

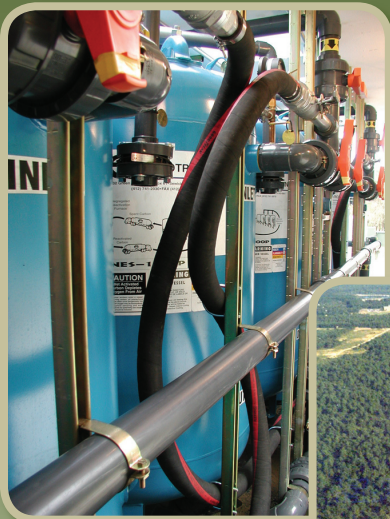
Spring 2007



IMPACT AREA

GROUNDWATER STUDY PROGRAM

Overview & Update: Transitioning to Cleanup



Camp Edwards at the Massachusetts Military Reservation



Soil sampling



Monitoring well drilling



Soil excavation



Soil treatment



Modular groundwater treatment units

MOVING FORWARD: TRANSITIONING TO CLEANUP

Having removed contaminants from 48,000 tons of soil, and treated 350 million gallons of groundwater to date, the U.S. Army Environmental Command's Impact Area Groundwater Study Program (IAGWSP) continues to move forward with its efforts to complete investigations and implement actions that address groundwater contamination and its sources at Camp Edwards on the Massachusetts Military Reservation (MMR). Working in cooperation with the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP), the program is identifying contamination and taking actions to protect public health.

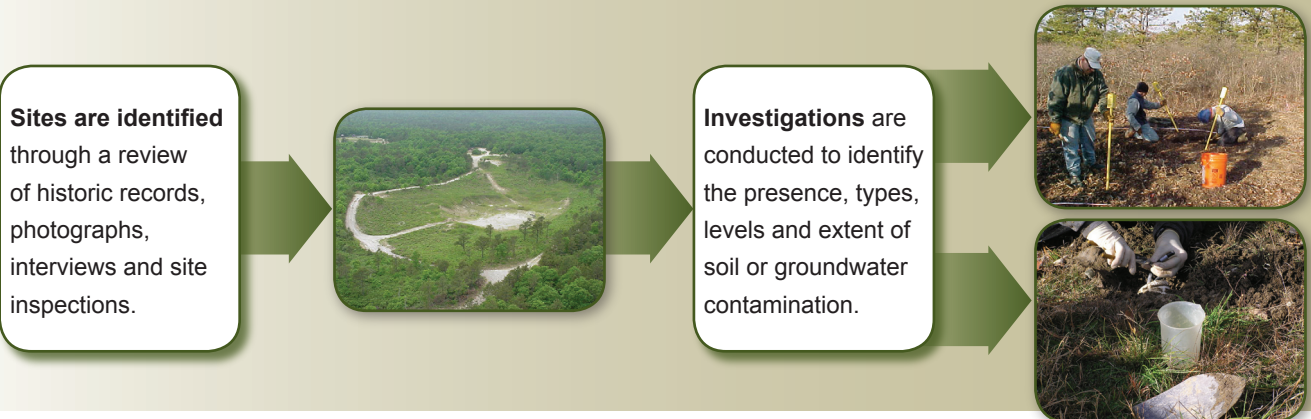
Recent actions include:

- Start-up of treatment systems that are addressing the three groundwater plumes with the highest levels of contamination by cleaning 1.5 million gallons of groundwater per day
- Construction by mid-2007 of an expanded groundwater treatment system for Demolition Area 1 (see page 3)
- Construction by late summer 2007 of a fourth groundwater treatment system to address an area of contamination from the J-1 Range that is migrating off post
- Removal and treatment of contaminated soil at source areas associated with six groundwater plumes

GETTING STARTED: BACKGROUND

Camp Edwards is comprised of 15,000 acres that lie above the Sagamore Lens, an important recharge area for the sole-source aquifer (layer of groundwater), which is a source of drinking water for the four towns of the Upper Cape. Community concerns about the potential impact of activities conducted at Camp Edwards on the groundwater beneath the installation led to the start of the IAGWSP's investigation into possible groundwater contamination and the issuance of EPA Administrative Orders under the Safe Drinking Water Act. The orders stopped the use of high explosives and the firing of lead bullets, and required the investigation and cleanup of contamination.

The following **Process** is used in the investigation and cleanup:





Demolition Area 1



J-1 Range



Central Impact Area



J-3 Range



J-2 Range

Investigations to Date

- 14 sites are being investigated based on historical activities.
- 2 sites consist of multiple locations.
 - Gun and Mortar Firing Positions (37)
 - Small Arms Ranges (24)
- 950 groundwater monitoring well screens have been installed in 470 locations.
- 50,000 soil samples and 18,000 groundwater samples have been analyzed to look for contamination.
 - 2 primary groundwater contaminants have been identified - RDX and perchlorate.
 - Primary soil contaminants include RDX, other explosives, propellants, metals and perchlorate.
- 9 sites with groundwater contamination have been identified.
 - None of these areas of contamination are impacting public or private drinking water supplies. The contamination is being addressed to ensure drinking water supplies are not impacted in the future.
 - 2 sites - the J-1 Range and J-2 Range - have more than one defined area of groundwater contamination.
 - 8 areas of groundwater contamination contain both RDX and perchlorate.
 - 2 areas of groundwater contamination contain only RDX.
 - 1 area of groundwater contamination contains only perchlorate.
 - 5 sites with soil contamination do not have significant groundwater contamination.
- 9 areas of groundwater contamination are sufficiently defined and cleanup alternatives are being developed.
 - 3 areas of groundwater contamination are being treated with Rapid Response Action systems.
 - 1 long-term treatment system is under construction at one of these sites.
 - 1 area of groundwater contamination has dissipated to below health-based levels.
 - A Rapid Response Action is planned to begin reducing contamination while the process of fully defining the area of groundwater contamination is completed.
- 12 areas of soil contamination have been identified. Rapid Response Actions conducted at several sites have resulted in:
 - 50 tons of lead being removed from 16 small arms range berms.
 - 48,000 tons of soil being removed from 7 source areas and treated using thermal desorption. 700 tons of soil were removed and disposed of off site.
 - 1 site that is known to have remaining source areas.
 - 4 sites (including multiple Gun and Mortar Positions and Small Arms Ranges) that are still being investigated.



Rapid Response Actions are used to start cleaning up contamination while the investigation and Feasibility Study are completed. Public comment is solicited on these actions.

A **Feasibility Study** presents alternatives for addressing contamination.

A **Remedy Selection Plan** presents an evaluation of alternatives and details the preferred Response Action. Public comments are solicited on the Remedy Selection Plans.

A **Decision Document** records the selected **Response Action**, explains why it was selected and tells how it will be implemented. It also provides responses to public comments.

Implementation may include soil or groundwater response actions. Long-term monitoring and operations and maintenance will be conducted to ensure effectiveness of the actions.

None of these areas of groundwater contamination are impacting public or private drinking water supplies. The contamination is being addressed to ensure drinking water supplies are not impacted in the future.

NORTHWEST CORNER

The Northwest Corner site is located along Canal View Road in Bourne and extends from 2,700 feet inside the installation west to the Cape Cod Canal. Past activities included off-post fireworks displays and on-post pyrotechnics use, both of which involved items containing perchlorate, the primary site contaminant.

- Groundwater sampling identified a shallow perchlorate plume and a deeper, smaller RDX plume.
- Area residents are connected to town water.
- More than 250 soil samples were collected. A continuing source area was not identified.
- A feasibility analysis is expected in late 2007.

CENTRAL IMPACT AREA

The Central Impact Area site covers 330 acres near the center of the base. It has 49 targets that were used for artillery, mortar and other firing until 1997.

- Multiple finger-like RDX and perchlorate plumes are migrating northwest.
- RDX, other explosives, propellants and perchlorate were detected in soil at various targets.
- This soil and unexploded or partially-exploded munitions are considered potential groundwater contamination sources.
- A soil action removed 800 tons of soil from two targets in 2004.
- A joint soil and groundwater feasibility study is expected in early 2008.

WESTERN BOUNDARY

The Western Boundary site is located on the western side of the installation and extends into the Monument Beach area of Bourne.

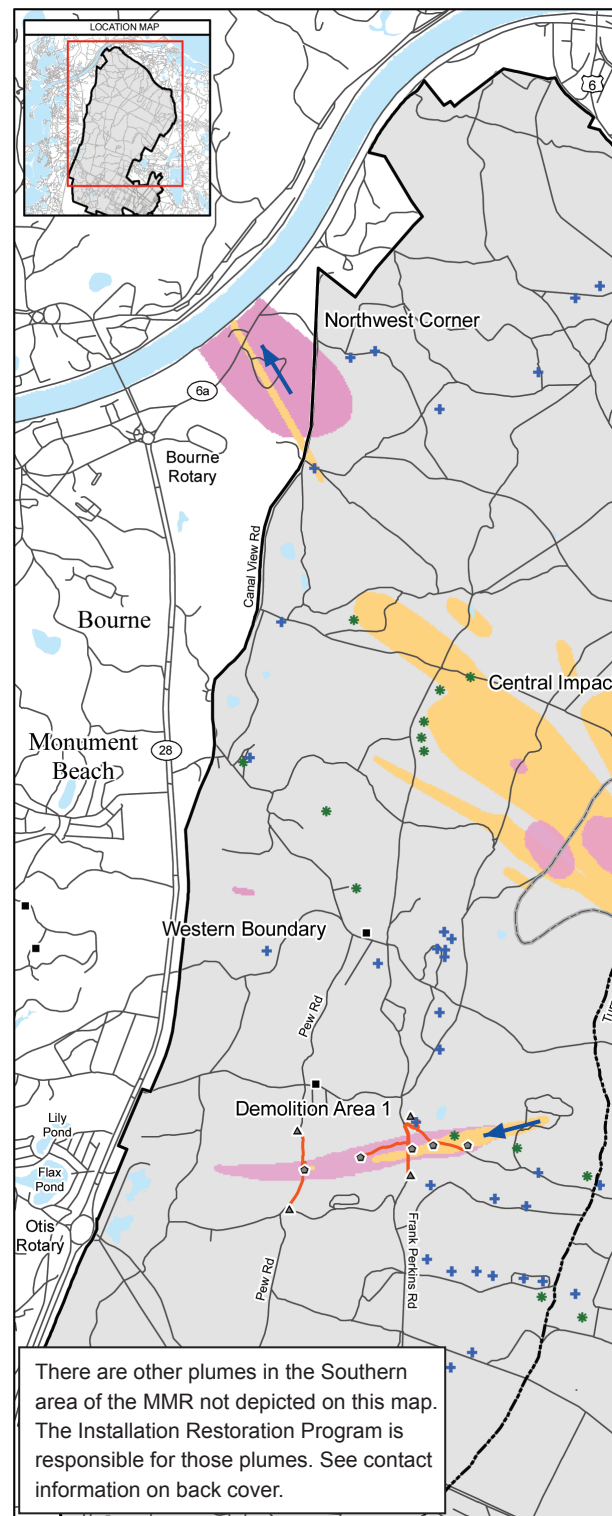
- Concentrations near the 2 parts per billion (ppb) state standard for perchlorate were detected in monitoring wells on the installation.
- Intermittent perchlorate detections below 1 ppb were found in four water-supply wells and in Monument Beach monitoring wells.
- Perchlorate is currently below detectable levels in the water-supply wells and most of the Monument Beach monitoring wells.
- Only one monitoring well on the installation currently has detections of perchlorate near the state standard.
- A Remedy Selection Plan is scheduled for mid-2007. Continued monitoring is the proposed action at this site.

DEMOLITION AREA 1

The Demolition Area 1 site is a 7.4-acre natural depression that was used from the mid-1970s until 1997 for training and disposal of munitions, fireworks and other items.

- A 2004 source area removal excavated and treated 28,000 tons of contaminated or potentially contaminated soil.
- A groundwater treatment system has cleaned 170 million gallons of groundwater per year since 2004.
- An expanded groundwater system that will treat 476 million gallons per year will begin operation in mid-2007.
- The system is expected to restore groundwater in 11 years.

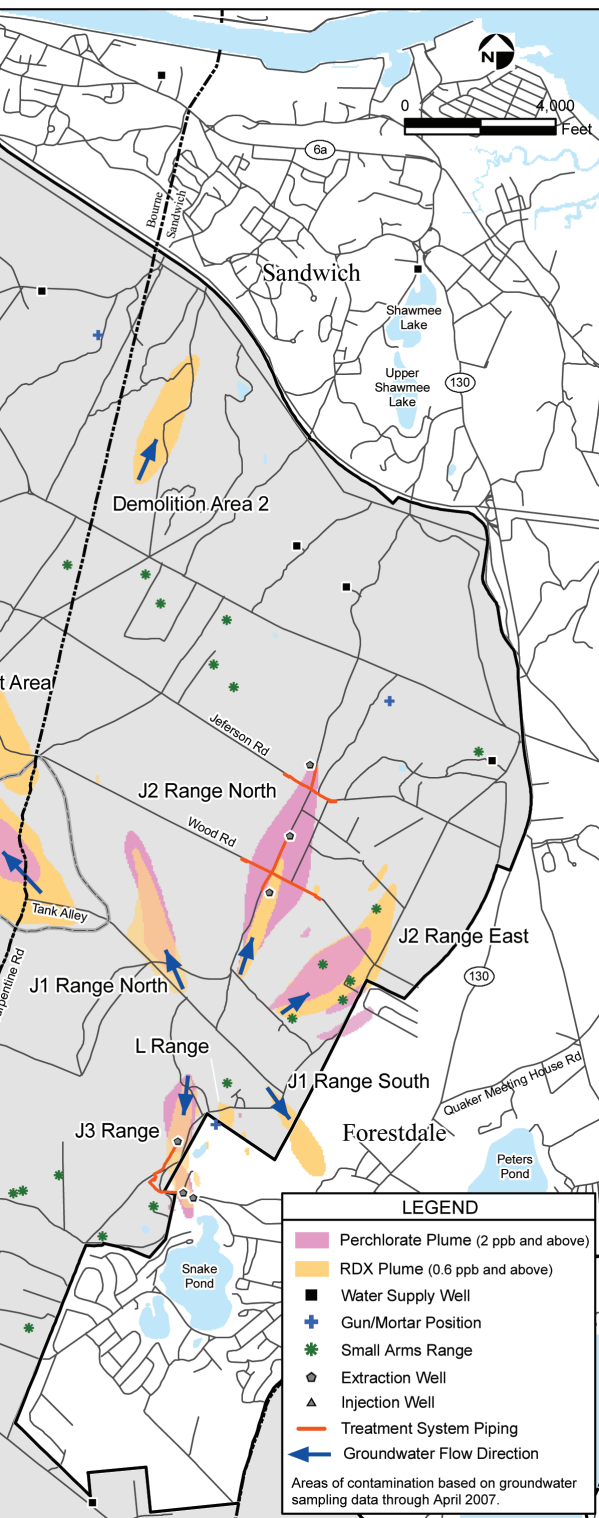
The 10⁻⁶ risk-based level for RDX in groundwater is 0.6 ppb. This is the concentration resulting in an increased lifetime cancer risk of one in a million. The Federal Lifetime Health Advisory is 2 ppb. The Massachusetts Maximum Contaminant Level for perchlorate in groundwater is 2 ppb.



OTHER ONGOING INVESTIGATION

Ongoing soil actions and investigations include:

- **Gun and Mortar Firing Positions** – Soil removals were completed at two of 37 former mortar and artillery firing sites. The propellant 2,4-DNT, found in soil at some of the sites, is the primary contaminant of concern.
- **Small Arms Ranges** – A berm maintenance program removed 50 tons of lead and treated 36,000 tons of soil to prevent lead migration in 1998. Soil sampling conducted at the ranges in 200... and propellants n... Currently soil and investigations are to better define a... the small arms ra...
- **Former A and K** – Investigations are... former anti-tank a... and the former g... range.



INVESTIGATIONS AND ACTIVITIES

02 found metals related to firing. Groundwater investigations are being conducted to determine any contamination at the ranges.

Ranges – Investigations are ongoing at the hand and rocket range, and grenade launching

- **BA-4 Disposal Site** – A soil response action is under way to remove lead and explosive contamination from several areas at this site.
- **Munitions** – Several sites contain unexploded or partially exploded munitions. Studies are ongoing to determine what, if any, impact they may have on groundwater quality.

DEMOLITION AREA 2

Demolition Area 2, located in the northern portion of the installation, is a former demolition training site that was used for training with small explosives charges.

- Source removal, including excavation and treatment of 1,200 tons of contaminated soil, was completed in 2004.
- A plume with RDX is migrating northeast.
- A feasibility analysis is expected in late 2007.

THE SOUTHEAST RANGES

The Southeast Ranges are comprised of four sites located near the Camp Edwards/Sandwich boundary that were developed for military training in the 1940s. The J-Ranges were used from the 1950s to mid-1990s for a variety of defense contractor activities, including munitions testing and disposal.

J-2 RANGE

- Two areas of groundwater contamination containing RDX and perchlorate have been defined.
- The J-2 North plume, which is now being treated, had the potential to impact a drinking water supply well.
- A cleanup system is reducing contamination and limiting migration of the J-2 North plume by treating 190 million gallons of groundwater per year.
- 8,400 tons of soil were excavated from the J-2 Range in 2004, including source areas for the J-2 North and J-2 East plumes.
- Subsurface investigations being conducted to identify other potential source areas are removing additional soil contamination and metallic items.
- The groundwater Remedy Selection Plan is expected in mid-2007.

J-1 RANGE

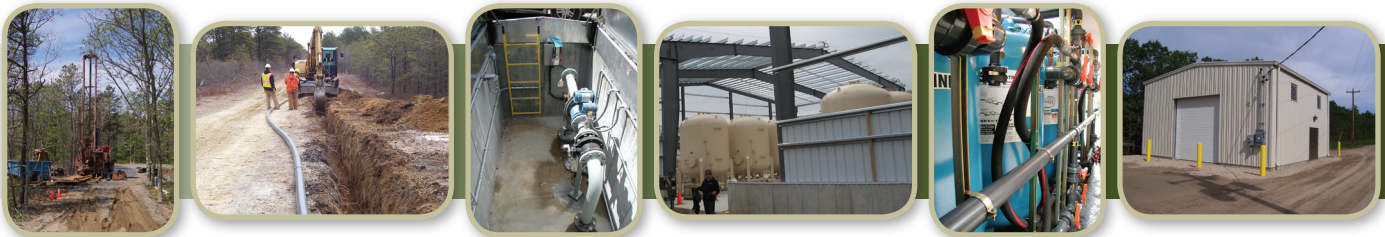
- The J-1 North plume, containing RDX and perchlorate, is migrating toward the impact area.
- The J-1 South plume, which contains RDX, is migrating into a residential area supplied by town water.
- A Rapid Response Action treatment system is planned to begin treating contamination from the J-1 South plume and limiting off-post migration.
- Potential source areas are being investigated and removed.
- The feasibility studies for both plumes are expected in late 2007.

I RANGE

- Small areas of groundwater, contaminated by RDX and perchlorate, are migrating to the southeast from the installation.
- Contaminant concentrations appear to be declining.
- Soil and groundwater sampling indicates the source area is depleted.
- A feasibility analysis is expected in late 2007.

J-3 RANGE

- An area of RDX and perchlorate contamination is migrating in groundwater to the south from the installation toward Snake Pond in Sandwich.
- Neither explosives nor perchlorate have been detected in Snake Pond.
- The J-3 source area was part of a 3,500-ton soil removal in 2004.
- A groundwater system is treating 92 million gallons a year.
- The groundwater Remedy Selection Plan is expected in mid-2007.



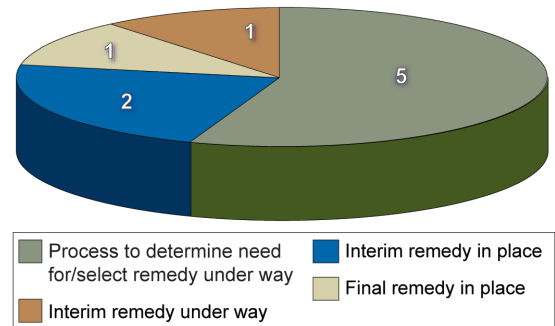
The construction of a groundwater treatment system including: (left to right) extraction well installation, running of pipes and utility lines, reinjection well vault, treatment building construction, interior of modular treatment unit and completed treatment facility building.

CLEANING UP GROUNDWATER

Systems are in place to address the three areas with the highest levels of groundwater contamination – Demolition Area 1, the J-2 Range North and the J-3 Range. By mid-2007, with the completion of the selected response action for Demolition Area 1 groundwater cleanup, these systems will be treating more than 765 million gallons of groundwater per year. Treatment includes:

- Extracting contaminated groundwater from the aquifer
- Pumping it through containers of treatment media housed in either modular treatment units or permanent buildings
- Using ion exchange resin and granular activated carbon to remove contaminants from groundwater
- Returning the treated groundwater to the aquifer through reinjection wells or infiltration trenches

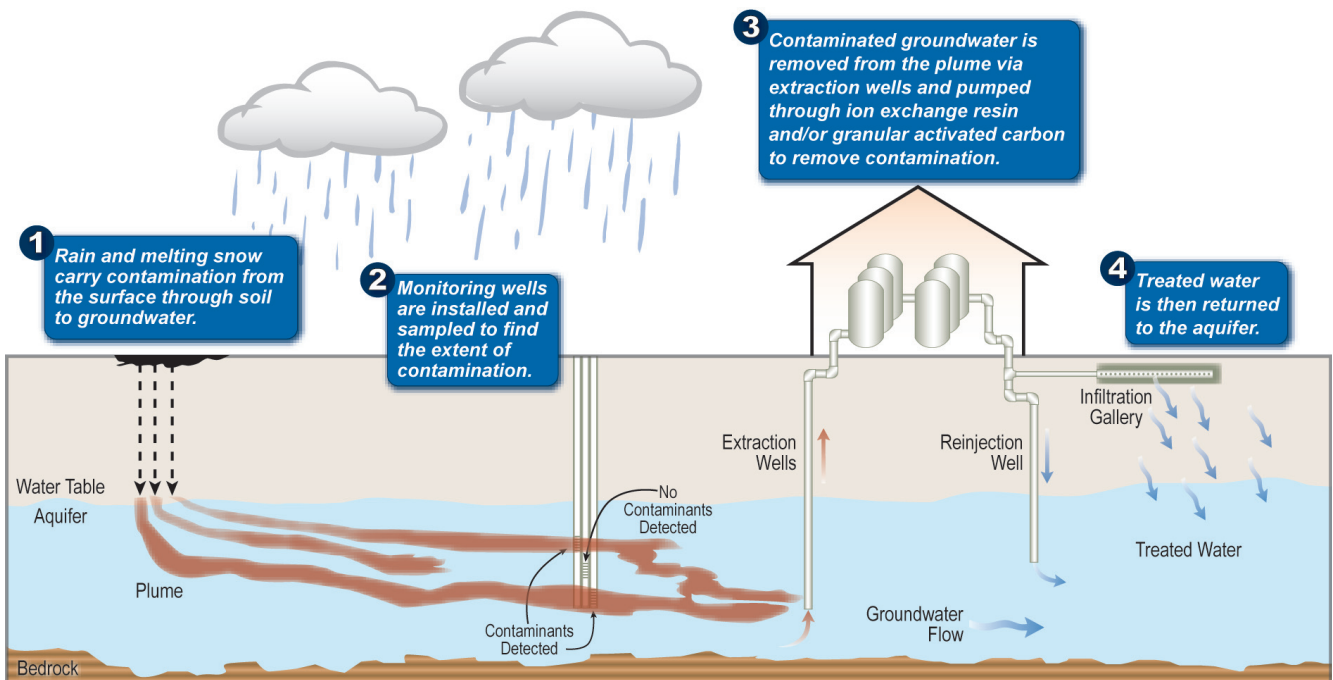
GROUNDWATER PROGRESS
9 SITES WITH GROUNDWATER CONTAMINATION



For further information on groundwater cleanup technologies visit the IAGWSP Web site: groundwaterprogram.army.mil

With investigations now completed for other areas of contamination, the IAGWSP will be proposing a range of alternatives to address the groundwater contamination at each site. These will be presented for public review and comment. Alternatives are expected to be selected and implemented for all identified plumes by 2011. It is expected that most response actions will take 11 to 16 years to return groundwater to health-based levels.

How Pump-and-Treat Systems Clean Up Groundwater Contamination





Source Area removal, treatment and restoration at (from left to right) Demolition Area 2, Demolition Area 1, Treatment Unit at Demolition Area 1, J-3 Range and Demolition Area 1

CLEANING UP SOURCE AREAS:

Several methods have been used to address and remove areas of soil that are continuing sources of groundwater contamination.

- Dry screening and soil washing were used to remove 50 tons of lead from 28,000 tons of soil excavated during the 1998 berm maintenance program at the small arms ranges.
- A thermal desorption unit, which uses heat to separate and destroy contaminants, treated more than 48,000 tons of soil from known source areas at Demolition Area 1, Demolition Area 2, the Central Impact Area, Gun Position 6, and the J-2 and J-3 Ranges.
- Off-site disposal is used for soil from small removal actions or when the soil is not suitable for treatment due to the contaminant types or concentrations. More than 300 tons of soil have been disposed of off site.
- More than 100,000 metallic items have been investigated and removed. Metal items, including inert munitions, are recycled as scrap. Munitions that potentially contain explosives are destroyed by open or contained detonation as determined by munitions experts.

Soil investigations are ongoing in several areas including the Gun and Mortar Positions and the Small Arms Ranges. Rapid Response Actions or other proposed actions, including treatment or disposal plans, will be presented for locations where removals are necessary. Those proposals will be submitted to the public for review and comment.

Learning More About the Program:

In addition to public comment periods, public meetings and other activities offer ways to learn more about and become involved in the IAGWSP's cleanup program. These include:

Impact Area Review Team (IART): This citizens' advisory team meets on the fourth Tuesday of most months to review program activities and to provide input. If interested in joining the IART, contact Jim Murphy, EPA, at 617-918-1028.

Senior Management Board (SMB): This citizens' advisory team, which includes elected officials from the towns surrounding MMR and local tribal representatives, meets on the fourth Wednesday of every other month.

Documents and Updates: Documents related to the IAGWSP investigation and cleanup are available on the IAGWSP Web site and at public libraries in Bourne, Falmouth, Mashpee and Sandwich.

Mailing List: Mailing and e-mail lists are used to send meeting announcements, updates, fact sheets and newsletters to interested individuals. Please contact Kristina Curley at 508-968-5626.

Neighborhood Meetings: Open houses and information sessions are held to update local communities about investigations affecting a particular town or neighborhood. Please call 508-968-5626 for more information.

Town Updates: The IAGWSP annually updates the Boards of Selectmen and Health in the four Upper Cape towns. Selectmen presentations are televised on public access TV.

Community Involvement Plan: This document outlines the community involvement process and activities to inform and involve the public.



Neighborhood meeting at Snake Pond.

A recent community survey indicated a high level of concern regarding possible health exposures from the MMR. If you or someone you know has concerns, please contact us at 508-968-5626.

FOR MORE INFORMATION,
PLEASE CONTACT:

Impact Area Groundwater Study Program

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FOR INFORMATION ON THE
INSTALLATION RESTORATION
PROGRAM, PLEASE CONTACT:

Air Force Center for Environmental Excellence

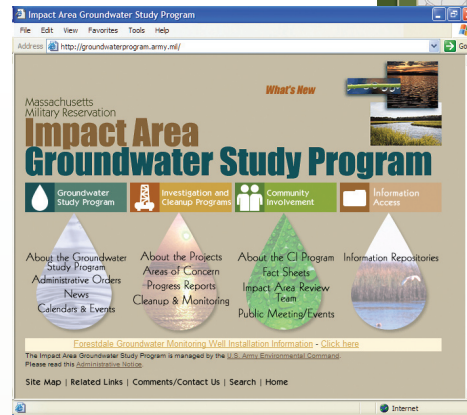
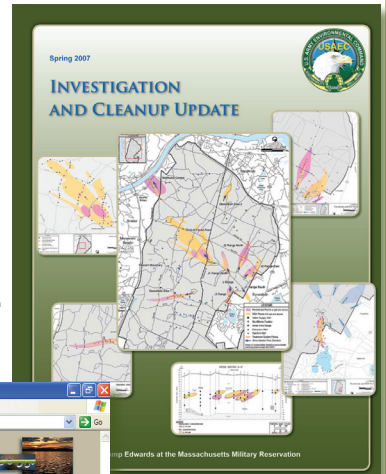
Doug Karson
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FOR INFORMATION ON
CAMP EDWARDS, TRAINING AND
SMALL ARMS RANGES ACTIVITIES,
PLEASE CONTACT:

**Massachusetts National Guard
Environmental & Readiness Center**

Lynda Wadsworth
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E-mail: lynda.e.wadsworth@us.army.mil

To receive more detailed
information on the IAGWSP
investigation sites and
identified areas of soil and
groundwater contamination,
please call **508-968-5626**
or e-mail your request to
kristina.curley@us.army.mil.



For recent news, meeting dates and locations, and additional
information on the program, please visit the IAGWSP web site
at: groundwaterprogram.army.mil.

**This fact sheet was developed in coordination with the
EPA and the MassDEP.**

Impact Area Groundwater Study Program
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*Photos on the cover: (Clockwise from upper left) containers
from a modular groundwater treatment unit, the J-1 Range, soil
sampling, construction of the Demolition Area 1 groundwater
treatment facility, subsurface investigations, thermal desorption
soil treatment unit.*