

# FORMER A RANGE, FORMER K RANGE AND GUN AND MORTAR POSITIONS DECISION DOCUMENT FACT SHEET

June 2012

The United States Environmental Protection Agency (EPA) seeks your feedback on the proposed decisions for the Former A Range, Former K Range and Gun and Mortar Positions located on the Camp Edwards portion of the Massachusetts Military Reservation (MMR) as summarized in this Decision Document Fact Sheet. The fact sheet describes the investigations and response actions conducted to date at these sites and the proposed decisions for each.

The Army National Guard's Impact Area Groundwater Study Program (IAGWSP), under the oversight of EPA and the Massachusetts Department of Environmental Protection (MassDEP), has investigated potential source area and groundwater contamination at the sites and has issued reports on those investigations. Source area investigations included geophysical work to assess the presence of munitions.

The work at the site was conducted under the authority of EPA's Safe Drinking Water Act Administrative Orders (SDWA 1-97-1019 and SDWA 1-2000-0014), and in consideration of the substantive cleanup standards of the Massachusetts Contingency Plan (MCP).

EPA wants your feedback and is seeking public comment regarding the proposed decisions for the Former A Range, Former K Range and Gun and Mortar Positions during a 30 day comment period from June 11 through July 10, 2012. Please review this fact sheet, and send your comments to us. After the comment period ends, EPA will consider the public comments, consult with MassDEP, and unless public comments cause EPA to revisit the proposed response actions, EPA will issue a Decision Document outlining the actions selected for the sites. With the Decision Document, EPA will include a Responsiveness Summary that provides responses to comments received during the public comment period. MassDEP will issue its official position in a comment letter after the public comment period has ended.

## HOW TO PARTICIPATE

You can provide written comments on the proposed decisions outlined in this fact sheet from June 11, 2012 through July 10, 2012, and you are invited to a public informational meeting on Wednesday, June 20, 2012 at 6:00 p.m. in Building 1805 (at the water tower rotary) on Camp Edwards, MA to learn more about the soil and groundwater contamination and source areas at the Former A Range, Former K Range and Gun and Mortar Positions. EPA, MassDEP and Army representatives will be available at the meeting to respond to questions regarding the sites and proposed decisions. A summary of comments and the responses to those comments will be provided as part of the Decision Document.

### Public Comment Period

June 11, 2012 through July 10, 2012

Oral comments may be offered at the Public Meeting or written comments may be submitted by U.S. mail, fax or email no later than July 10, 2012.

### Public Information Meeting

June 20, 2012 at 6:00 p.m.

Building 1805 (at the water tower rotary)  
Camp Edwards, MA

### Written comments should be mailed to:

Jeanethe Falvey  
US EPA Region 1  
5 Post Office Square - Suite 100  
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### Or sent by:

Fax: (617) 918-0020  
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## FORMER A RANGE

### BACKGROUND

The Former A Range (also known as the Former Gravity Anti-Tank Range) is an inactive anti-tank artillery and rocket practice range. It is located on the west side of Camp Edwards. This range was originally constructed in 1941 and functioned as an anti-tank artillery and rocket practice site until the 1960s. Targets were placed on specially-designed rail cars and rolled downhill on tracks. Soldiers would fire at moving targets from a firing point approximately 2,400 feet west of the target area on the southern side of Wood Road (Figure 2). The range was later converted to a machine gun practice area.

### INVESTIGATIONS AND FINDINGS

#### SOURCE AREA (SOIL & MUNITIONS)

The initial soil investigation of the Former A Range was conducted in 2001 under what was known as the Phase IIb Investigation. Twenty samples were collected from various locations on the range, including the target area, target berms, the lower half of the rail line, the firing point, and at the base of a slope containing 37 mm projectiles. These samples were analyzed for explosives, semi-volatile organic compound (SVOCs) and metals. Selected samples were also analyzed for pesticides/polychlorinated biphenyls (PCBs), herbicides, and inorganics.

Based on the initial sample results, a multi-component field investigation was conducted in 2004 and 2005 to further evaluate chemical contaminant distribution in soil including explosives, semi-volatile organic compounds, and metals in the target area; polycyclic aromatic hydrocarbons (PAHs) along the rail line; and propellants at the firing point. Based on computer-modeled groundwater particle back-tracks and a site reconnaissance, three locations southeast of the range were sampled in an effort to delineate the potential source of hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine (RDX) in two downgradient monitoring wells. These samples were analyzed for explosives, perchlorate, SVOCs, and metals.

The results of soil sampling and analyses indicated that explosives compounds, primarily 2,4,6-trinitrotoluene (TNT) and its breakdown products, 2-amino-4,6-dinitrotoluene (2A-DNT), 4-amino-2,6-dinitrotoluene (4A-DNT), were detected generally in samples located on or in close proximity to the target area berms. The distributions of these compounds exhibited no systematic pattern within the target area.



*Former A Range Target Berm*

The results of the soil sampling also indicated some elevated lead concentrations in the target area. Elevated lead detections may be related to the use of shot rounds that contained small lead balls. Lead concentrations are below the MCP S-1/GW-1 cleanup standard of 300 parts per million (ppm).

Several geophysical surveys have been performed at the Former A Range. An airborne magnetometer (AIRMAG) survey of Training Area B-9, which includes the Former A Range, was performed in January 2001 to detect large metallic anomalies and to identify sites where ground-based geophysical surveys might be needed. Ground-based electromagnetic surveys of the target areas were performed in 2001 and 2004 in order to identify concentrations of ordnance on the range. In 2010, a ground-based survey and visual inspection were performed to confirm that munitions were primarily located within the target area. The target area includes four berms, labeled Berm A, B, C and D. These berms were designed to capture munitions fired at the moving targets as they passed through the target area (see Figure 2). Further investigations were conducted in 2010 to determine the extent of munitions in and around these berms.

The majority of high explosive (HE) items discovered on the range were 37 mm and 40 mm projectiles, which contain very small amounts of explosives.

## GROUNDWATER

Four monitoring wells have been installed to investigate possible releases from the Former A Range. During the Phase IIb Investigation in 2001, one monitoring well (MW-149S) was installed to intercept groundwater downgradient of the upper target area. During 2001 and 2002, two additional monitoring well clusters (MW-206 and MW-249) were installed as part of the Central Impact Area and Former A Range investigations. Two of these monitoring wells (MW-206S and MW-249M3) were positioned and screened to monitor groundwater originating from the target area. In 2009, MW-536 was installed just north of Former A Range along Avery Road to further assess whether contaminants may be migrating from the target area.

All four monitoring wells were sampled for explosives compounds and perchlorate. Explosives compounds were detected at concentrations below drinking water standards in one well (MW-249M3). Perchlorate was detected twice wells (MW-249M3) and (MW-536S) below drinking water standards.

## RESPONSE ACTIONS

In June 2008, the Air Force Research Laboratory conducted a technology demonstration at the Former A Range. A remotely-controlled C325 excavator equipped with an electromagnetic attachment was used to remove munitions items from the surface and near-surface of the upper backstop Berm A. Twelve 37 mm suspected HE projectiles, one suspected 57 mm HE projectile, and a large number of 50 caliber small arms rounds were recovered by the excavator.

In November 2009, soil from the face of all four berms within the target area was excavated to a depth of approximately two feet below ground surface to remove any munitions that might be present. Eighteen munitions were found (Figure 3). No explosives compounds were detected in any of the samples collected from the soil at the bottom of the excavations.

After excavation, soil was screened to remove small arms munitions, stockpiled and sampled to determine if contaminants were present. Approximately 50 cubic yards of soil that had detections of contaminants above screening levels was shipped off-site to an approved disposal facility. The remainder of the soil, which had no detections above screening levels, was then used to backfill the soil excavation footprints and support areas.

## SUMMARY

Extensive investigations at the Former A Range were performed over a ten year period. The groundwater investigations revealed only low concentrations of several analytes with only isolated detections slightly above any screening criteria. Thus it does not appear that past activities at the site have significantly impacted groundwater.

In addition, residual soil contamination has been removed and it is believed that the majority of the munitions in the berms have been removed. Based on the investigations conducted, it is believed that only a few munitions may remain.

In order to confirm that no further sources of groundwater contamination remain at the Former A Range, limited action is being proposed for the site. This includes sampling wells MW-149S and MW-206S for explosives and MW-249M3 and MW-536S for explosives and perchlorate once in 2014 and again in 2016. The results will be presented in monitoring reports to be submitted after each sampling event. In addition, land-use controls will be put in place to protect the monitoring well network. The data will be assessed as part of a 5-year review to be conducted in 2017 and the need for additional monitoring will be determined at that time.

## FORMER K RANGE BACKGROUND

The Former K Range is located on the eastern side of Camp Edwards, adjacent to Greenway Road and south of Wood Road (Figure 4). Former K Range was constructed in 1960 and was used as a 3.5-inch rocket range until 1967. In 1968, it was converted to an M79 grenade launcher range. After the mid-1960s, the northern portion of the range was extended to 2,000 meters. There are no known records of the types of munitions used on the extension. After the 1970s, the eastern end of the Former K Range was converted to a pistol range and renamed P Range, as it is currently known today.



*Former K Range - Trench*

## INVESTIGATIONS AND FINDINGS

### SOURCE AREA (SOIL & MUNITIONS)

Soil sampling at the Former K Range was completed during three separate phases of field activities (Figure 5). Soil samples were collected from the firing line and target areas in 2001 and 2004. Residues and environmental impacts are expected to be greatest at target areas; however, relatively few explosive munitions were used on the range and those that were used had very little explosives filler mass. Additional samples were collected in 2009 to characterize areas where a significant quantity of 3.5-inch rockets were found. Soil samples were analyzed for explosives compounds and perchlorate; selected samples were analyzed for a variety of other potential contaminants.

No explosives compounds or perchlorate were detected at the firing line. Two propellant-related SVOCs were reported at estimated levels below detection limits. Cobalt and lead were observed at slightly elevated concentrations in a few samples, but average concentrations across the site were near background levels.

In Area E, explosives compounds (RDX, 2A-DNT and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine [HMX]) were found in samples at one of the targets this soil was removed in a 2009 soil removal action. HMX was also found in samples at a second target location below the action level of 200 ppm.

Perchlorate was detected in 17% of samples collected from the target locations and at all seven locations sampled in Target Area F. However the average concentration for this area was below the MCP S-1/GW-1 standard.

Several geophysical investigations have occurred at Former K Range. In 2001, ground-based geophysical surveys and intrusive investigations of the four target areas were performed as part of the Munitions Survey Program Phase 2. The fifth target area was surveyed with a hand-held magnetometer. Additional investigations were conducted in 2008 to complete site characterization, including EM-61 surveys with intrusive investigations; detailed reconnaissance with intrusive investigations in areas of the range following prescribed fire; meandering path reconnaissance with intrusive investigation in firebreaks; aerial photograph feature investigations; and trenching.

Seven potentially explosive items, two 20 mm projectiles, a perforator, one 30 mm projectile, one 57 mm projectile, and two 3.5-inch rockets HE, were recovered from K Range. Except for the 3.5-inch rockets, the items discovered were munitions that were not expected to be present on the range based on its historical use and are presumed to be from the nearby J-2 Range. The rest of the munitions found were considered inert and did not contain high explosive fillers.

## GROUNDWATER

Two monitoring wells and four drivepoints were used to characterize groundwater associated with Former K Range. Well cluster MW-170 was installed north of Former K Range along Wood Road and downgradient of the Former K Range target area in 2001. Groundwater samples from MW-170M2 through January 2002 were analyzed for explosives compounds, SVOCs, volatile organic compounds (VOCs), metals, PCBs, pesticides, herbicides, and inorganic compounds. Samples collected since July 2002 were analyzed for explosives compounds and perchlorate. MW-366M3 was installed as part of the J-2 Range investigation but is also used to monitor groundwater from Former K Range. Groundwater samples from MW-366M3 since March 2005 have been analyzed for explosives compound and perchlorate. Groundwater data from drivepoints DP-459-462, which were located within Former K Range, were analyzed for explosives compounds and perchlorate. RDX was the only explosives compound detected in groundwater and it was only detected once at 0.064 µg/L (2009). Trace levels of perchlorate (<2 ppb, below drinking water standards) were detected in MW-366M3 in the first three rounds of sampling (2005) but has not been detected in subsequent rounds of sampling through August 2009.

### RESPONSE ACTIONS

A soil removal action was performed at one location in Area E of the Former K Range in the Fall of 2009, where elevated levels of RDX were detected in soil samples. The soil in the removal footprint was excavated to 1.5 feet below ground surface and approximately 125 cubic yards of soil was removed. The soil was transported to a lined cell at L Range and treated by alkaline hydrolysis using hydrated lime. Post-excavation samples were non-detect for all explosives compounds.

### SUMMARY

Extensive investigations at the Former K Range were performed over a ten year period. The groundwater investigations revealed only low concentrations of several analytes with only a single perchlorate detection slightly above screening criteria. Perchlorate has not been detected since 2005. It does not appear that past activities have significantly impacted groundwater in this area. In addition, there does not appear to be a source for potential future groundwater contamination. Contaminants and munitions have been removed. The results of the soil risk screenings suggest that any analytes detected in the remaining soil are unlikely to impact groundwater. Based on the types and quantities of munitions found during various investigation and removal actions, it is unlikely that any residual munitions represent a significant threat to groundwater. Based on a comparison of soil results with EPA risk-based screening values and MassDEP risk-based standards, no significant risk to human health or the environment exists at these sites. Therefore, no further action is necessary to address groundwater or source areas on the Former K Range.

## **GUN AND MORTAR POSITIONS**

### **BACKGROUND**

There are 24 gun positions and 13 mortar positions located south, west, and northwest of the impact area (Figure 1). The earliest known usage of any of the Gun and Mortar positions began during the World War II period starting around 1940. Several different types of artillery were used, but the most common were howitzers firing 105 and 155 mm artillery shells. The most common mortar rounds fired at MMR were the 60 and 81 mm. The firing of HE artillery rounds was discontinued in 1989. Practice rounds were fired until the USEPA moratorium on live artillery and mortar firing at Camp Edwards was established in 1997.

### **INVESTIGATIONS AND FINDINGS**

#### **SOURCE AREA (SOIL & MUNITIONS)**

Extensive investigations have been conducted at the Gun and Mortar positions. Soil sampling initially conducted as part of the Phase I Investigation in October 1997 through March 1998 included grid sampling at three gun positions and four mortar positions representing histories of high, medium, or low activity. The remaining Gun and Mortar positions (except GP-9, which was investigated by the Air Force Center for Engineering and the Environment as CS-18) were sampled during November 1999 through February 2000 as part of the Phase IIa Investigation. Additional sampling was conducted as part of the grenade courts investigation (GP-11, Area 61), the Munitions Survey Project (17 positions and adjacent trails), and the GP-2 Re-sampling Effort. Based on the results of these earlier sampling programs, selected Gun and Mortar positions were included in the Multi-point Sampling Program in 2009. Each site was divided into areas and a systematic random sampling approach was used to collect samples from each area.

Nitroglycerin (NG) and 2,4-dinitrotoluene (2,4-DNT) were detected in soil at many of these gun and mortar positions. These compounds are found in the propellants used at the positions. Laboratory studies were conducted to evaluate the potential for NG and 2,4-DNT to migrate through the soil and contaminate groundwater. The results of the laboratory studies indicated that residual 2,4-DNT and NG in weathered fired propellants, such as those found on the Gun and Mortar positions, is essentially immobile.

Investigations to locate munitions were conducted at the gun and mortar positions in 2000 and 2001 as part of the Munitions Survey Project (MSP). Based on the results of the surveys, 94 anomalies were excavated at GP-10 and 95 anomalies were excavated at GP-11. During Phase 3 of the MSP, selected anomalies were excavated from GP-7, GP-11, GP-16, GP-22, Former F Range, and MP-4 and their associated trails.



*Layout of a Typical Gun Position*

GP-16 was chosen for comprehensive investigation and all 324 geophysical anomalies were excavated from this position. Anomalies at the majority of the 17 positions surveyed during the MSP were considered metallic scrap and were not investigated further.

#### **GROUNDWATER**

Groundwater investigations were conducted at the four most heavily-used gun (GP-6, GP-14, GP-16, and GP-20) and mortar (MP-1, MP-3, MP-4, and MP-8) positions. In 2007, direct push groundwater sampling was performed at GP-10 and GP-11, two of the most contaminated gun positions based upon past use of these sites and previous investigations. Two permanent monitoring wells, MW-495 and MW-496, were installed in GP-10 and GP-11 (respectively) in Fall of 2007. Propellant-related compounds (2,4-DNT and NG), which are present in some firing position soils, have not been detected in groundwater samples collected at any of these sites. Perchlorate was detected in wells installed downgradient of the Gun and Mortar positions as part of other investigations. However, these detections are believed to be unrelated to activities at the gun positions and have been addressed as part of the Northwest Corner Site.

#### **RESPONSE ACTIONS**

Soil with elevated concentrations of 2,4-DNT was removed from two gun positions and either disposed of off-site or treated in a low temperature thermal desorption system. A removal action was also conducted at GP-9 (Chemical Spill-18) under the MMR Installation Restoration Program (IRP). Leaching studies conducted in 2009 after the removal actions were completed concluded that 2,4-DNT is encapsulated in nitrocellulose at the gun and mortar positions and therefore is unlikely to pose a threat to groundwater. MassDEP risk-based standards were used to determine whether any additional removal actions were required. None of the remaining sites supported concentrations of 2,4-DNT in excess of this standard, so no further source removal activities were deemed necessary.

## SUMMARY

Extensive investigations at the Gun and Mortar Positions were performed over a ten year period. The groundwater investigations revealed only low concentrations of several analytes with only isolated detections slightly above any screening criteria. Thus it does not appear that past activities at the site has significantly impacted groundwater. In addition, there does not appear to be a source for potential future groundwater contamination. Contaminants and munitions have been removed. The results of the soil risk screenings suggest that any analytes detected in the remaining soil are unlikely to impact groundwater. Also, based on the types and quantities of munitions found during various investigation and removal actions, it is unlikely that any residual munitions represent a significant threat to groundwater. Finally, based on a comparison of soil results with EPA and MassDEP risk-based screening values, no significant risk to human health or the environment exists at these sites. Therefore, no further action is necessary to address groundwater or source areas on the Gun and Mortar Positions. Old Gun Position 2 is located on top of the north west corner of the Former landfill which is part of the Superfund site. Although further work is not needed to address Old Gun Position 2, long-term management of this portion of the former landfill will be addressed as part of the Superfund site.

## PROPOSED DECISIONS

The response activities conducted at the Former K Range, and Gun and Mortar positions are protective of human health, the environment, and the aquifer. USEPA has determined that the response activities have achieved the objectives set forth in SDWA § 1431(a), 42 U.S.C. § 300i, and the Administrative Orders. Therefore, USEPA requires no further response actions with respect to these sites.

For the Former A Range, EPA is proposing a Limited Action consisting of limited groundwater monitoring over the next five years and to maintain land-use controls to protect the groundwater monitoring equipment. The need for additional monitoring will be evaluated in 2017 as part of the 5-year review process.

## FOR MORE INFORMATION

Contact the following individuals for more information:

**Lori Boghdan – Impact Area Groundwater Study Program**  
(508) 968-5635

**Ellie Donovan – Massachusetts Department of Environmental Protection**  
(508) 946-2866

**Jeanethe Falvey – U.S. Environmental Protection Agency**  
(617) 918-1020

Or visit the EPA Web site at:

<http://www.epa.gov/region1/mmr/>

Or the IAGWSP Web site at:

<http://iagwsp-mmr.org>

Information repositories have been established at the public libraries in Bourne, Sandwich, and Falmouth to make information on the program available to the public. The repositories are updated to ensure that all necessary documents are available. A complete repository of documents, including copies of work plans, sampling results, site reports, fact sheets, meeting minutes, and other materials, are available at the Jonathan Bourne Library in Bourne. Recent documents are available at the other two libraries and all documents are available on the CLAMS (Cape) Library automated system.

Key documents related to the Former A, Former K, and Gun and Mortar Positions sites include:

*Final Former A Range Investigation Report*, Apr 2012  
*Final Former K Range Investigation Report*, Jan 2011  
*Final Gun & Mortar Positions Investigation Report*, Oct 2011

Note: These key documents will be available on the IAGWSP web site beginning June 11, 2012.

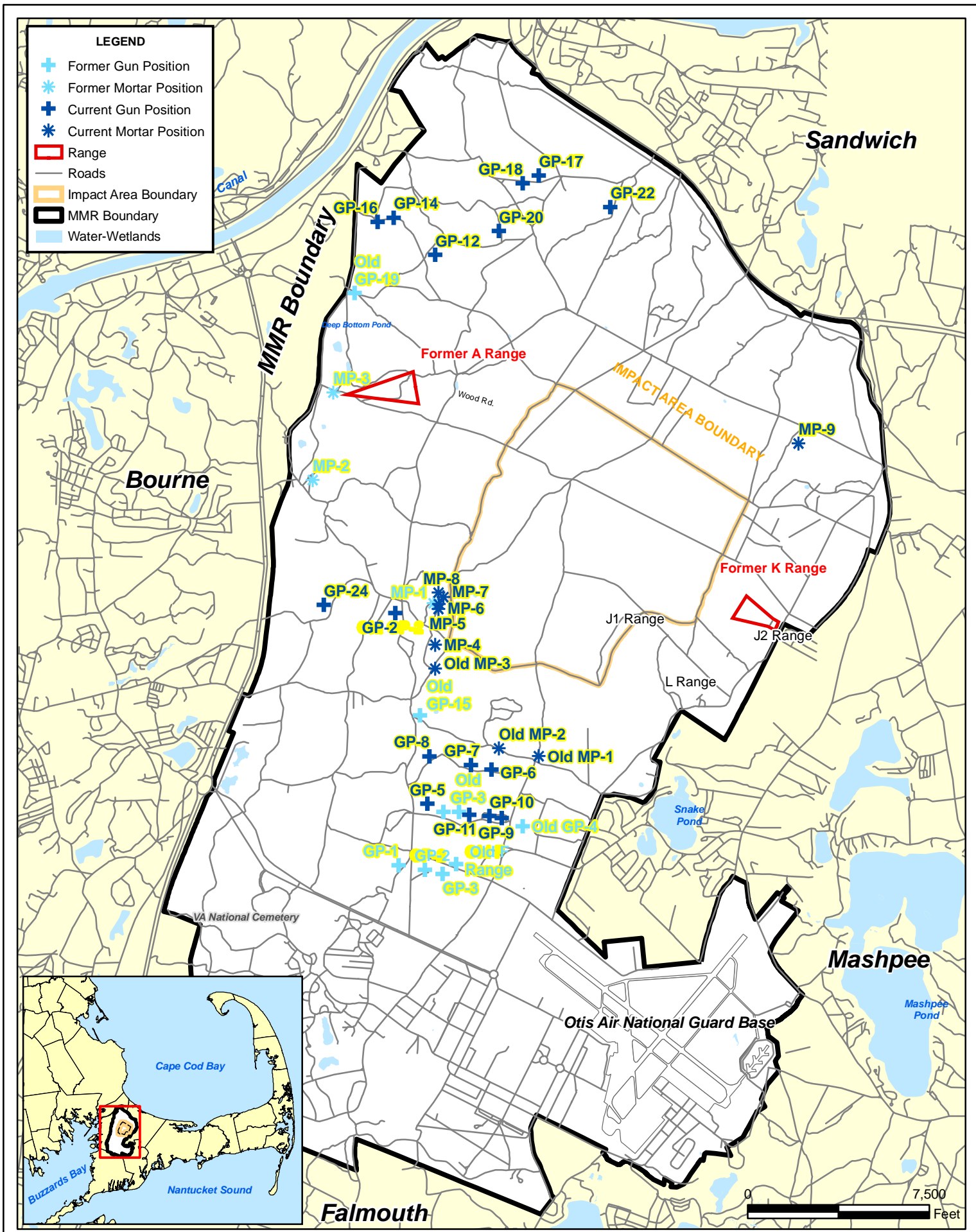
## OPPORTUNITIES FOR PUBLIC COMMENT

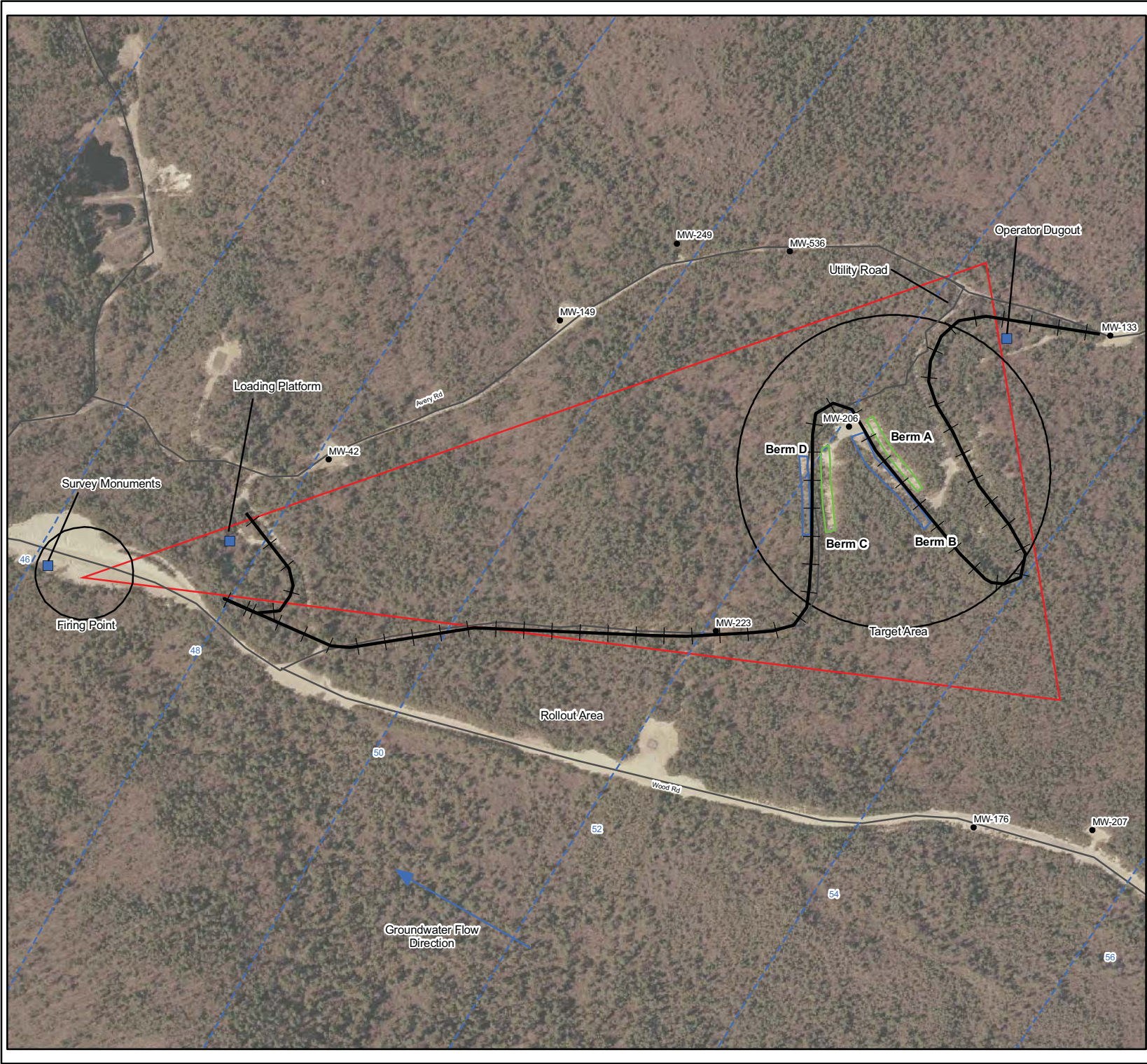
The 30-day public comment period for the proposed decisions will be June 11, 2012 through July 10, 2012. During the public comment period, comments can be submitted as follows:

By fax to:  
**(617) 918-0020**

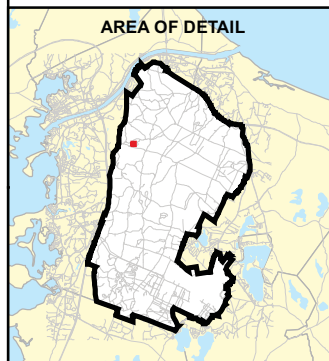
By mail to:  
**Jeanethe Falvey**  
**US EPA Region 1**  
**5 Post Office Square - Suite 100**  
**Boston, MA 02109-3912**

By email to:  
[falvey.jeanethe@epa.gov](mailto:falvey.jeanethe@epa.gov)





- Monitoring Wells
- ▭ Backstop Berm (A-upper, C-lower)
- ▭ Protective Berm (B-upper, D-lower)
- Roads
- +— Rail Line
- - - Groundwater Contours (MMR-10 Model)

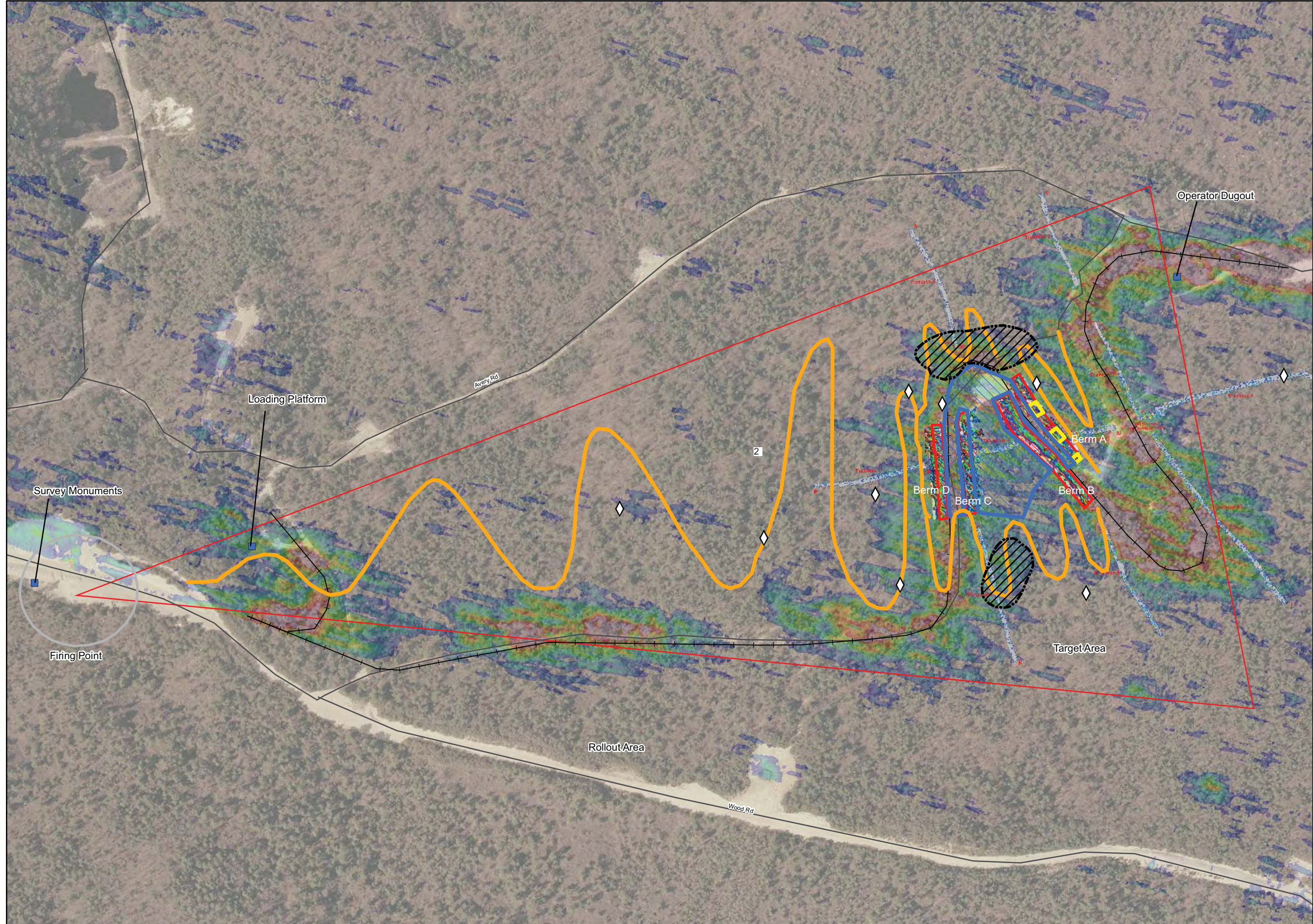


Former A Range Layout



File: P:\GIS\MMR\FormerARange\GIS\Spatial\MXD\20110418\_InvReport\20110510\_Fig2-3\_FAR\_Layout.mxd  
Prepared By: william.scales  
Coordinate System: NAD 1983 UTM Zone 19N

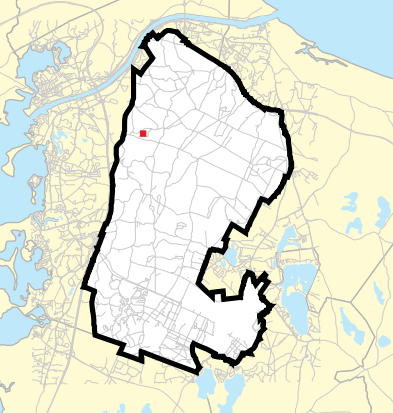




Munitions Summary - 2010 Detailed Reconnaissance

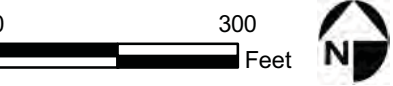
- ◇ Suspected HE
- 2010 Detailed Reconnaissance Meandering Path
- ▭ Areas Excavated During 2009 Source Removal
- ▭ Trench Excavated During the 2004 Ordnance Penetration Study
- ▭ Cleared During 2009 Source Investigation/Removal
- ▭ Area Cleared During Berm Extension Investigation
- Road
- Rail Line

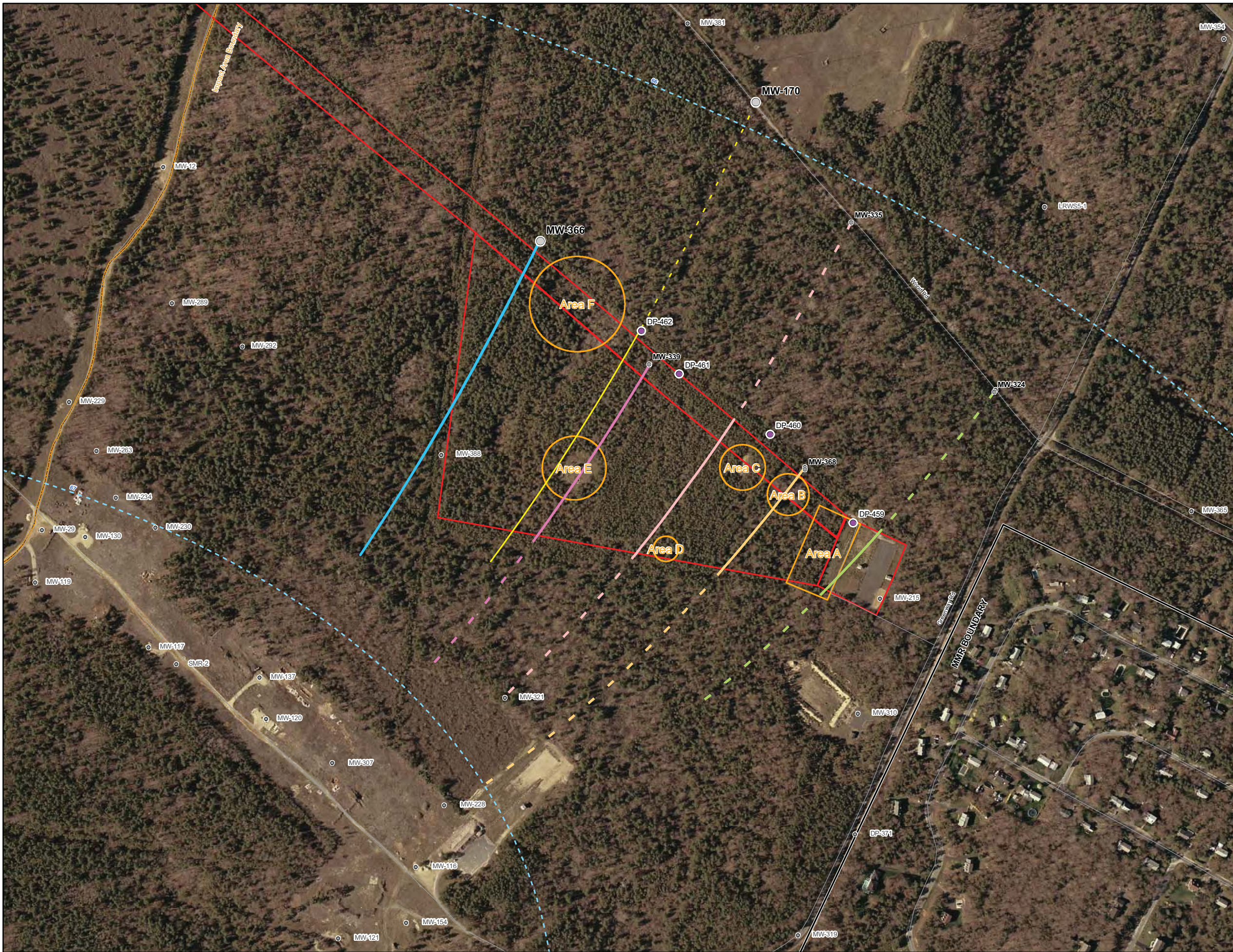
AREA OF DETAIL




Note:  
 1. Background includes 2001 AIRMAG Anomaly Map - Survey Area 2 imagery. AirMag Anomaly Data Source: Tetra Tech, Inc.  
 2. Aerial photos: 1:2400 color digital orthophotos Resolution: 0.5 feet, Date Flown: 2002; Source: EarthData International of Maryland, LLC  
 3. Topography: 10 meter contours generated from digital terrain models (DTMs) Source: MASSGIS








Former A Range  
Source Area (Soil and Munitions)  
Investigation and Response Action  
Summary



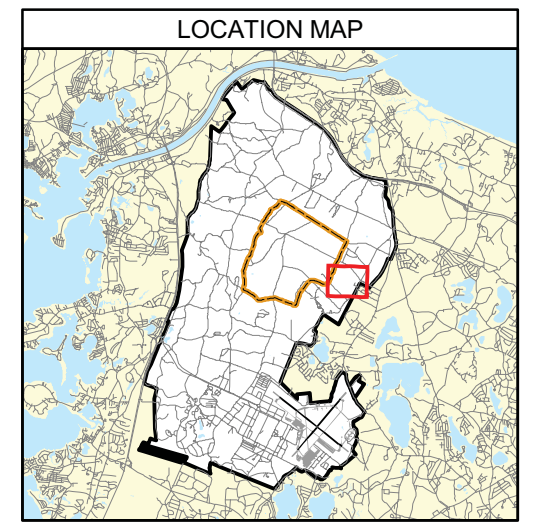


 **Impact Area  
Groundwater Study Program**

**LEGEND**

-  Drive Point Location
-  Existing Monitoring Well
-  GW Sample Location
-  Borehold Samples Considered \*
-  Borehold Samples Not Considered \*
-  Groundwater Contours  
In Feet Above MSL (Jacobs, SE Range Model Run 20)
-  Range Boundary

\* General location where reverse particle tracks indicate profile sample originated. Line colors vary.

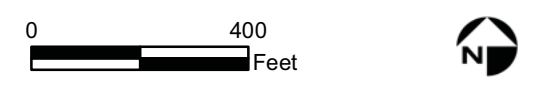


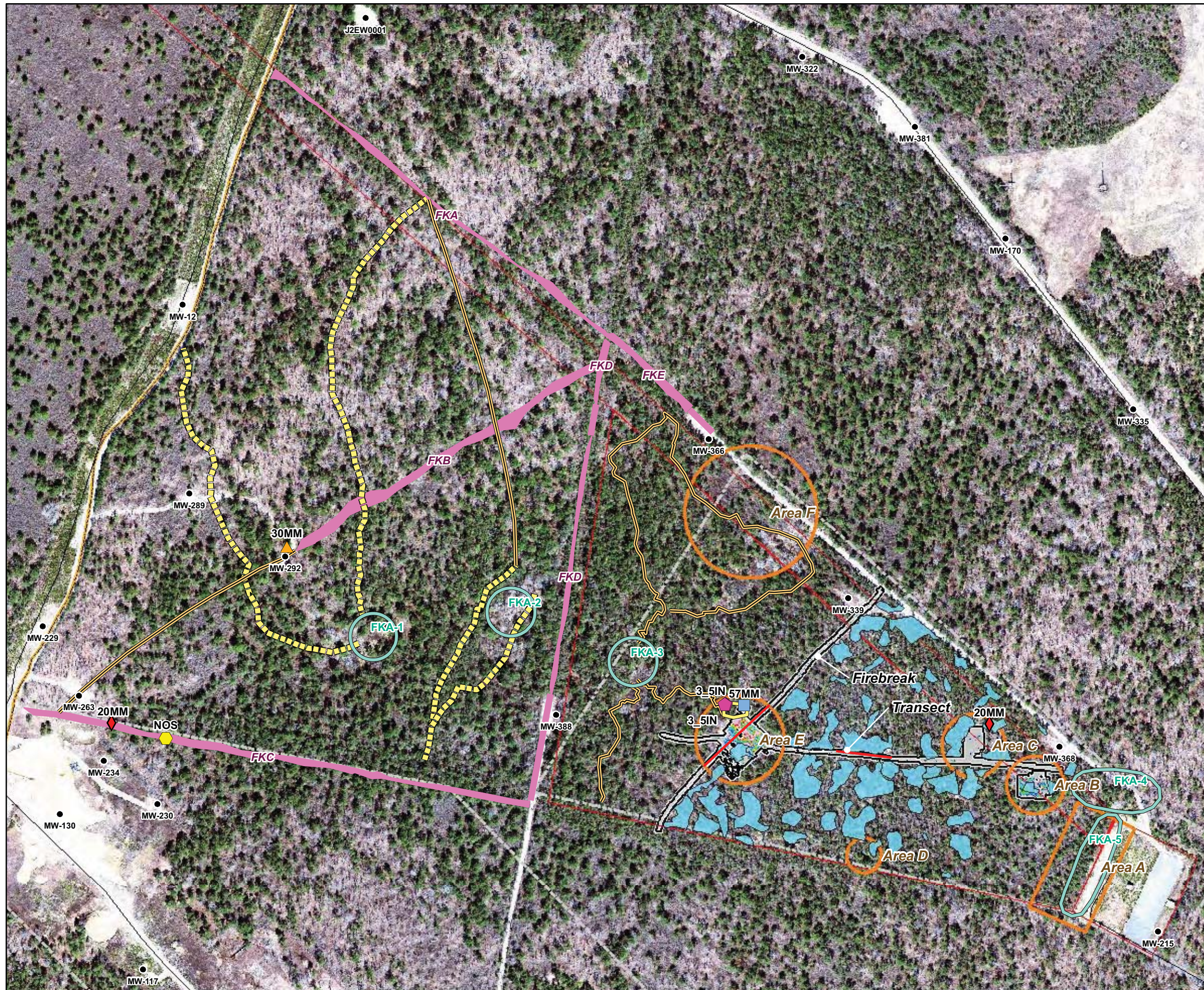
**NOTES & SOURCES**

Base data from US Geological Survey 7 1/2 minute Topographic Maps. Source: MassGIS  
 Aerial photos: 1:2400 color digital orthophotos  
 Resolution: 0.3 meter; Date Flown: 2002  
 Source: EarthData International of Maryland

**TITLE**

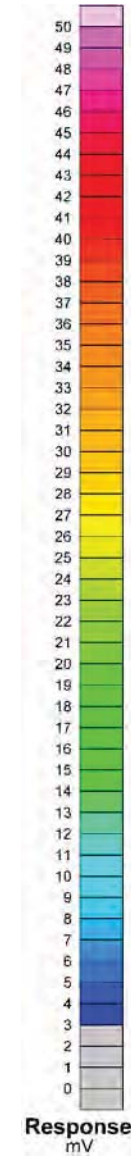
Former K Range  
 Groundwater Investigation Summary  
 Reverse Particle Tracks  
 and Direct Push Locations



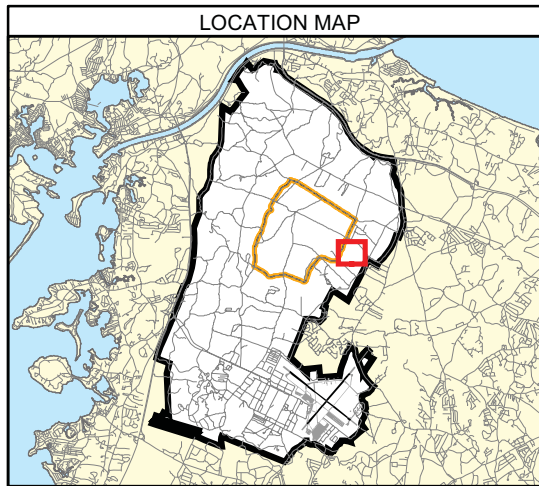


# Impact Area Groundwater Study Program

LEGEND	
<b>Former K MEC Items</b>	
	20 MM Projectile (2)
	30 MM Projectile (1)
	3.5 Inch Rocket (2)
	57 MM Projectile (1)
	Perforator (1)
	Existing Monitoring Wells
	Trench Locations (3 ft wide)
	Excavation Area
	Aerial Assessment Locations
	Meandering Path Reconnaissance
	Jeep Trails (GPS Surveyed)
	AFRL Cut Firebreaks
	Detailed Reconnaissance Area
	Presumed Target Areas
	Range Boundary
	Geophysically Surveyed Area Boundary
	Impact Area Boundary
	Study Area



Response  
mV



**NOTES & SOURCES**  
Map Coordinates: NAD 83, UTM, Zone 19N, Meters  
Basemap data from MA ARNG

**TITLE**  
Former K Range  
Source Area (Soil and Munitions)  
Investigation and Response Action Summary



**DRAFT**

ECC MMR  
Cape Cod, Massachusetts

ECC GIS Server  
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September 2009 DWN BY: JYK CHKD BY: RF



**FIGURE**

5