of copper poisoning can cause anemia and disrupt liver and kidney function.

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.

The Bourne Water District sampled the new well #8 for Synthetic Organic Compounds (SOC) in 2016. All tested SOC Regulated Contaminants had returns of no detect (no contaminants present).

In addition to the contaminants we test for, we are mandated to test for hundreds of additional substances and microscopic organisms to make certain our water is safe and of high quality. 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 (PWS #4261024)

The Upper Cape Regional Water Supply consists of three groundwater supply wells located on the Massachusetts Military Reservation. A Board of Managers representing the four member public water supply systems manages the Cooperative. The member public water supply systems include Bourne Water District, Sandwich Water District, Mashpee Water District and the Town of Falmouth. The Cooperative also has capacity to supply water to the Joint Base Cape Cod public water system, and the Barnstable County Jail.

Wells #1, #2, #3 are located in a forested area of the northeastern portion of the Joint Base Cape Cod(JBCC). The JBCC has adopted a Groundwater Protection Plan to prohibit inappropriate activities in the Zone II areas of community public water supply wells. In addition, the creation of 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 about Upper Cape Regional Water Supply CCR contact Don Rugg at (508) 888-7262.

APPENDIX F
RARE SPECIES REPORTED TO NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM

LIST OF RARE SPECIES REPORTED TO NHESP HISTORY										
Common / Scientific Names	**TY 2009**	**TY 2010**	**TY 2011**	**TY 2012**	**TY 2013**	**TY 2014**	**TY 2015**	**TY 2016**	**TY 2017**	**TY 2018**
BIRDS										
Grasshopper Sparrow[1] *(Ammodramus savannarum)*	68	50	26	40	36	26	100	59	44	47
Northern Harrier[1] *(Circus cyaneus)*	4	9	4	5	8	12	Wintering	Wintering	Wintering	Wintering
Upland Sandpiper[1] *(Bartramia longicauda)*	29	29	3	3	15	3	22	20	23	20
Northern Parula *(Parula Americana)*	1	0	0	0	0	0	0	0	0	0
Sharp-shinned Hawk[1] *(Accipiter striatus)*	1	0	0	0	2	2	1	0	0	0
Vesper Sparrow *(Pooecetes gramineus)*	3	8	3	1	3	1	0	0	0	0
Whip-poor-will[2] *(Caprimulgus vociferous)*	0	0	0	201	51	156	96	87	52	110
Long-eared Owl[1] *(Asio otus)*	0	0	0	0	0	1	0	0	0	0
Bald Eagle[1] *(Haliaeetus leucocephalus)*	0	0	0	0	0	0	3	0	0	0
ODONATES										
Comet Darner[3] *(Anax longipes)*	9	6	14	4	0	5	0	N/A	N/A	N/A
Spatterdock Darner[3] *(Aeshna mutate)*	13	7	10	14	0	9	0	N/A	N/A	N/A

LIST OF RARE SPECIES REPORTED TO NHESP HISTORY										
Common / Scientific Names	**TY 2009**	**TY 2010**	**TY 2011**	**TY 2012**	**TY 2013**	**TY 2014**	**TY 2015**	**TY 2016**	**TY 2017**	**TY 2018**
REPTILES and AMPHIBIANS										
Eastern Box Turtle *(Terrapene carolina carolina)*	10	13	29	13	11	15	0	38	42	43
BUTTERFLIES and MOTHS[11]										
Barrens Buckmoth *(Hemileuca maia)*	0	0	0	0	0	4 clusters	13	90	95	0
Pine Barrens Speranza *(Speranza exonerate)*	0	0	0	0	0	0	0	44	13	0
Sandplain Euchlaena *(Euchlaena madusaria)*	0	0	0	0	0	0	0	3	7	0
Coastal Swamp Metarranthis *(Metarranthis pilosaria)*	0	0	0	0	0	0	0	1	1	0
Melsheimer's Sack Bearer *(Cicinnus melsheimeri)*	0	0	0	0	0	0	0	2	0	0
Gerhard's Underwing *(Catocala herodias)*	0	0	0	0	0	0	0	33	10	0
Pine Barrens Zale (Zale lunifera)	0	0	0	0	0	0	0	13	8	0
Barrens Dagger Moth *(Acronicta albarufa)*	0	0	0	0	0	0	0	1	0	0
Drunk Apamea *(Apamea inebriata)*	0	0	0	0	0	0	0	1	0	0
Pink Sallow *(Psectraglaea carnosa)*	0	0	0	0	0	0	0	9	5	0

LIST OF RARE SPECIES REPORTED TO NHESP HISTORY										
Common / Scientific Names	**TY 2009**	**TY 2010**	**TY 2011**	**TY 2012**	**TY 2013**	**TY 2014**	**TY 2015**	**TY 2016**	**TY 2017**	**TY 2018**
BUTTERFLIES and MOTHS[11]										
Pink Streak *(Dargida rubripennis)*	0	0	0	0	0	0	0	25	0	0
Unexpected Cycnia *(Cycnia inopinatus)*	0	0	0	0	0	0	0	0	1	0
Coastal Heathland Cutworm (Abagrotis benjamini)	0	0	0	0	0	0	0	0	1	0
Pine Barrens Lycia (Lycia ypsilon)	0	0	0	0	0	0	0	0	2	0
Water-willow Stem Borer (Papipema sulphurata)	0	0	0	0	0	0	0	0	1	0
Waxed Sallow Moth (Chaetaglaea cerata)	0	0	0	0	0	0	0	0	2	0
Frosted Elfin (Callophrys irus)	0	0	0	0	0	0	0	0	5	5
CRUSTACEANS										
Agassiz's Clam Shrimp[10] (Eulimnadia agassizii)	0	0	0	0	0	0	1	0	6	38
PLANTS										
Adder's Tongue Fern[4,6] *(Ophioglossum pusillum)*	0	138	48	84	542	1,467	256	98	247	0
Broad Tinker's Weed[5,6] *(Triosteum perfoliatum)*	69	56	233	332	1,230	297 plants 945 stems	4,861 plants 11,611 stems	113	127	0

LIST OF RARE SPECIES REPORTED TO NHESP HISTORY										
Common/Scientific Names	**TY 2009**	**TY 2010**	**TY 2011**	**TY 2012**	**TY 2013**	**TY 2014**	**TY 2015**	**TY 2016**	**TY 2017**	**TY 2018**
PLANTS										
Torrey's Beak Rush[12] (*Rhynchospora Torreyana*)	2,550	4,800	2,606	4,416	910	N/A	N/A	N/A	N/A	N/A
American Arborvitae (*Thuja occidentalis*)	0	0	0	0	0	0	4	4	N/A	N/A
MAMMALS										
Northern Long-Eared Bat[7,8] (*Myotis septentionalis*)	0	0	0	0	0	8	22 (2)	TBD	TBD	TBD
Little Brown Bat[7] (*Myotis lucifugus*)	0	0	0	0	0	4	40	TBD	TBD	TBD
Tricolored Bat[7] (*Perimyotis subflavus*)	0	0	0	0	0	11	11	TBD	TBD	TBD

[1] 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). [2] 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. [3] Spatterdock Darner is no longer on NHESP's rare species list. Also, Odonate surveys were suspended after TY 2015. [4] 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. [5] Surveys performed in 2015 did not differentiate *Triosteum perfoliatum* from *T. aurantiacum*, greatly increasing the number of individuals reported. For this reason, *Triosteum perfoliatum* was not reported to NHESP in 2015. [6] 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. [7] 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. Numbers are reported to NHESP, but not tracked by them due to current uncertainty in using acoustic identifications. TY 2017/2018 data is still being processed, these numbers are to be determined at a later date (TBD). [8] Number in parentheses is captured individuals trackable by NHESP due to species identification confirmation versus acoustic data. [9] NHESP is not interested in tracking this population, as it is likely of anthropogenic origin (pers. comm. with State Botanist, Bob Wernerehl). [10] Numbers represent only locations where species was found and ID confirmed by NHESP Aquatic Ecologist. [11] 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 Reserve. [12] Torrey's beak rush is on Coast Guard land and the Natural Resource Office is no longer monitoring this site.

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APPENDIX G
ENVIRONMENTAL PERFORMANCE STANDARDS VIOLATIONS HISTORY

EPS VIOLATIONS HISTORY			
TRAINING YEAR	REPORTED VIOLATION	EXPLANATION OF VIOLATION	CORRECTIVE ACTION
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 a 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 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 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 Reserve to ensure activities are within established performance standards.
TY 2014	None	-----	
TY 2013	None	-----	-----
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.

EPS VIOLATIONS HISTORY			
TRAINING YEAR	REPORTED VIOLATION	EXPLANATION OF VIOLATION	CORRECTIVE ACTION
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.
TY 2010	None	------	------
TY 2009	Small Arms Range EPS (EPS 19)	On November 17, 2008 a contractor conducting maintenance on the STAPP™ system at Tango Range did not use secondary containment or take other steps to prevent a release of contaminated media to the environment.	The MAARNG ordered the contractor to shut down its operations and the MAARNG conducted response actions to remove contaminated debris and soil. In addition, the MAARNG completed the following four additional actions required by the Notice of Noncompliance: 1. Scheduled and attended a follow-up meeting to discuss steps to avoid future incidents of this type. 2. Made revisions to the Tango, Juliet & Kilo Range OMMP plans to prevent similar releases and non-compliance. 3. Conducted confirmatory soil sampling to document that the release of metals was fully addressed. 4. Provided documentation of appropriate management and disposition of contaminated soil and debris.
TY 2008	Wetlands and Surface Water EPS (EPS 2)	Part of the old M Range training area and associated road network near Bypass Bog were not restricted on April 5th and 6th, 2008, thus allowing a unit to use vehicles within 500 feet of the wetland during the restricted March 1 – June 15 timeframe.	The site was assessed for long-term training needs, and an appropriate update was made to the range packet to ensure positive management of the site.
TY 2007	None	-----	-----

EPS VIOLATIONS HISTORY			
TRAINING YEAR	REPORTED VIOLATION	EXPLANATION OF VIOLATION	CORRECTIVE ACTION
TY 2006	General Performance Standard	An Army Reserve unit training on Camp Edwards fired approximately 2,000 rounds of lead ammunition on J Range during a training weekend on October 15 – 16, 2005.	Implemented four new procedures: 1. Units must provide a copy of their ammunition request to Range Control prior to firing so that Range Control can track what ammunition has been drawn from the Ammunition Supply Point. If lead ammunition is on the request form, Range Control will not let them fire on an outdoor range. 2. Units cannot draw lead ammunition from the Ammunition Supply Point unless they have a confirmation letter that the Coast Guard indoor range facility is reserved for their use. 3. A statement was added in the Range Packet – non-lead ammunition only. 4. Signs were posted at all outdoor ranges indicating "no lead firing." (Note: This procedure has been modified to accommodate the firing of lead ammunition at Tango Range that was approved by the EPA and EMC in July 2007.)
TY 2005	Wetlands EPS (EPS 2)	Positive controls to ensure certain roads were closed to vehicle traffic during the March 1 – June 15 timeframe were not in place until late March or early April.	The MAARNG placed road barriers with signage, closed existing gates, and strung chains across roads accordingly.
TY 2005	Rare Species EPS (EPS 3)	Work commenced on a project, after the project had been revised, to upgrade the Sierra East / Sierra West (SE/SW) ranges without the required notification, review and approval of the project by the Massachusetts NHESP.	The MAARNG halted the work, completed a revised environmental review, and a project filing was submitted to NHESP for review. NHESP subsequently approved the project with several conditions.
TY 2004	None	-----	-----
TY 2003	None	-----	-----
TY 2002	None	-----	-----