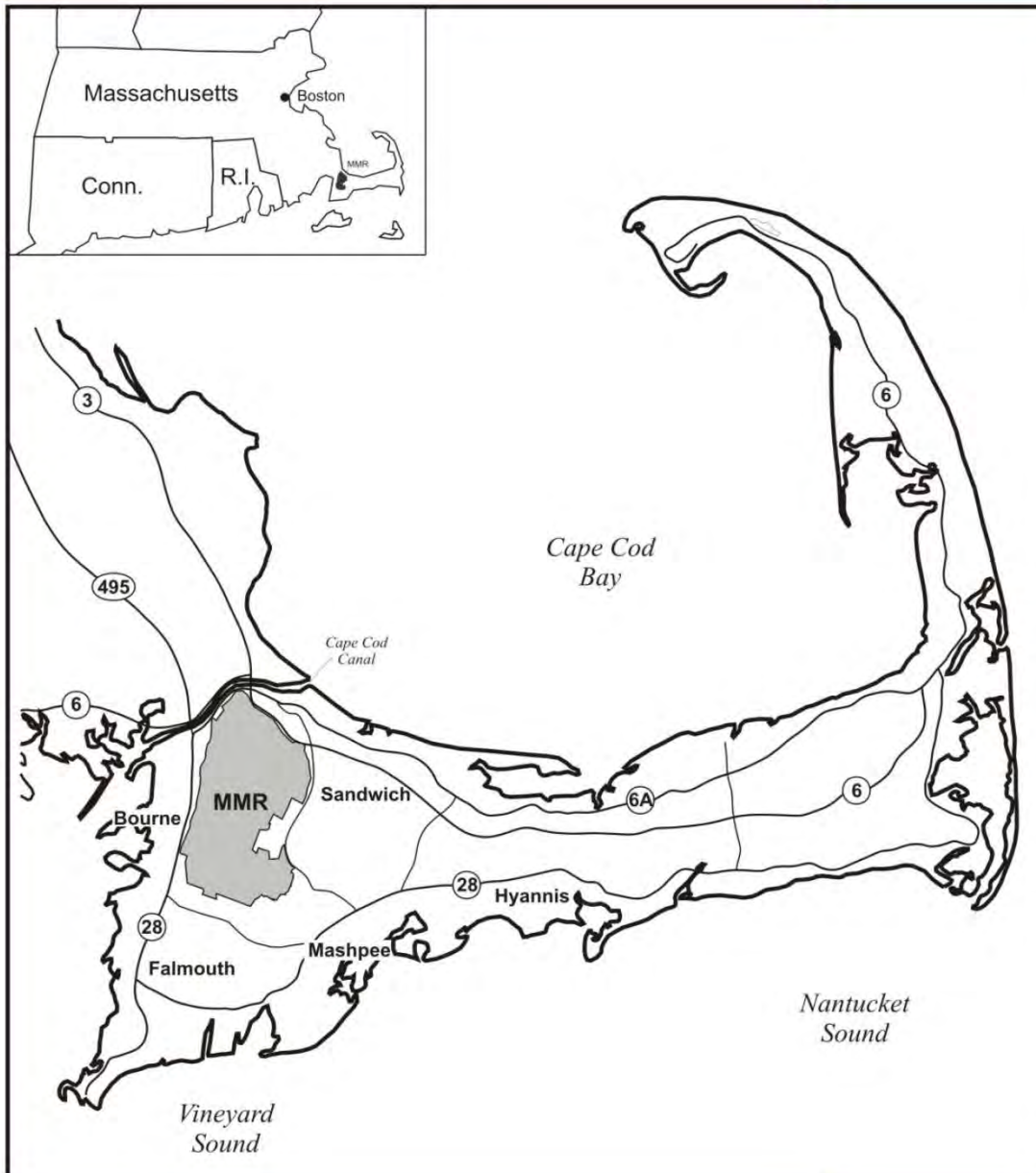

Remediation Optimization and Sustainability: Wind Turbine on Cape Cod to Power Groundwater Remediation Systems

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Program Manager
May 4, 2009

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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?



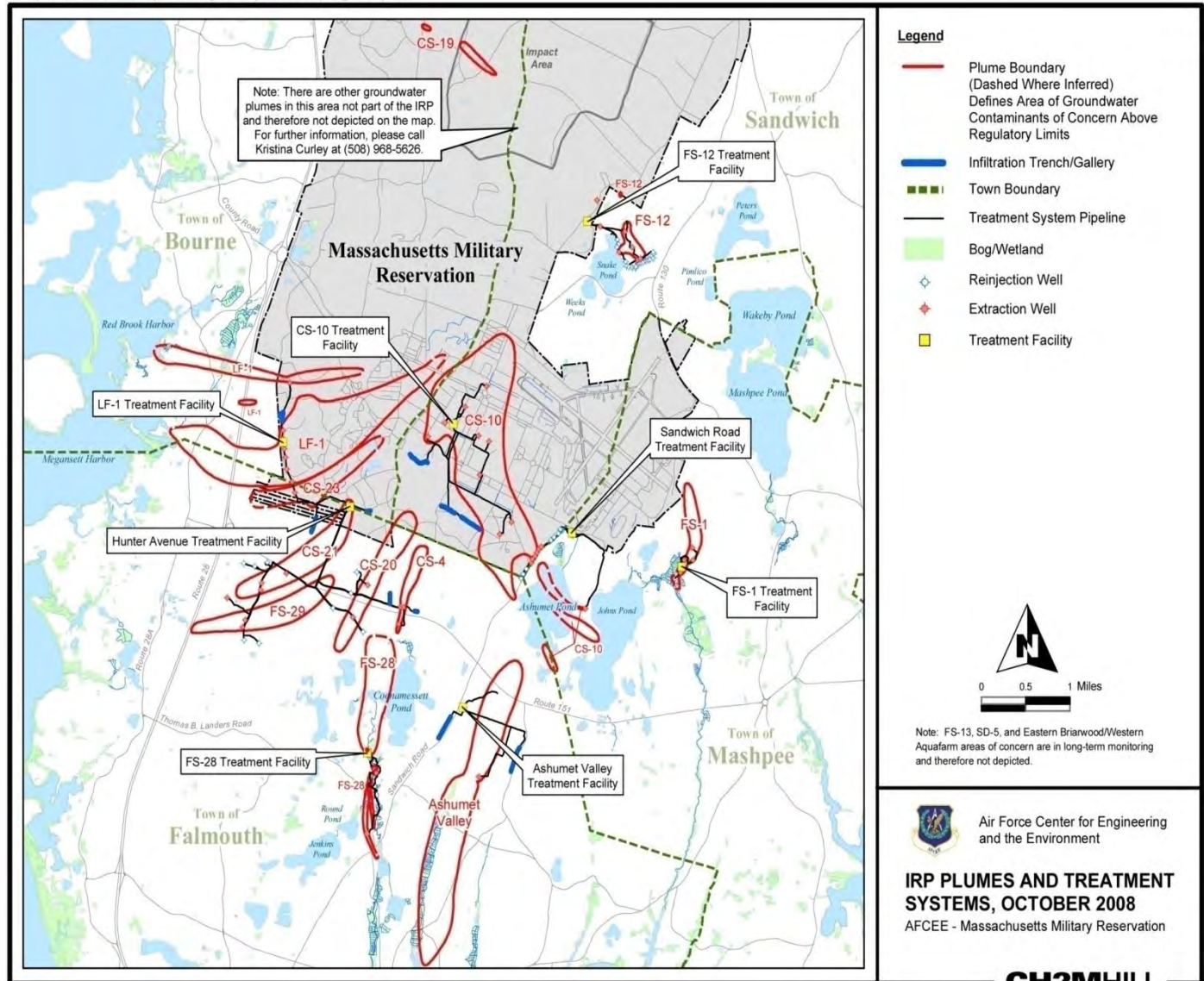
Air Force Center for
Engineering and the Environment

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

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**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

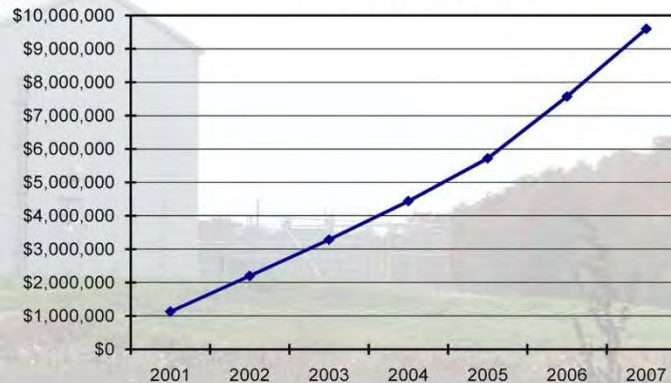
Electricity cost from

- 2001-2007:
\$9.6 Million

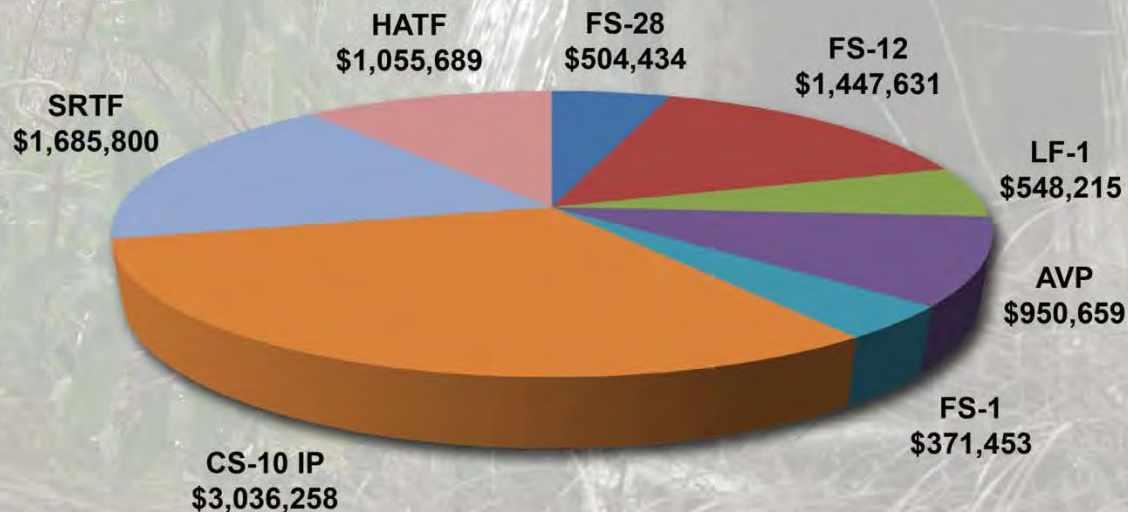
- Electricity 2007:
\$2.0 Million

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

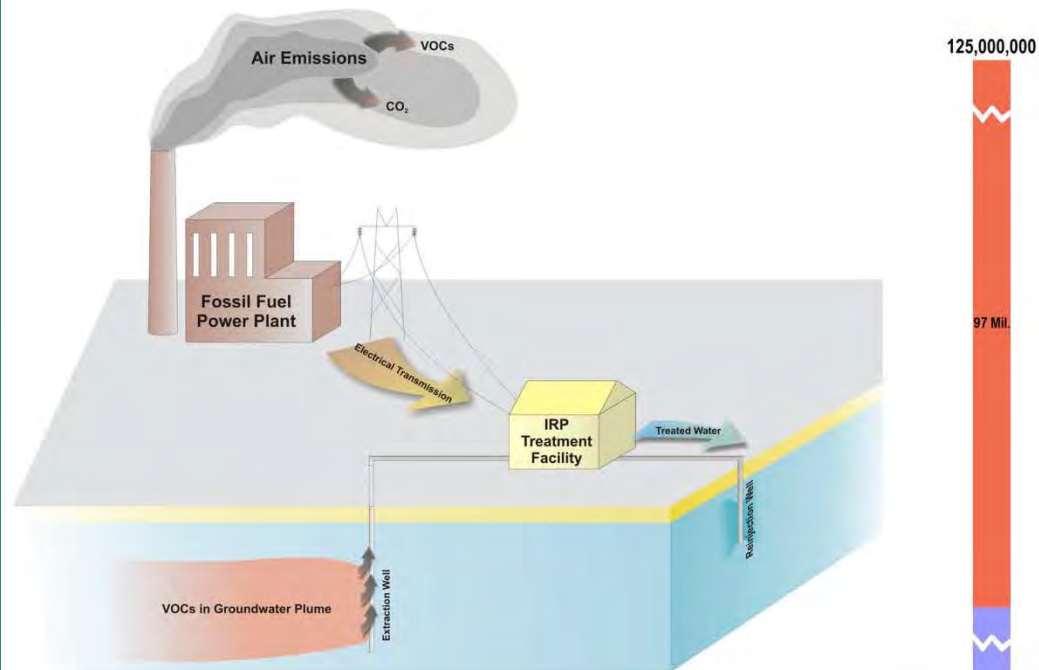
Cumulative Cost of Electricity



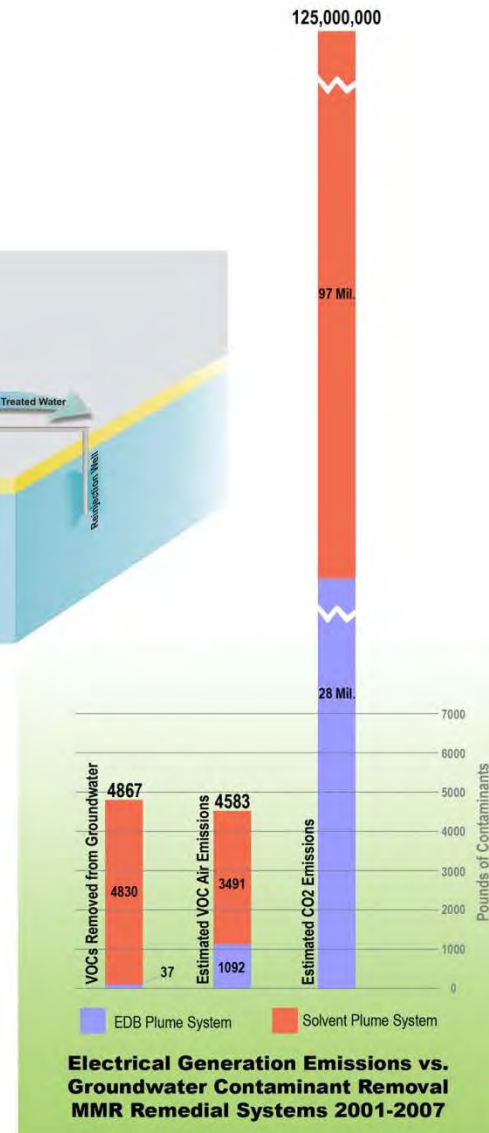
IRP Program Electricity Costs by Treatment System



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.



U.S. AIR FORCE

Green Power: Wind Turbine Coming Soon !

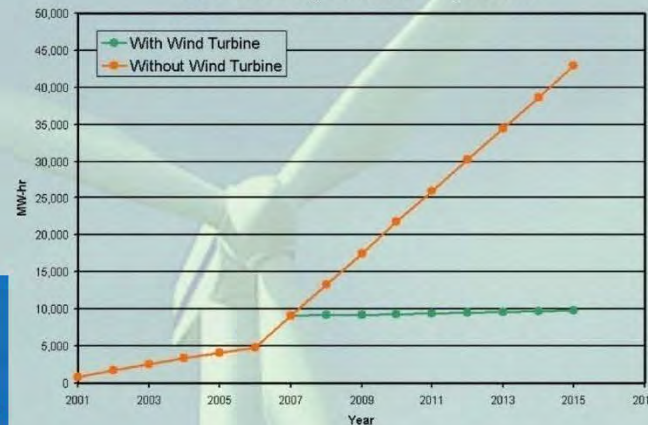
Purpose of Project:

- 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)

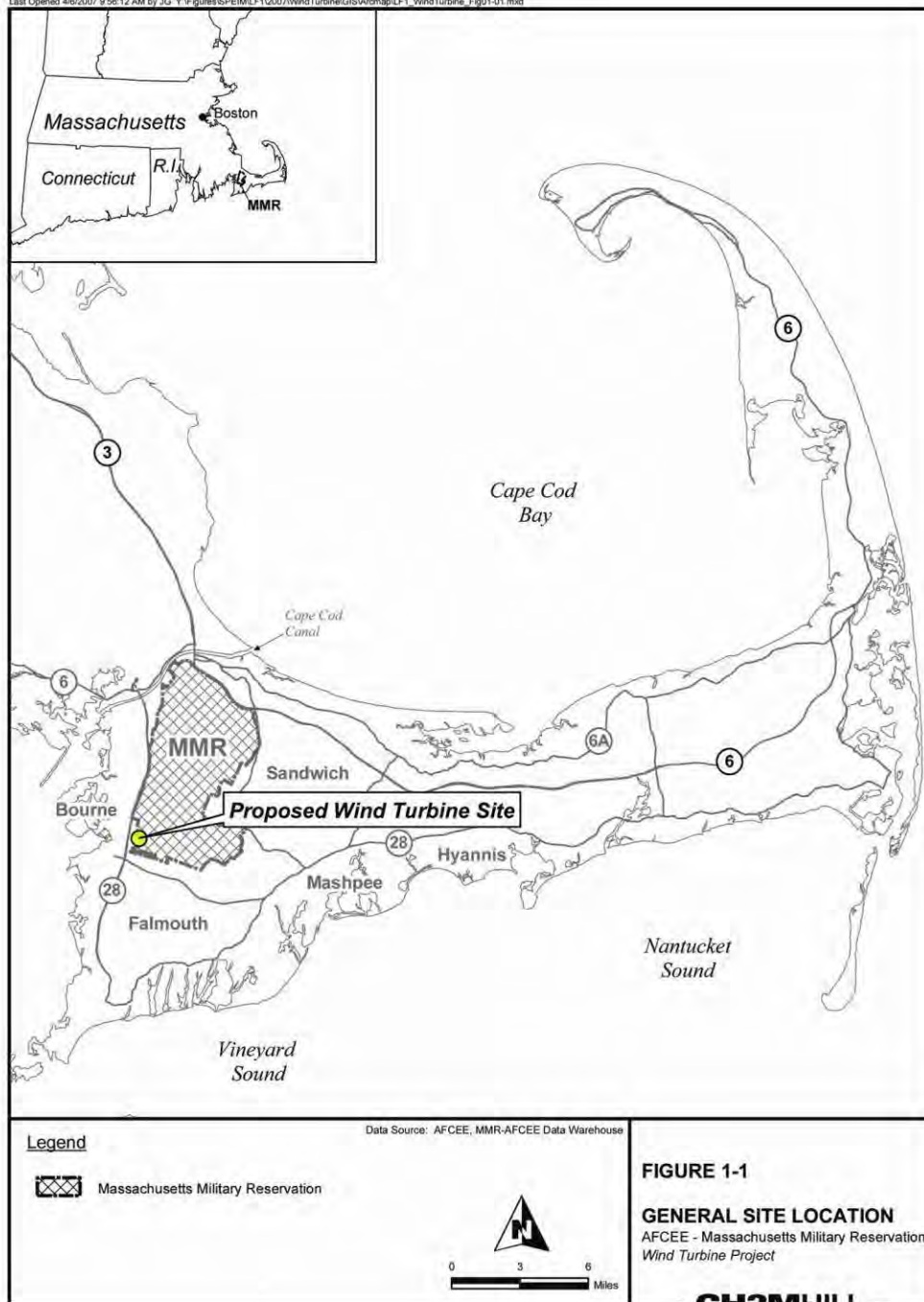
- CO₂: 6,741,300
- NO_x: 11,833
- SO₂: 11,443
- CO: 1,112
- VOCs: 442
- PM₁₀: 418

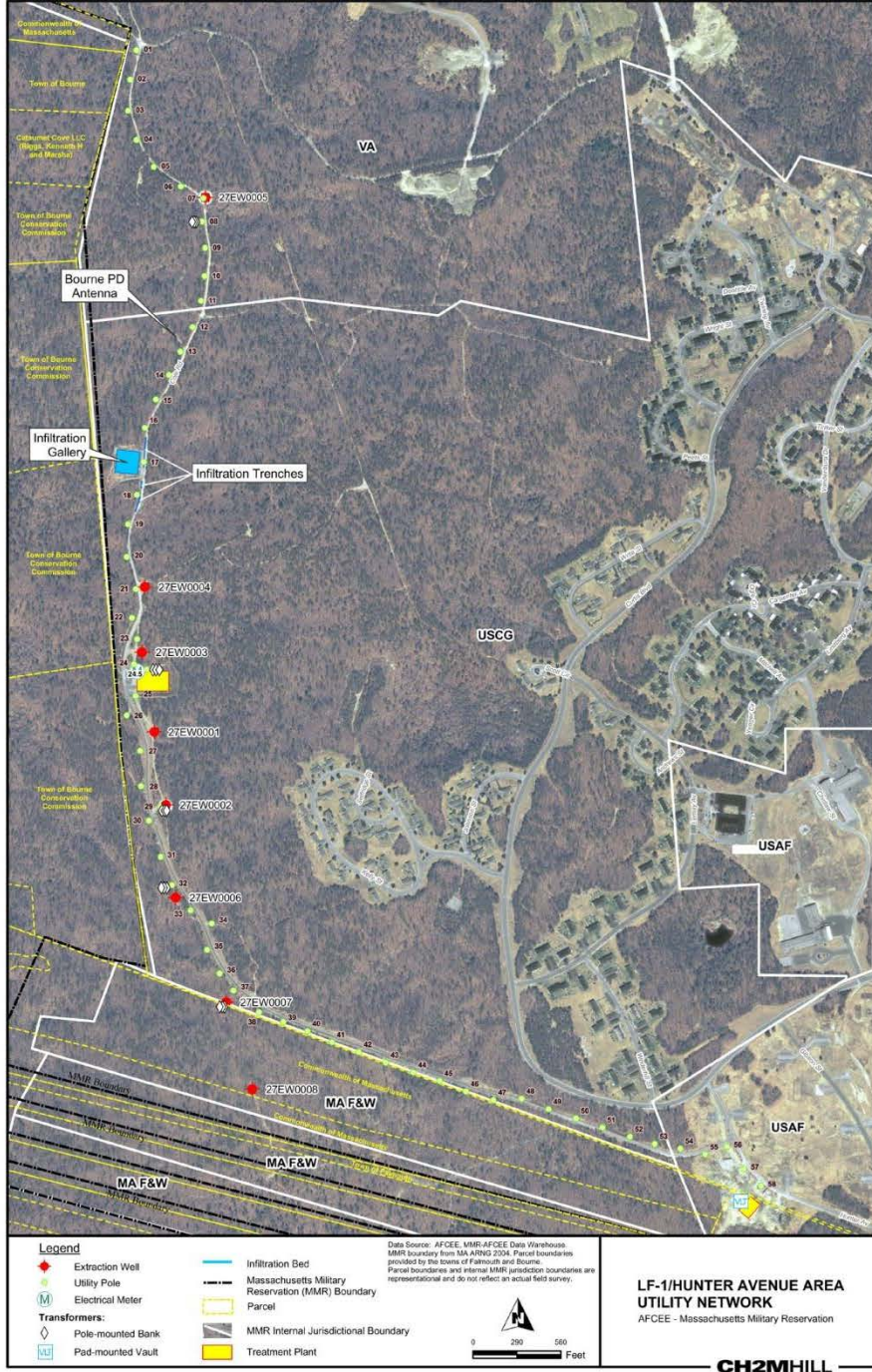
Wind Turbine - Energy Optimization

- Produce $\sim 3,810$ 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.





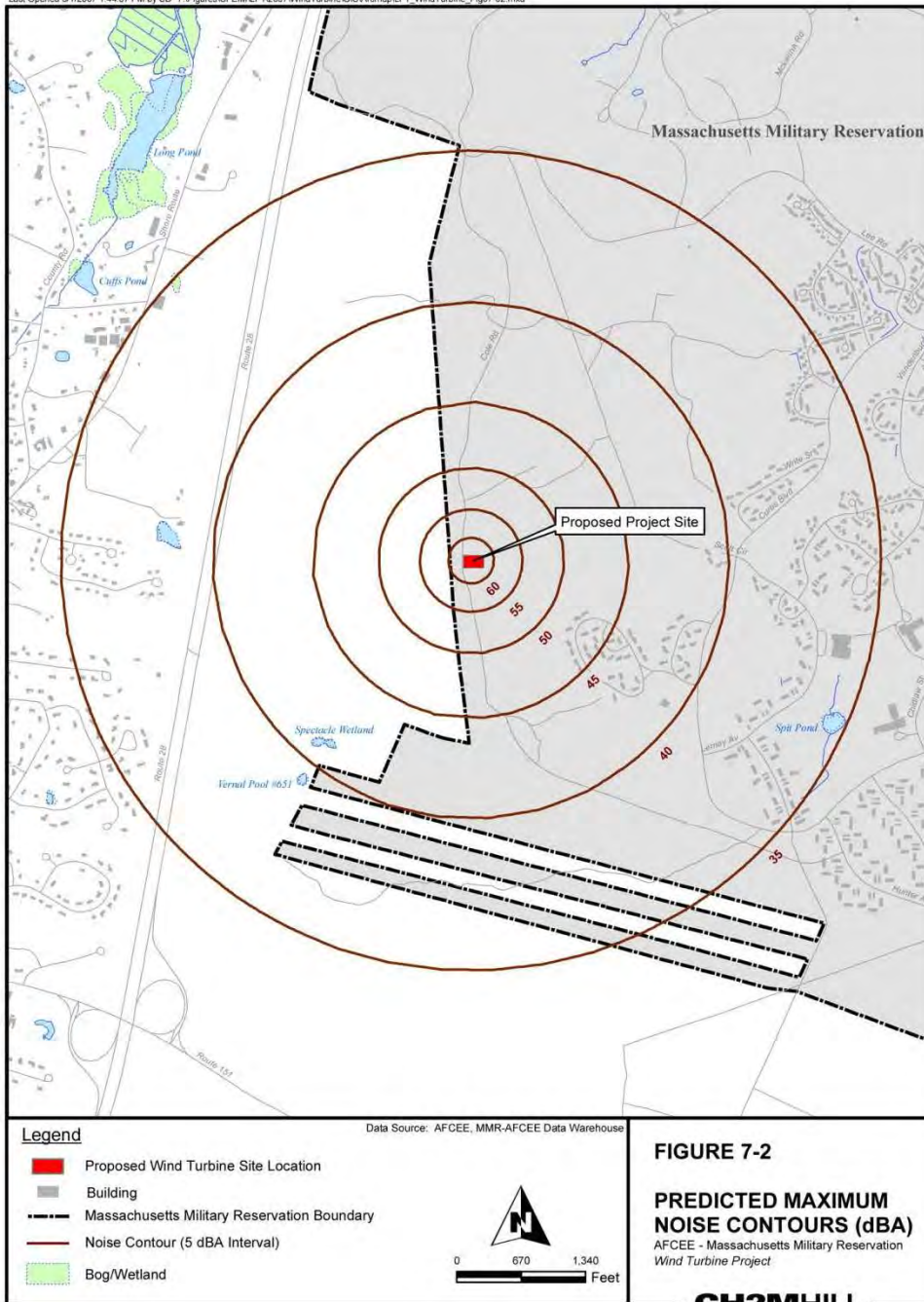
Fuhrlander FL-1500

- 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



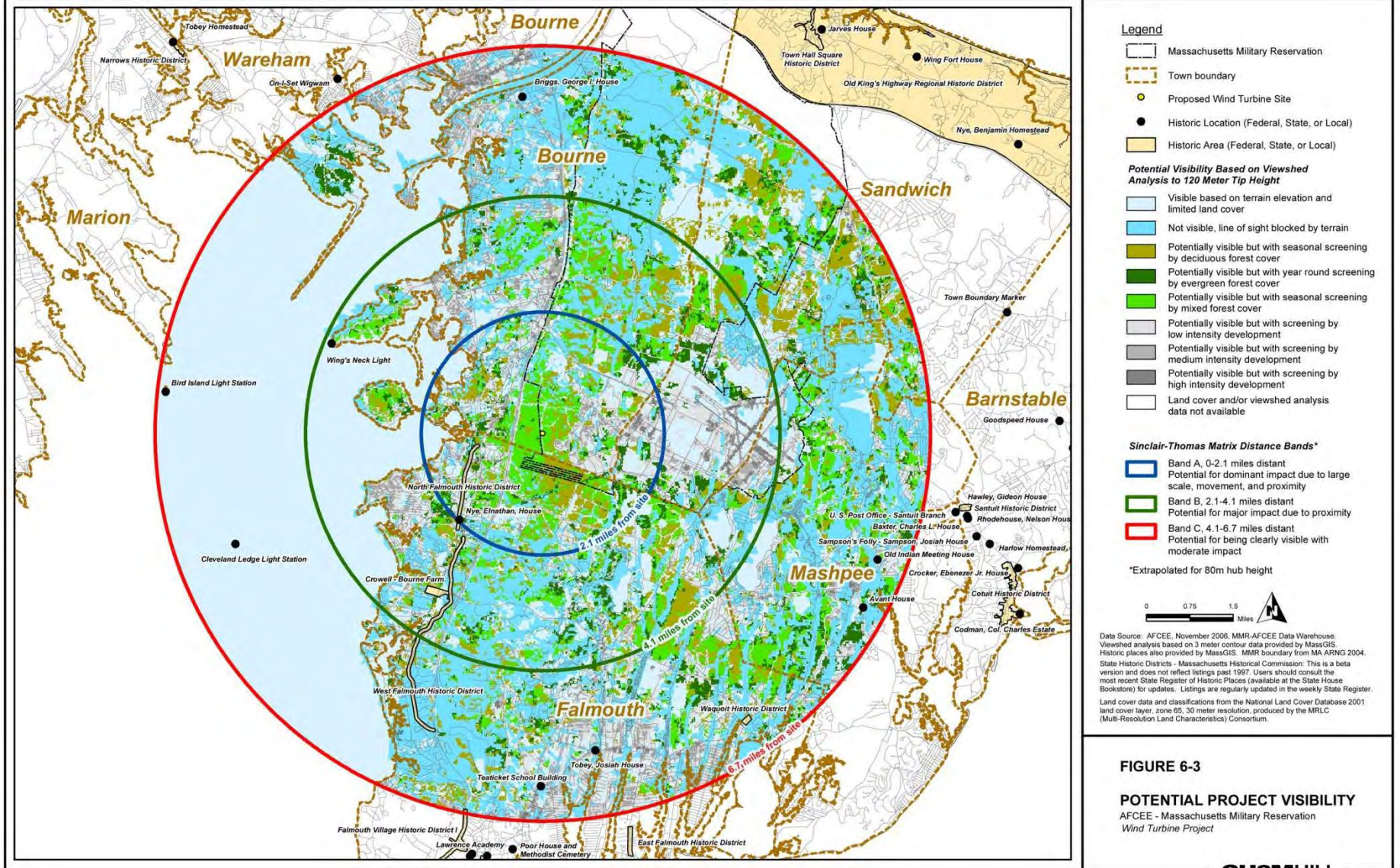


FIGURE 6-3

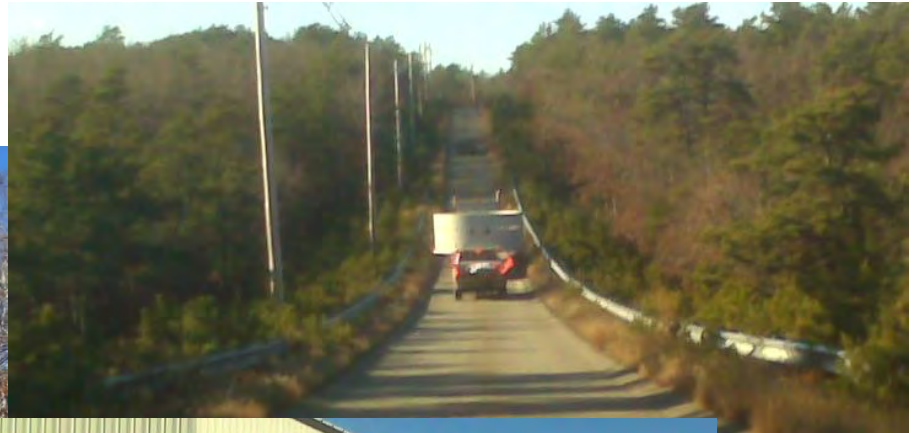
POTENTIAL PROJECT VISIBILITY
AFCEE - Massachusetts Military Reservation
Wind Turbine Project

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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