

Installation Restoration Program



Air Force Civil Engineer Center

Environmental Investigation and Remediation at Joint Base Cape Cod

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Joint Base Cape Cod (JBCC)



Cape Cod Geology today







In the Upper Cape, the geology is typically over 300 feet of sand on top of a granite **bedrock**. Some areas have silt, clay and rock deposits.

Melted glaciers and snow filled much of the air space in the sandy soil. This area is called groundwater.

Retreating glaciers left behind very flat areas and *kettle ponds*.





Sagamore Lens



The Sagamore Lens is the 300 feet of saturated sand (groundwater) that underlies all of the Upper Cape. This is where Upper Cape residents get their drinking water. The Town of Falmouth also uses Long Pond for drinking water.

Groundwater flows radially outward from the top of the Sagamore Lens at about 1-2 feet per day.

This flow is the movement of water through the sand particles. It is NOT a free-flowing river.

Kettle ponds – a glacial remnant



- Ponds, such as Ashumet, Johns, and Snake are called *kettle ponds*.
- These ponds represent surface depressions where groundwater fills the area, yet continues to flow *through* the pond, at a rate of millions of gallons a day.

JBCC Restoration Program Review Groundwater - Conceptual Site Model (CSM)

 The JBCC is located over the mound for the Sagamore Lens, which is the sole source drinking water aquifer for the Upper Cape. Groundwater flows radially away from the mound. Plumes have moved beyond base boundaries and underneath the surrounding communities.



Conceptual model



Discovery of Contamination



Where did the contamination come from?





Source Area Sites at JBCC

- Source areas on JBCC include:
- Chemical Spills
- Coal Yards
- Fuel Spills
- Landfills
- Storm Drains
- Dump Area
- Oil Water Separator
- MMRP sites
- PFOS/PFOA sites

Note: 61 source areas were formally "delisted" from the EPA Superfund Program in October 2007

JBCC Restoration Program Review Addressing Off-Base Exposure

- Bottled Water
- Water Hookups
- Carbon Filters
- Private Well Sampling
- Wellhead Treatment at Municipal Wells
- Replace impacted Municipal Wells
- Increase water supply with new wells

IRP Groundwater Plumes and Treatment Systems

Primarily PCE, TCE, and EDB – now PFOS/PFOA, and 1,4-dioxane

Concentrations generally less than 1 mg/L, (except for TCE at CS-10); highest PFOS+PFOA concentration at 130 ug/L

Plumes are typically deep (>100 ft) and thick (>100 ft)

9 treatment plants treating 8.7 million gallons per day

Over 27 miles of pipeline

Over 130 extraction and reinjection wells

Over 3000 monitoring wells

FS-1 Cleanup Progression 100% AF Funded

Plume defined based on ethylene dibromide; PFOS/PFOA detected above health advisories

Sustainability Evaluation

JBCC Restoration Program Review Current Activities – Wind Turbines

- Operating and maintaining 5 utility scale wind turbines
 - AFCEC owns three 1.5 MW wind turbines
 - AFSPC-PAVE PAWS owns two 1.68 MW wind turbines

	Wind 1	Wind II
Rating (MW)	1.5	1.5
Hub Height (m) /Rotor Diameter (m)	80/77	80/77
Cost of Construction	\$4.6M	\$9.3M
Operational	2 Dec 09	9 Nov 11
Production through Jul 2018 (MWhr)	21,421	49,712
Credits to date (through Jul 2018)	\$3.1M	\$7.9M

Questions?

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Emerging Contaminants (EC)

EC sites (PFOS/PFOA/DX)

- Ten PFOS/PFOA sites
 - Three are existing IRP sites AV, FS-1, LF-1
 - Seven new sites Tanker Truck Rollovers, USCG Hangars, Former Fire Department (Bldg 122), Army Helicopter Hangar/Lower 40 Ramp Area, Wastewater Treatment Plant, ANG Motor Pool, Building 118

Four DX sites

All are existing IRP sites - AV, CS-10, CS-20, LF-1

Emerging Contaminants Response Actions

- 102 private wells sampled; 33 historically had PFOS/PFOA > LHA; currently 3 private wells > LHA
- 8 public wells sampled; 2 public wells with PFOS/PFOA > LHA (one shut down – wellhead treatment project started; one connected to municipal water supply)
- > 3 residents currently receiving bottled water
- 13 filtration systems installed; 4 removed when connections to municipal water were completed; 9 operating
- 108 connections made to municipal water supply (includes one public well with 93 units at a trailer park)

Wellhead Treatment in Mashpee

PFOS/PFOA plume in Falmouth/ Mashpee (draft)

Direct push drilling on private property in Pocasset, MA

