



Installation Restoration Program



Air Force Center for
Engineering and the Environment

Remediation Optimization and Sustainability: Wind Turbine on Cape Cod to Power Groundwater Remediation Systems

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May 4, 2009

Report Documentation Page

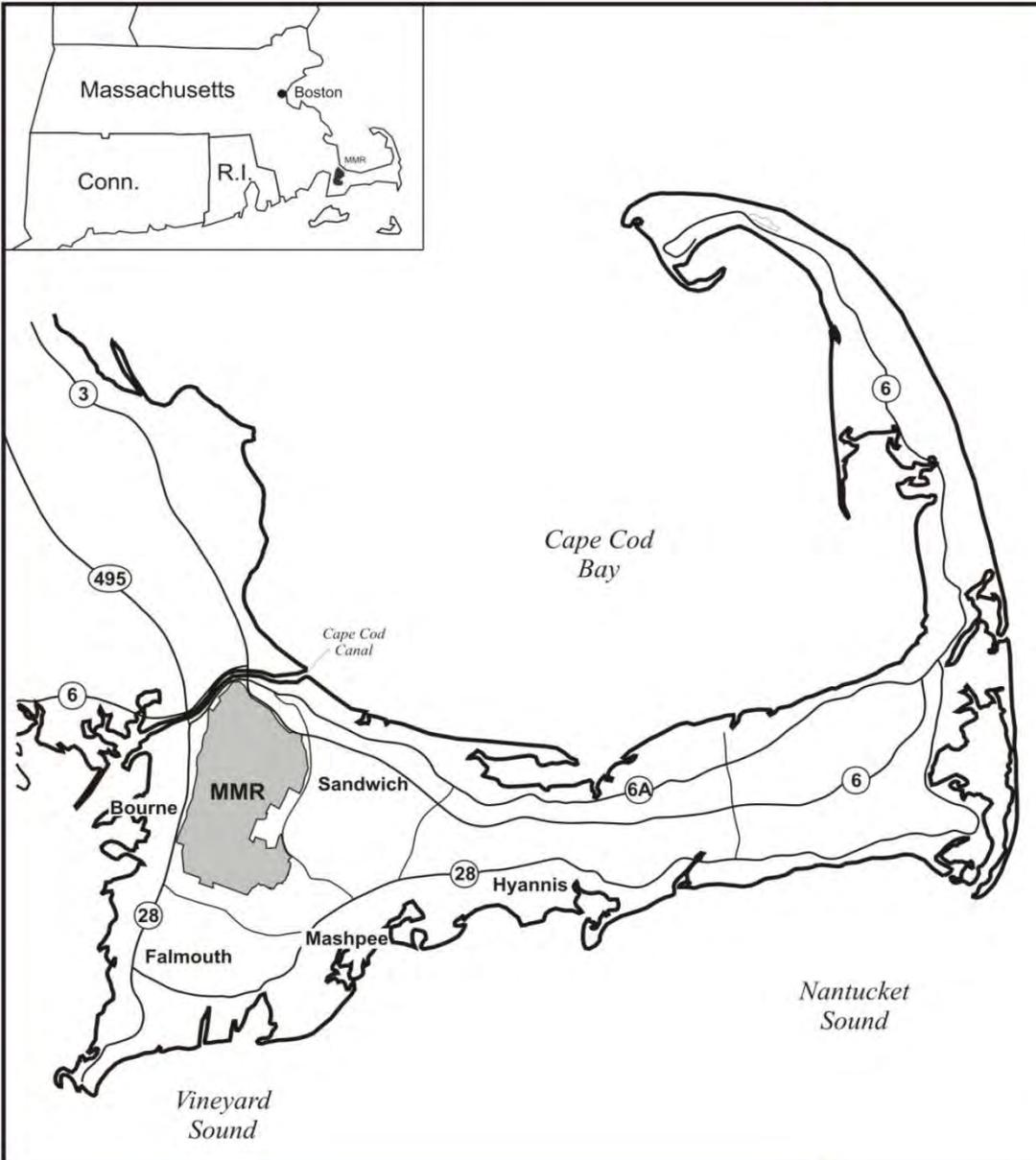
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Outline

- Brief Background
- Program Consumption/Emissions
- Small Scale Initiatives
- Wind Turbine



The Installation Restoration Program at the Massachusetts Military Reservation (MMR)



**Air Force Center for
Engineering and the Environment**

What is IRP?

Installation Restoration Program

- Implements CERCLA (Superfund)
- One of two major cleanup programs at MMR
- Funded with Defense Environmental Restoration Account (Congressional appropriation)
- Both AF and Army funds at MMR



Air Force Center for
Engineering and the Environment

Who is AFCEE?



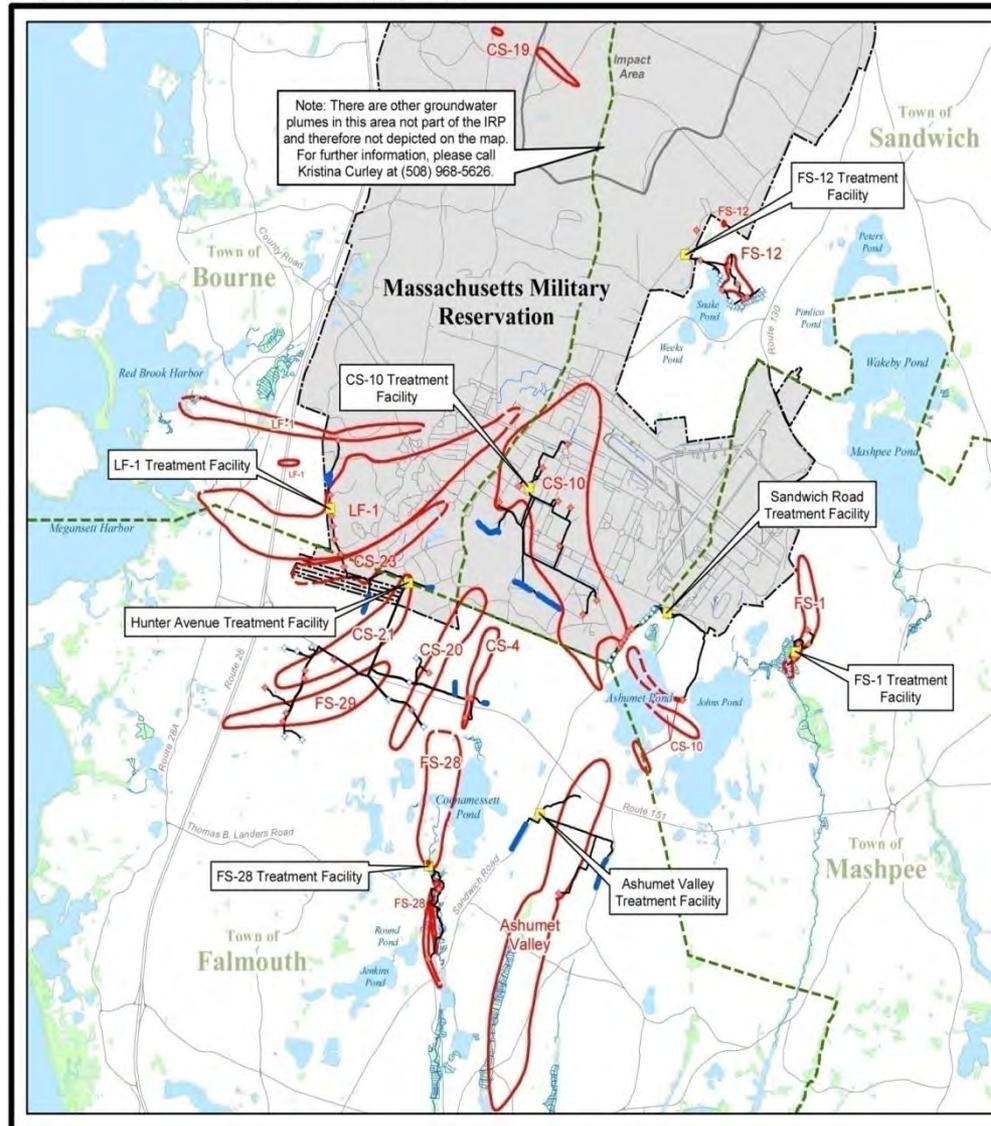
Air Force Center for
Engineering and the Environment

Air Force Center for Engineering and the Environment

- AF's Central Program Management Office for environmental cleanup, military construction and housing programs
- Headquarters in San Antonio, TX
- Managing cleanup at MMR since 1996

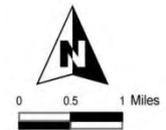
Groundwater plumes and treatment systems at the MMR

Last Opened 10/8/2008 11:21:06 AM by JG Y:\Meetings\PCT\Templates\GIS\Arcmap\PCT_Plumemap1.mxd



Legend

- Plume Boundary (Dashed Where Inferred)
Defines Area of Groundwater Contaminants of Concern Above Regulatory Limits
- Infiltration Trench/Gallery
- Town Boundary
- Treatment System Pipeline
- Bog/Wetland
- Reinjection Well
- Extraction Well
- Treatment Facility



Note: FS-13, SD-5, and Eastern Brianwood/Western Aquafarm areas of concern are in long-term monitoring and therefore not depicted.



Air Force Center for Engineering and the Environment

IRP PLUMES AND TREATMENT SYSTEMS, OCTOBER 2008

AFCEE - Massachusetts Military Reservation

CH2MHILL

Primarily PCE, TCE, and EDB

Concentrations less than 1.3 ppm

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

8 treatment plants treating 16 million gallons per day

Over 27 miles of pipeline

Over 100 pumping and reinjection wells

Over 3,000 mw's



Program Electricity Consumption

IRP Remedial System (2001-2007)

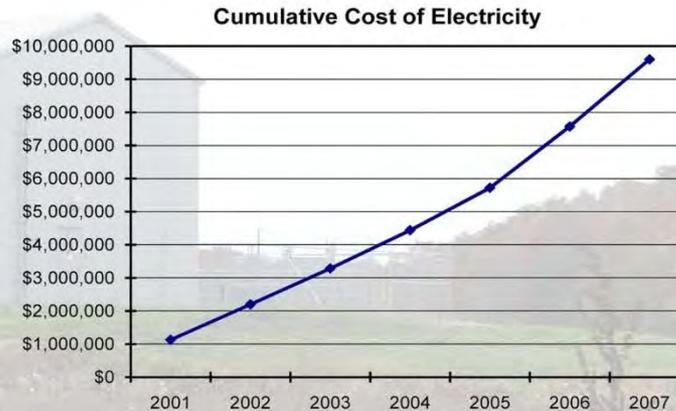
Electric Consumption:

- 77 Million kW - hrs

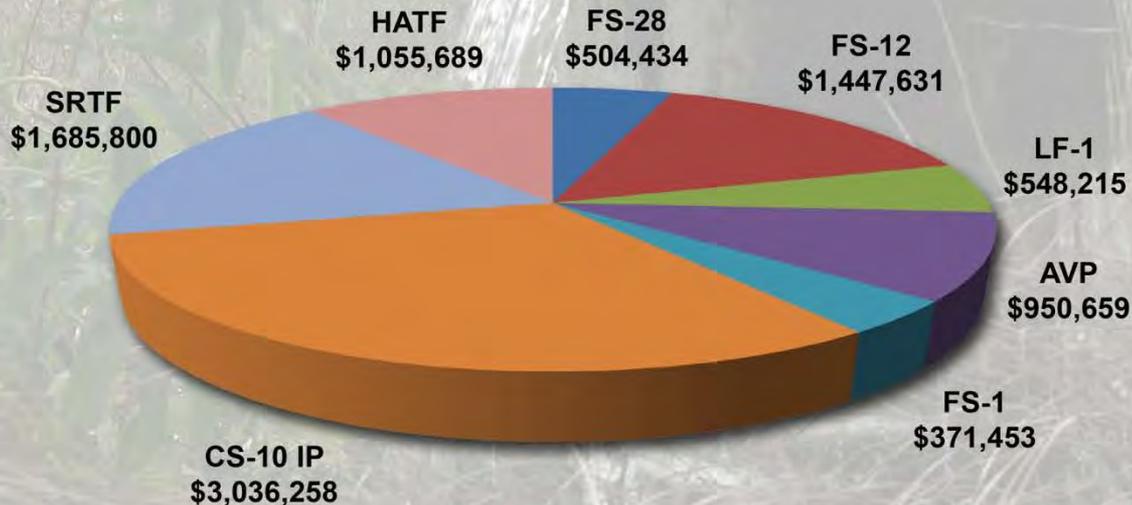
- Electricity cost from 2001-2007: \$9.6 Million

- Electricity 2007: \$2.0 Million

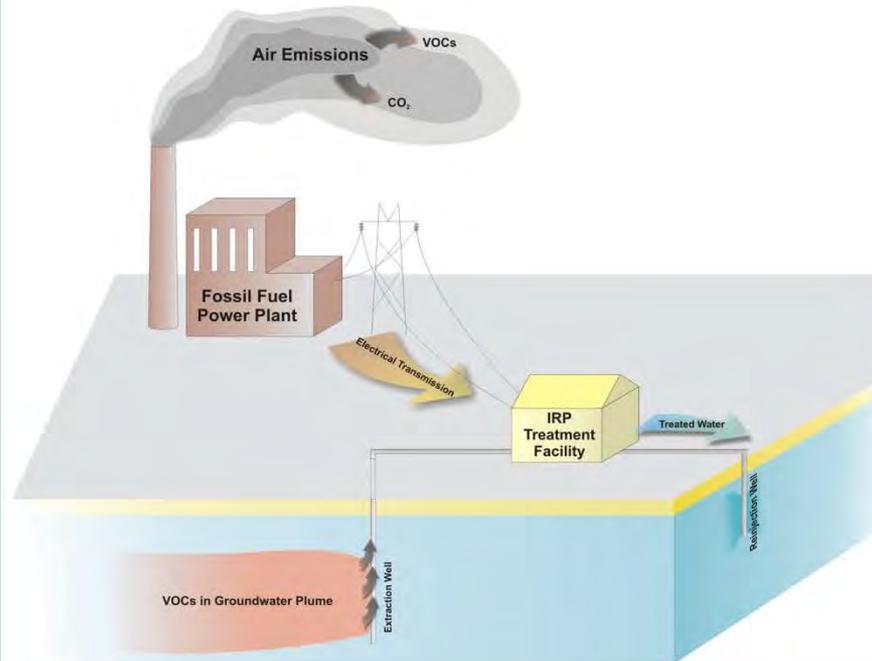
- Program annual consumption equivalent to providing power to approximately 1,000 average American homes



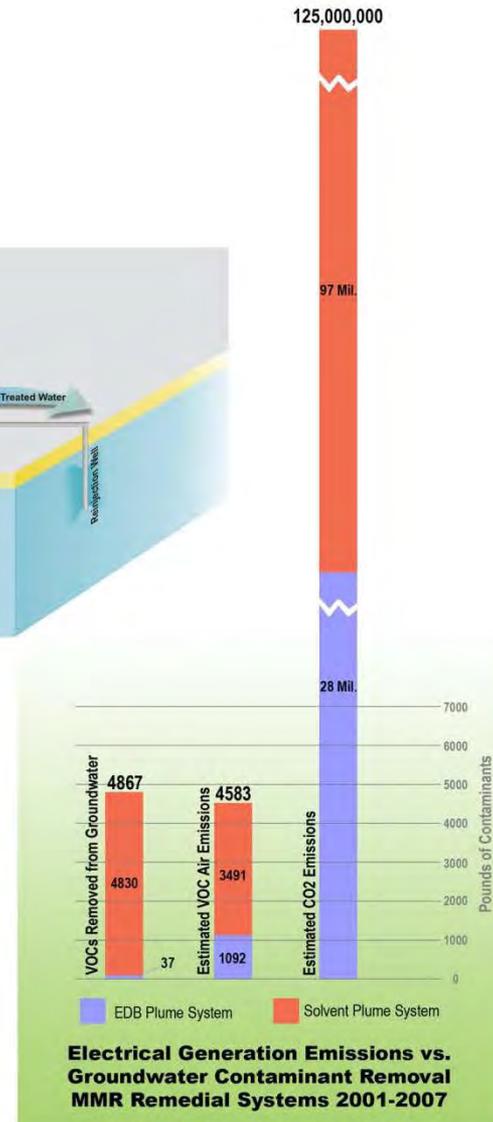
IRP Program Electricity Costs by Treatment System



Impacts of Electricity Generation



Electricity Generation to Power IRP Remedial Systems Results in Air Emissions Including Greenhouse Gases



Conservation Initiatives

- **High Efficiency Pumps: Savings over \$100,000 per year**
- **Remedial System Optimizations: Savings over \$100,000 per year**
- **Energy Audit Conducted: Motion sensors, efficient lighting, programmable thermostats, savings over \$50,000 per year**

Passive Treatment: Ashumet Pond Barrier Zero Air Emissions



Purchaser Awards Green Power Partner of the Year

U.S. Air Force

What started as efforts at individual bases has become a nationwide commitment, and this year the U.S. Air Force will continue in their role as the nation's leading purchaser of renewable energy. During fiscal year 2004, ten Air Force bases collectively purchased over 320 gigawatt hours (GWh) of RECs, accounting for 41 percent of all green power purchased by the federal government.



In early 2004, the U.S. Air Force was named a Green Power Partner of the Year by the U.S. House of Representatives. This honor was a result of a study commissioned by Congress which found that the Air Force was the nation's leading purchaser of renewable energy while increasing commercial development of renewable energy.

Green Power: Wind Turbine Coming Soon !

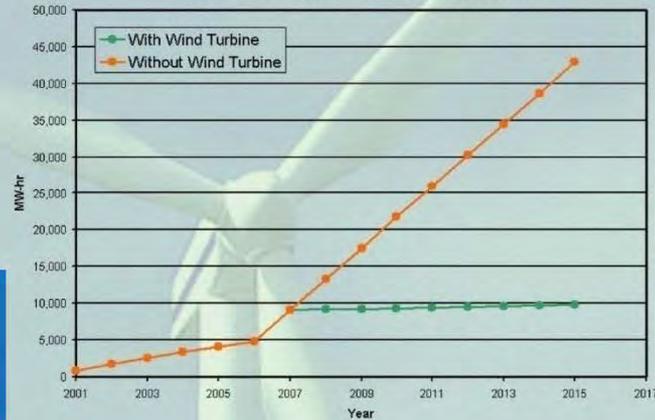
Purpose of Project:

- Generate electricity using renewable energy to reduce cost
- Offset air emissions from commercial plants
- Expected to provide 25% of Program electrical needs



Artist rendering - not to scale

LF-1 & Hunter Avenue Treatment Facility Net Electricity Purchase Projections



Air Emission Reductions (Pounds Per Year)

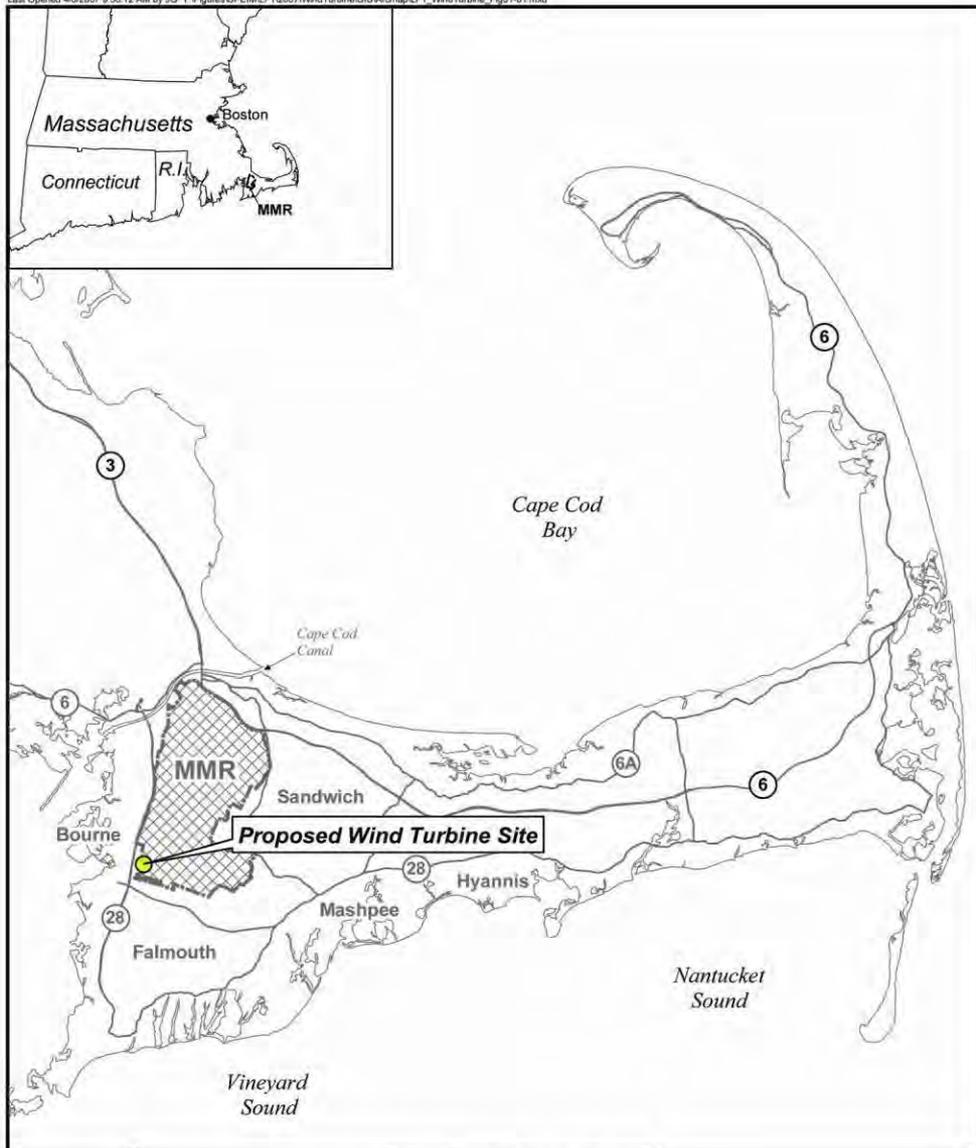
- CO₂: 6,741,300
- NO_x: 11,833
- SO₂: 11,443
- CO: 1,112
- VOCs: 442
- PM₁₀: 418

Wind Turbine - Energy Optimization

- Produce ~ 3,810 MWh yearly (29% capacity factor)
- Expected to generate 25-30% of AFCEE's total electrical requirement
- Expected to reduce ~25-30% air emissions
- Payback anticipated in 6-8 years (RECs/O&M)
- Massachusetts Technology Collaborative (MTC) Grant of \$300K awarded to Air Force



Note: Artist rendering, not to scale.



Legend

 Massachusetts Military Reservation

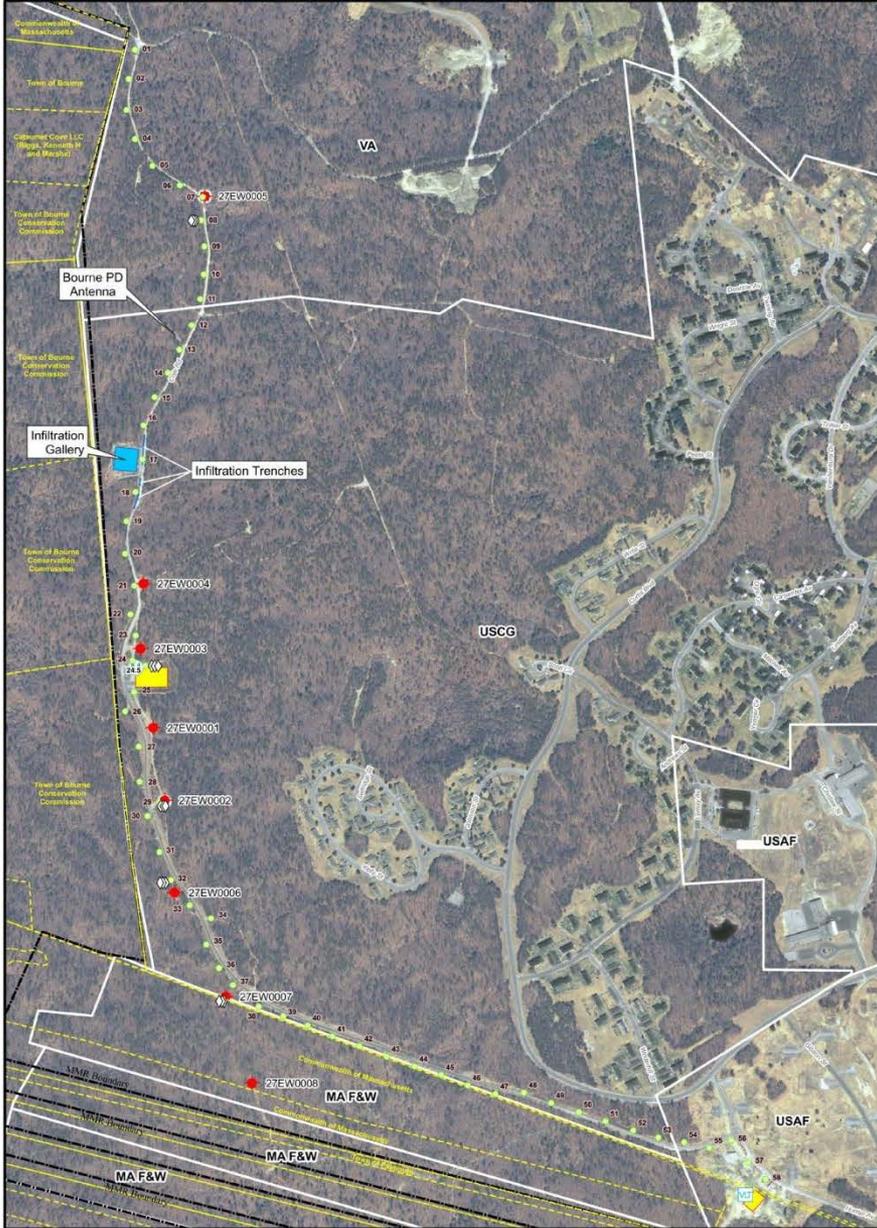
Data Source: AFCEE, MMR-AFCEE Data Warehouse



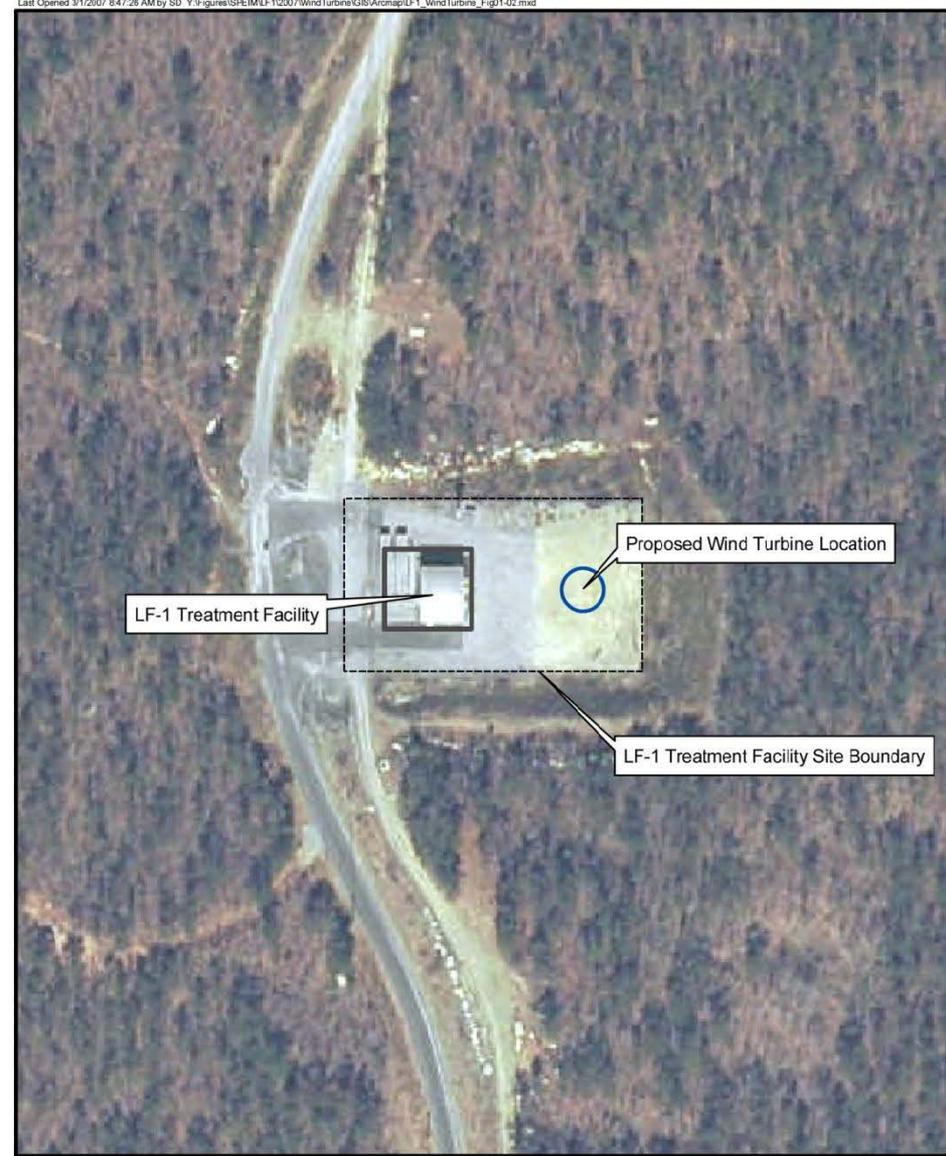
FIGURE 1-1

GENERAL SITE LOCATION

AFCEE - Massachusetts Military Reservation
Wind Turbine Project



<p>Legend</p> <ul style="list-style-type: none"> ◆ Extraction Well ◆ Utility Pole M Electrical Meter Transformers: ◇ Pole-mounted Bank □ Pad-mounted Vault Infiltration Bed Massachusetts Military Reservation (MMR) Boundary Parcel MMR Internal Jurisdictional Boundary Treatment Plant 	<p>Data Source: AFCEE, MMR-AFCEE Data Warehouse MMR boundary from MA A/RNG 2004. Parcel boundaries provided by the towns of Fairhaven and Bourne. Parcel boundaries and internal MMR jurisdiction boundaries are representational and do not reflect an actual field survey.</p>	<p>LF-1/HUNTER AVENUE AREA UTILITY NETWORK</p> <p>AFCEE - Massachusetts Military Reservation</p>
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<p>Legend</p>	<p>Data Source: AFCEE, MMR-AFCEE Data Warehouse 2005 Aerial Photography from MassGIS</p>	<p>FIGURE 1-2</p> <p>PROPOSED PROJECT SITE</p> <p>AFCEE - Massachusetts Military Reservation Wind Turbine Project</p> <p>14</p> <p>CH2MHILL</p>
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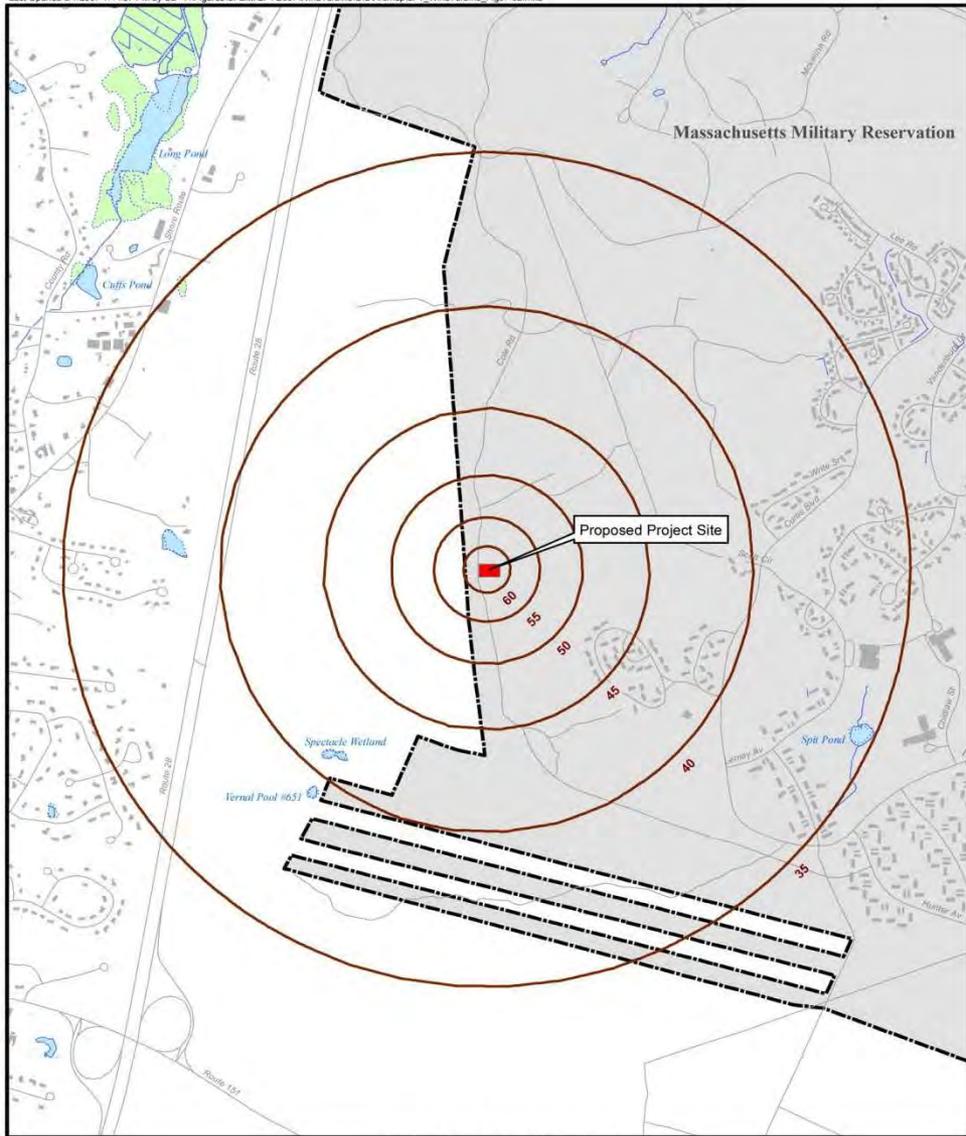
Fuhrländer FL-1500

- Rating: 1.5 MW
- 80 m (~260 ft) hub height
- ~ 118 m (~390 ft) high from ground to tip of rotor blade
- 77 m (~253 ft) rotor diameter (blades are 37.5 m long (123 ft); epoxy/glass fiber)
- Speeds:
 - Rotational speed: 9.7-19 rpm
 - Avg site wind speed ~ 6.5-7.0 m/s (14.5 – 15.7 mph) at 80 m hub height
 - Rated output @ 11 m/s (~25 mph)
 - Start wind @ 3 m/s (6.7 mph)
 - Stop wind @ 20 m/s (~45 mph)
 - Survival speed @ 52.5 m/s (117 mph)
- Weights:
 - Rotor: 34,000 kg (74,800 lbs; ~ 37 tons)
 - Nacelle: 51,000 kg (112,200 lbs; ~ 56 tons)
 - Tower: 243,714 kg (~536,000 lbs; ~268 tons)
 - Insert: 8181 kg (18,000 lb ; 9 tons)



EA Conclusions

- Wind Turbine would not result in significant, adverse impacts on the quality of the natural or human environment.
- An Environmental Impact Statement (EIS) is not required and issuance of a Finding of No Significant Impact (FONSI) is appropriate.
- No comments received during 30-day public comment period



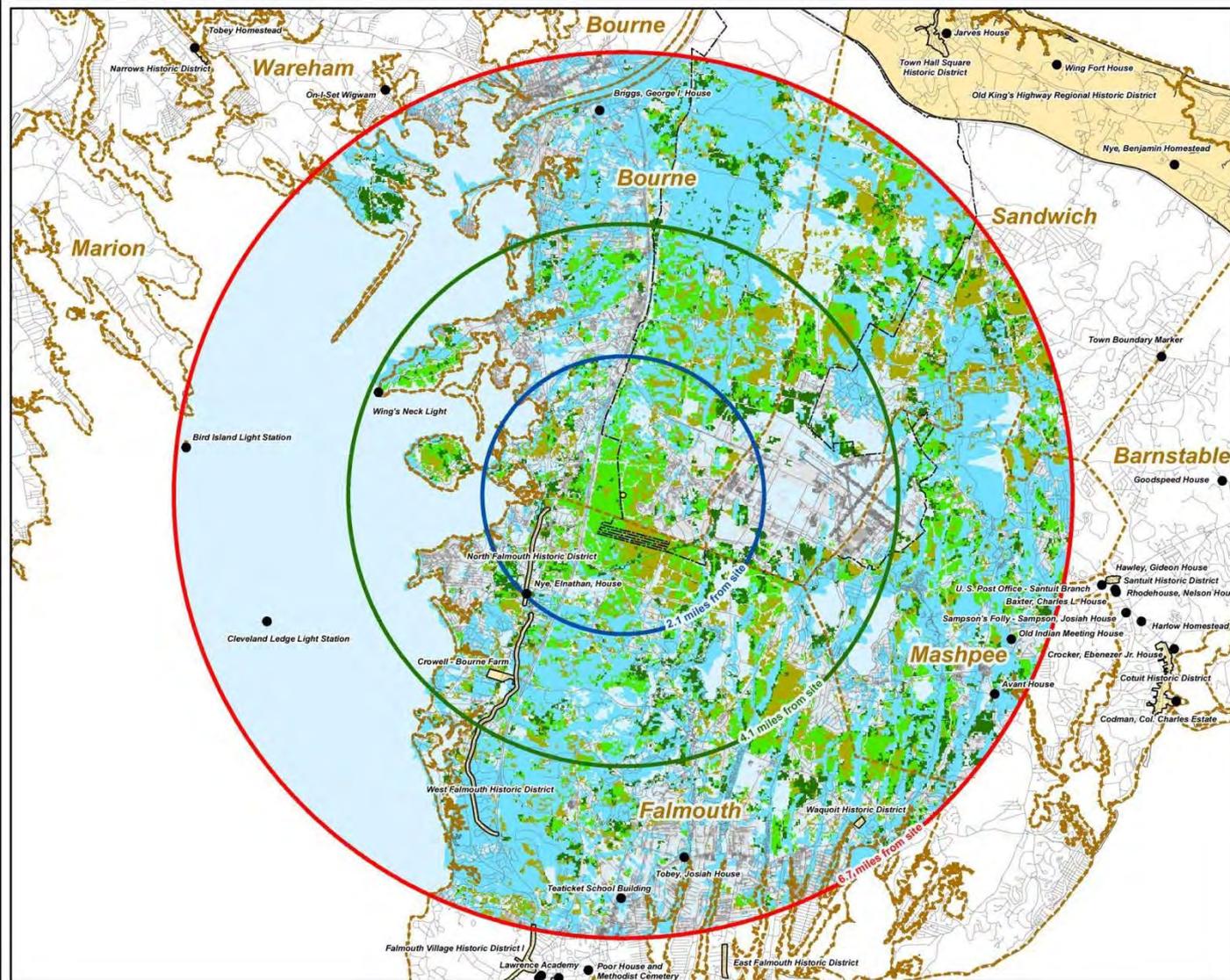
Legend

- Proposed Wind Turbine Site Location
- Building
- Massachusetts Military Reservation Boundary
- Noise Contour (5 dBA Interval)
- Bog/Wetland

Data Source: AFCEE, MMR-AFCEE Data Warehouse


0 670 1,340
Feet

FIGURE 7-2
PREDICTED MAXIMUM NOISE CONTOURS (dBA)
AFCEE - Massachusetts Military Reservation
Wind Turbine Project



Legend

- Massachusetts Military Reservation
- Town boundary
- Proposed Wind Turbine Site
- Historic Location (Federal, State, or Local)
- Historic Area (Federal, State, or Local)

Potential Visibility Based on Viewshed Analysis to 120 Meter Tip Height

- Visible based on terrain elevation and limited land cover
- Not visible, line of sight blocked by terrain
- Potentially visible but with seasonal screening by deciduous forest cover
- Potentially visible but with year round screening by evergreen forest cover
- Potentially visible but with seasonal screening by mixed forest cover
- Potentially visible but with screening by low intensity development
- Potentially visible but with screening by medium intensity development
- Potentially visible but with screening by high intensity development
- Land cover and/or viewshed analysis data not available

Sinclair-Thomas Matrix Distance Bands*

- Band A, 0-2.1 miles distant
Potential for dominant impact due to large scale, movement, and proximity
- Band B, 2.1-4.1 miles distant
Potential for major impact due to proximity
- Band C, 4.1-6.7 miles distant
Potential for being clearly visible with moderate impact

*Extrapolated for 80m hub height

0 0.75 1.5 Miles

Data Source: AFCEE, November 2006. MMR-AFCEE Data Warehouse. Viewshed analysis based on 3 meter contour data provided by MassGIS. Historic places also provided by MassGIS. MMR boundary from MA ARNG 2004. State Historic Districts - Massachusetts Historical Commission. This is a beta version and does not reflect listings past 1997. Users should consult the most recent State Register of Historic Places (available at the State House Bookstore) for updates. Listings are regularly updated in the weekly State Register. Land cover data and classifications from the National Land Cover Database 2001 land cover layer, zone 65, 30 meter resolution, produced by the MRLC (Multi-Resolution Land Characteristics) Consortium.

FIGURE 6-3
POTENTIAL PROJECT VISIBILITY
 AFCEE - Massachusetts Military Reservation
 Wind Turbine Project

Project Timeline

- 2004: Examine funding options, determine basic steps for feasibility
- 2004: Approved for use of DERA funding
- 2005: Coordination with base agencies (numerous iterations)
- 2005: Siting analysis, preliminary cost analysis
- Feb 2006: Presented more detailed plan to base agencies
- Mar 2006: Plume Cleanup Team (PCT) presentation - public
- Jun 2006: Wind turbine constructability assessment awarded to CH2M Hill
- Jan 2007 – PCT and Senior Management Board (SMB) presentations -public
- Feb 2007 – Prepared Form 813 for EA
- 13 Mar 2007: News Release - Public comment period on MMR wind turbine project environmental assessment (EA); Paid Advertisements on 30-day public comment period for the EA in the Cape Cod Times and 4-town Enterprise Newspapers
- 19 Mar – 17 Apr 2007: EA comment period
- Mar 2007: RFP for construction issued
- Sep 2007: Construction contract awarded to ECC
- 26 Sep 2007: News Release - contract awarded for wind turbine
- Sep 2007: PCT and SMB presentations - public

Project Timeline (cont)

- May 2008: Pre-construction meeting
- 19 Nov 2008: Delivery of foundation insert
- Spring 2009: Delivery of tower and construction of foundation
- Summer 2009 (Jul/Aug): Delivery of nacelle/blades
- Aug/Sep 2009: Construction/startup





Contracting Mechanisms

- Constructability Assessment, Environmental Assessment/FONSI, Design Package, Title II Oversight
 - AFCEE 4PAE Task Order awarded to CH2M Hill, Inc
 - Time and Materials
 - \$408K
- Construction and 6 months O&M
 - AFCEE Heavy Engineering, Repair and Construction (HERC) Task Order awarded to Environmental Chemical Company (ECC)
 - Competitive Firm Fixed Price
 - \$4.6M

Notable Issues/Advice

- Never too soon to coordinate with stakeholders
 - Flying missions, radar, FAA
- Understand net-metering and state rules
 - Big player in payback calculations
- Utility Interconnection
 - Build in the time for utility company
- Logistics
 - Room to haul and build (bridges, road width, corners, etc)
- Explore additional grants
 - MMR project received \$300K from state renewable program
- Long lead time on turbines
 - Explore interest from manufacturers
- Long Haul Project – better have a dedicated champion

Questions/Comments?

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