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Wind Energy Project Final Report

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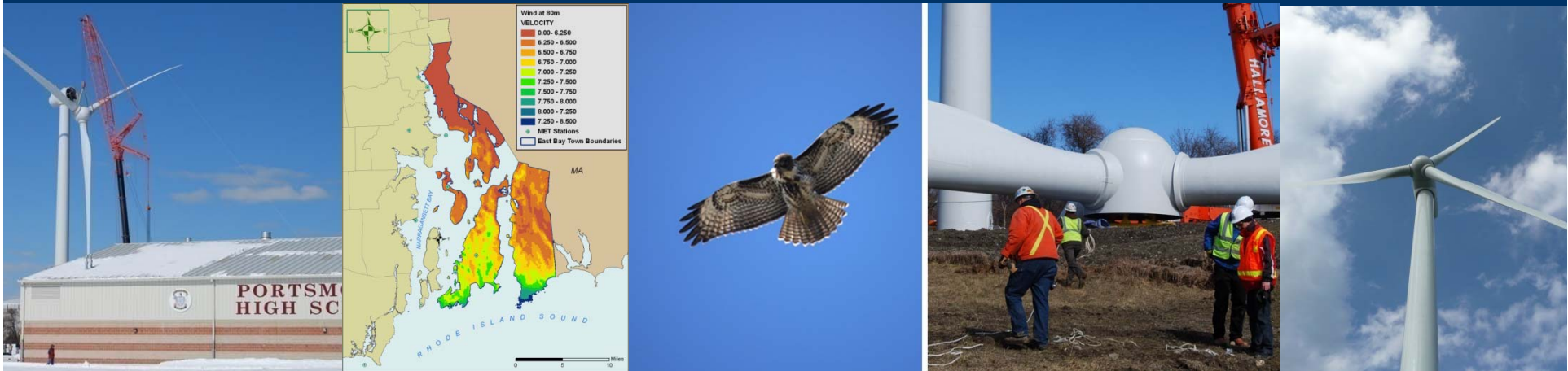
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East Bay Energy Consortium (EBEC)

Wind Energy Project Final Report



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March 1, 2010

www.asascience.com

Review - Load Summary

| Town | kWh | kW | kW - offset | kW-avg. |
|----------------|-------------------|--------------|-------------|--------------|
| Barrington | 1,924,142 | 220 | | 219.7 |
| Bristol | 3,204,203 | 366 | | 365.8 |
| Little Compton | 547,235 | 62 | | 62.5 |
| Middletown | 4,532,025 | 517 | | 517.4 |
| Newport | 29,264,397 | 3341 | | 3340.7 |
| Tiverton | 3,013,103 | 344 | | 344.0 |
| Warren | 2,673,452 | 305 | | 305.2 |
| Portsmouth | 4,095,966 | 468 | 377 | 90.9 |
| EP* | 8,878,668 | 1014 | | 1013.5 |
| TOTAL | 58,133,191 | 6,636 | 377 | 6,259 |

- Annual Load – 58.1MM kWh which equates to an average demand of 6,259kW (6.26MW) over a year (8760 hours)
- Based on net capacity factor of 25% the entire load could be offset by 25MW installed capacity



Review - Minimum Wind Criteria

- Projected Savings based on the value of offset energy
 - Cost of Energy
 - Production Estimates
- WTG Performance
Wind Resource**
- Minimum wind speed for EBEC assumed 6.4m/s
 - Based on current energy rates (conservative)

| Projects <3 MW | Units | Single WTG | Two WTG | > 3 WTG |
|------------------------------|---------------|-----------------|-----------------|-----------------|
| Avg Hub Ht. Wind Speed | m/s | 6.4 | 6.4 | 6.5 |
| Project Cost | \$/kW | 3000 | 2925 | 2850 |
| Debt Term | years | 20 | 20 | 20 |
| Debt Interest Rate | | 5% | 5% | 5% |
| Capacity Factor | | 25% | 24% | 25% |
| Capital Recovery Cost | \$/kW-year | \$241 | \$235 | \$229 |
| Annual Energy Production | kWh/kW | 2,173 | 2,073 | 2,165 |
| Capital Recovery Cost | \$/kWh | \$ 0.111 | \$ 0.113 | \$ 0.106 |
| O&M Cost | \$/kWh | \$ 0.025 | \$ 0.025 | \$ 0.020 |
| Total Project Cost | \$/kWh | \$ 0.136 | \$ 0.138 | \$ 0.126 |
| Net Metering Energy Value | \$/kWh | 0.114 | 0.114 | 0.105 |
| REC Value | \$/kWh | 0.025 | 0.025 | 0.025 |
| Total Project Revenue | \$/kWh | 0.139 | 0.139 | 0.130 |
| First Year Revenue - Cost | \$/kWh | 0.003 | 0.001 | 0.004 |



Review - Siting Criteria

- **Minimum Wind Speed**
 - 6.4m/s
- **Lot Ownership**
 - Town or EBEC Provided Lot
 - May consider specific private lots
- **Lot Size**
 - 10 acres minimum
 - Derived from Fall Zone of typical utility scale WTG
 - Geometry of Lot not considered at this time
- **Zoning**
 - Not considered
 - Most towns do not have regulations
 - Most Zoning ordinances consider fall zone, noise and shadow



Review - Economics

- 25MW required installed to offset entire EBEC Load
- Estimated Project Costs:
 - Project cost estimated by \$/kW installed rules of thumb
 - True \$/kW of installation affected by:
 - Wind Turbine Costs
 - Project Size (construction of 10MW project lower \$/kW than ten individual 1MW projects)
 - Project Site (construction/access/delivery/permitting costs)
 - **Electrical Interconnect**
 - Estimated average \$/kW between 2,650 – 3,000 \$/kW
 - For 25MW project – equates to \$66-75MM
 - Economic assessment based on comparison of project costs, revenues and projected savings

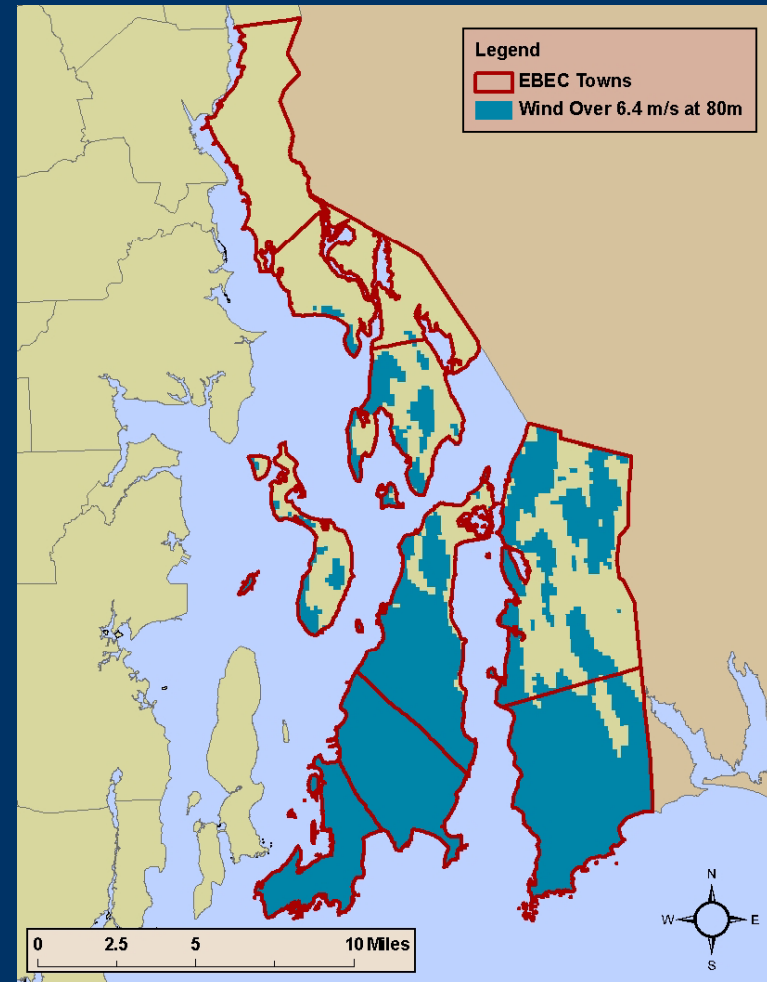
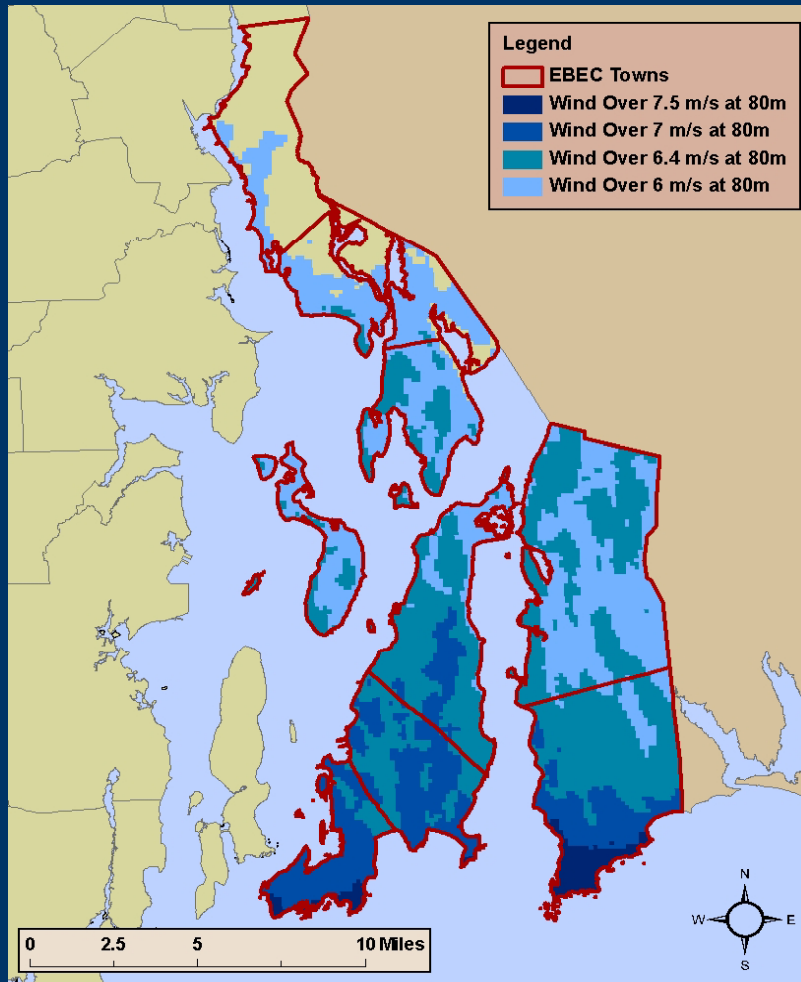


Review - Approach

- GIS used as database for screening properties
- Plot of Areas with minimum wind speed
- Overlay of Lots for Consideration
 - Little Compton had no GIS parcel delineation
 - List of town properties was reviewed
 - Sites based on acreage were considered for further evaluation
- Removal of Lots under minimum size requirement (some exceptions)
- Removal of Lots not meeting minimum wind speed (some exceptions)
- Lots also removed at Town's/EBEC request
- **Result - list and map of parcels passing through screening process**



Review – Preliminary Results

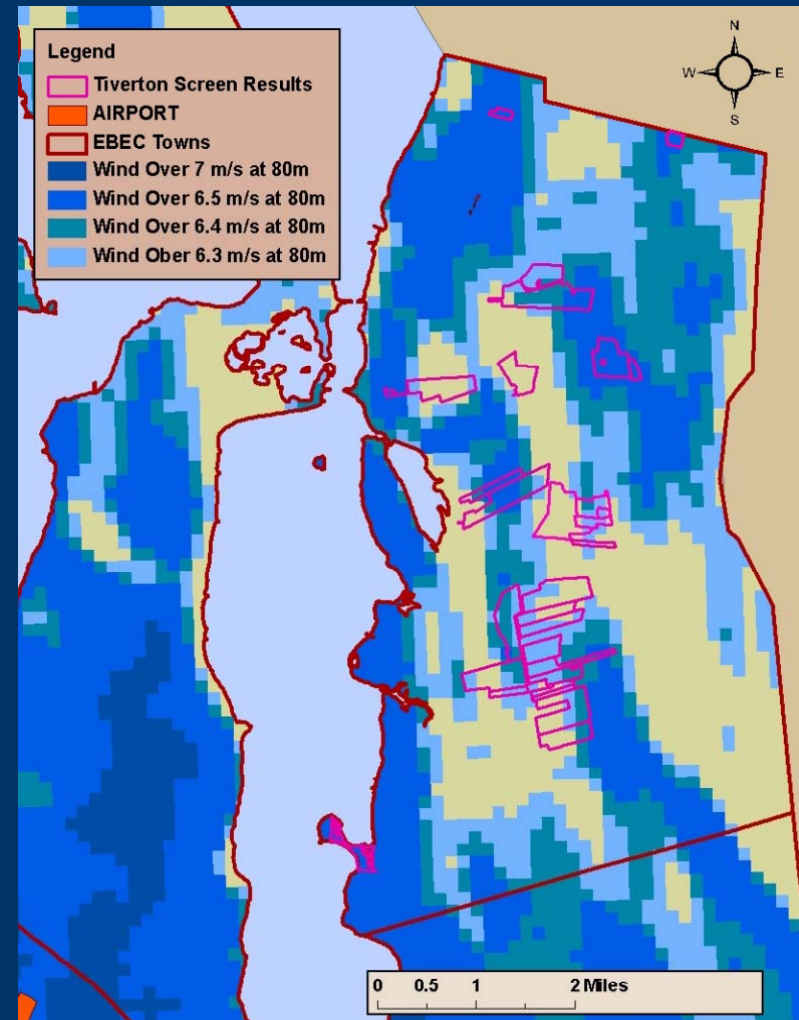
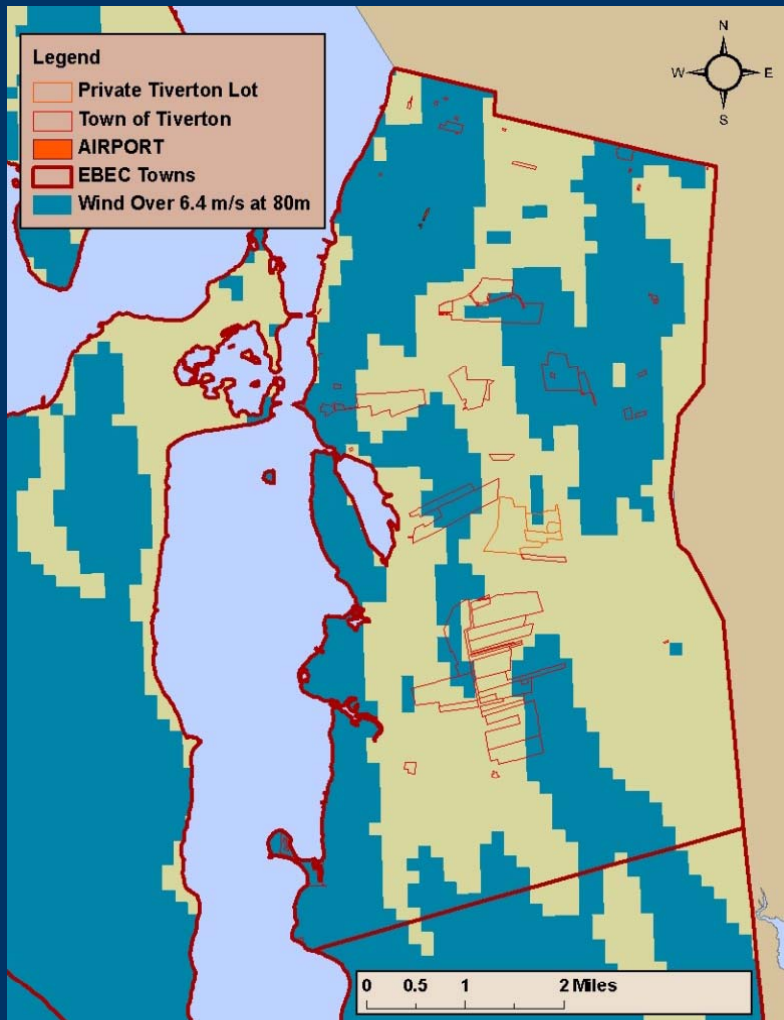


- East Providence, Barrington & Warren & sites screened out
- Bristol, Portsmouth, Middletown & Newport sites screened out or removed



Review - Results

Tiverton

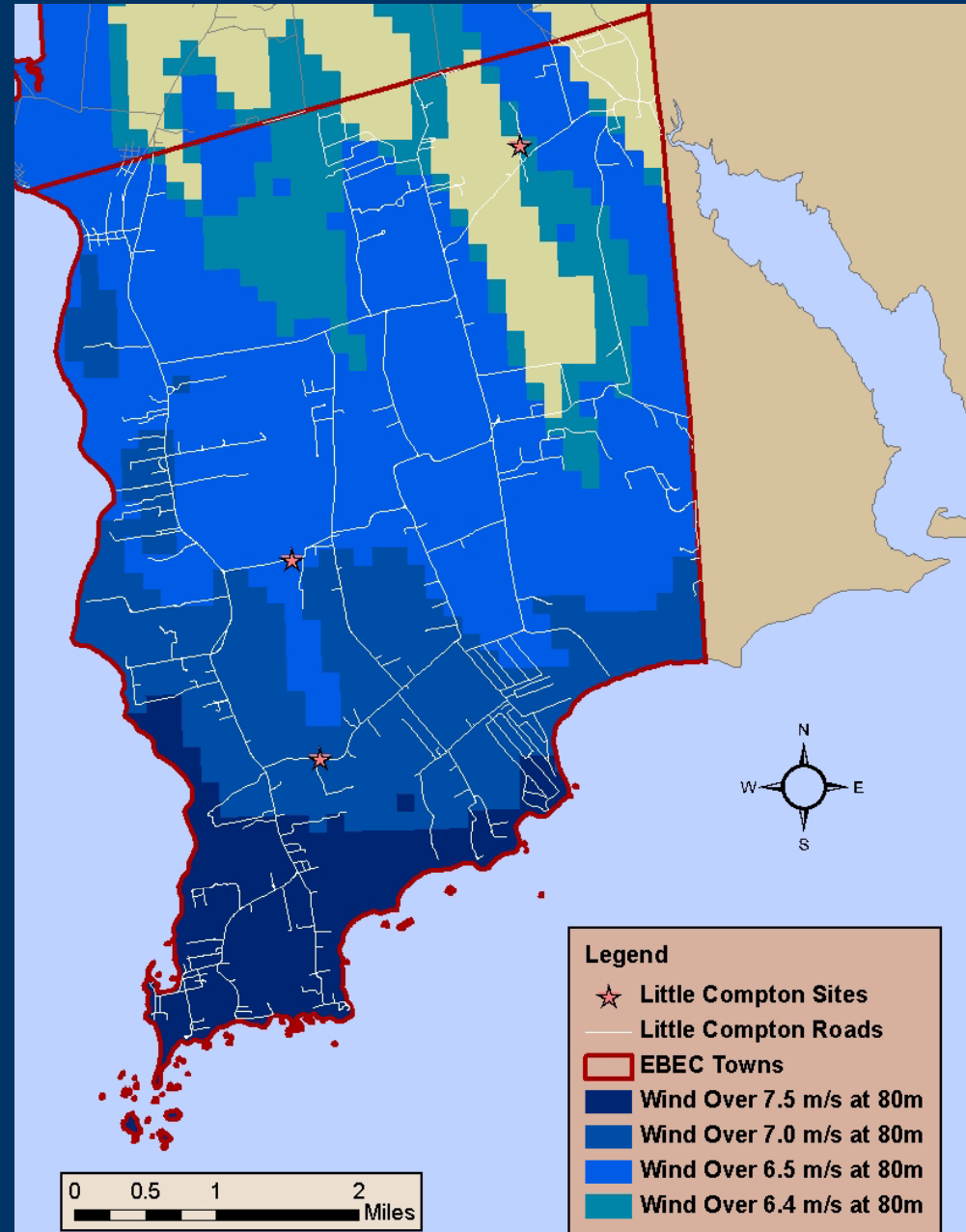


- 25 Town Lots plus combination of 4 Private Lots Pass through Screening

Review - Results

Little Compton

- 6 Potential Town Sites and 1 Potential Private Site
 - Some potential parcels co-located equating to three separate locations in town
- Lot sizes available from Vision Appraisal Website
- Lot Size Considered Less than 10 acres due to source of information and potential for abutting Town Lots



Review - Results

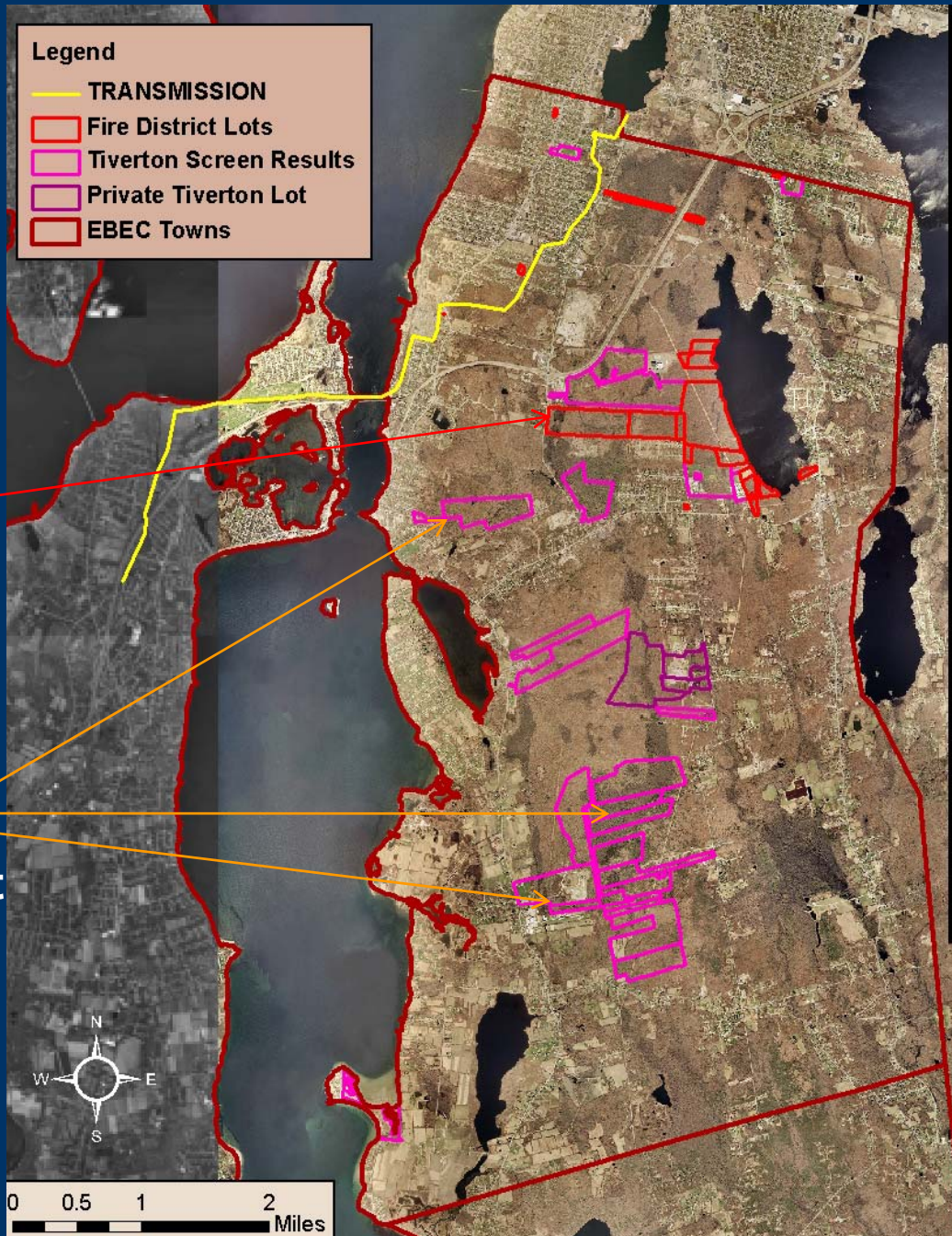
Little Compton



Results

Tiverton

- 25 Potential Town Site
- 1 Potential Private Site
- Fire District Sites not initially considered/not included in final ranking however are potentially available for development
- Fort Barton, Landfill & Weetamoo Woods thought unlikely for development



Electrical Interconnect

- Site review of Tiverton & Little Compton performed
- Transmission and distribution lines mapped
 - 12.47kV line to most areas
- Interconnect costs developed by potential project (group areas)
 - Tiverton
 - Industrial Park (1->3 WTGs)
 - Brayton Rd. (1-3 WTGs)
 - Eight Rod Way (1- >3 WTGs)
 - Little Compton
 - Amy Hart Path (1-3 WTGs)
 - Meeting House Lane (1 WTG)
 - Swamp Road (1-3 WTGs)
 - Costs
 - 1 WTG on 12.47kV line - \$430k
 - \$300-\$400k/mi to get to 12.47kV line
 - 2 WTGs on 12.47kV line - \$750k
 - 3 WTGs require new, dedicated 12.47kV line to Fish Rd substation:
\$400k/mi + \$1.55M
 - 4+ WTGs require new, 115kV line to Fish Rd substation + sub upgrade:
\$500k/mi + \$2.7M (+ \$1.7M for each add. Group of 4)



Ranking Process

- Site ranking developed on individual parcel basis
- Estimate potential project size based on lot size
- Develop preliminary project development costs including interconnect
- Develop preliminary project annual payment
 - 5% interest rate and 30% rebate assumed
 - Above assumptions similar to CREB financing – no rebate
- Estimate potential annual production
 - Weibull distribution
 - 1.65 MW power curve
 - Increased losses > 2 WTGs
- Estimate annual revenue
 - Production
 - RECs
 - Net, Less debt service + O&M
- **Final Rank developed based on annual revenue trend estimates**



Summary Top Rank Lots

| Parcel | Name | Description | Wind Speed | Acres | WTGs | Annual Prod. (kWh) | Cost (\$) | Annual pmt (30% rebate) 5% int | Annual prod. Rev (\$) | Annual net revenue | Rank |
|--------|--------------------------|---------------------------|------------|-------|------|--------------------|------------|--------------------------------|-----------------------|--------------------|------|
| 44 | Tiverton - Private | BRAYTON RD | 6.2 | 174.0 | 6 | 20,099,472 | 30,000,600 | (\$1,685,128) | \$2,210,942 | \$525,814 | 1 |
| 36 | Town Of Tiverton | FISH RD | 6.4 | 125.4 | 5 | 17,949,168 | 26,133,500 | (\$1,467,914) | \$1,974,409 | \$506,495 | 2 |
| 38 | Town Of Tiverton | NO BRAYTON RD | 6.6 | 73.1 | 3 | 11,611,065 | 14,846,750 | (\$833,939) | \$1,277,217 | \$443,278 | 3 |
| 49 | Little Compton | 111 SWAMP ROAD | 7.0 | 81.5 | 3 | 12,950,958 | 17,646,750 | (\$991,215) | \$1,424,605 | \$433,391 | 4 |
| 35 | Town Of Tiverton | FISH TO POND | 6.3 | 49.2 | 3 | 10,579,829 | 14,846,750 | (\$833,939) | \$1,163,781 | \$329,842 | 5 |
| 20 | Town Of Tiverton | FAIRFIELD AVE | 6.2 | 106.0 | 4 | 13,521,463 | 20,742,900 | (\$1,165,125) | \$1,487,361 | \$322,236 | 6 |
| 39 | Town Of Tiverton | FOGLAND RD | 6.7 | 37.1 | 2 | 8,109,111 | 9,437,250 | (\$530,089) | \$851,457 | \$321,368 | 7 |
| 40 | Town Of Tiverton | HIGHLAND RD | 6.2 | 84.2 | 3 | 10,232,459 | 14,846,750 | (\$833,939) | \$1,125,570 | \$291,631 | 8 |
| 21 | Town Of Tiverton | EIGHT ROD WAY & LAKE RD | 6.2 | 102.2 | 4 | 13,521,463 | 21,542,900 | (\$1,210,061) | \$1,487,361 | \$277,300 | 9 |
| 24 | Town Of Tiverton | EIGHT ROD WAY | 6.2 | 101.9 | 4 | 13,521,463 | 21,542,900 | (\$1,210,061) | \$1,487,361 | \$277,300 | 9 |
| 19 | Town Of Tiverton | MAIN RD | 6.6 | 33.3 | 2 | 7,878,937 | 10,137,250 | (\$569,407) | \$827,288 | \$257,881 | 11 |
| 41 | Town Of Tiverton | FISH RD | 6.1 | 58.3 | 3 | 9,883,786 | 14,846,750 | (\$833,939) | \$1,087,216 | \$253,277 | 12 |
| 50 | Little Compton - Private | 11 Rita Way | 7.0 | 7.9 | 1 | 4,625,342 | 5,035,000 | (\$282,815) | \$527,289 | \$244,474 | 13 |
| 31 | Town Of Tiverton | EIGHT ROD WAY | 6.3 | 47.5 | 3 | 10,579,829 | 16,446,750 | (\$923,811) | \$1,163,781 | \$239,970 | 14 |
| 33 | Town Of Tiverton | EIGHT ROD WAY | 6.3 | 84.1 | 3 | 10,579,829 | 16,446,750 | (\$923,811) | \$1,163,781 | \$239,970 | 14 |
| 45 | Little Compton | 60 SIMMONS ROAD | 6.9 | 3.9 | 1 | 4,507,294 | 4,885,000 | (\$274,390) | \$513,832 | \$239,442 | 16 |
| 51 | Little Compton | 15 MEETING HOUSE LANE | 6.9 | 10.1 | 1 | 4,507,294 | 4,885,000 | (\$274,390) | \$513,832 | \$239,442 | 16 |
| 23 | Town Of Tiverton | EIGHT ROD WAY | 6.2 | 57.5 | 3 | 10,232,459 | 16,446,750 | (\$923,811) | \$1,125,570 | \$201,760 | 18 |
| 28 | Town Of Tiverton | MAIN RD | 6.2 | 96.2 | 3 | 10,232,459 | 16,446,750 | (\$923,811) | \$1,125,570 | \$201,760 | 18 |
| 32 | Town Of Tiverton | LAKE RD | 6.2 | 44.3 | 3 | 10,232,459 | 16,446,750 | (\$923,811) | \$1,125,570 | \$201,760 | 18 |
| 43 | Town Of Tiverton | MAIN RD | 6.6 | 10.5 | 1 | 4,146,809 | 4,885,000 | (\$274,390) | \$472,736 | \$198,347 | 21 |
| 37 | Town Of Tiverton | QUINTAL DR | 6.5 | 11.0 | 1 | 4,024,792 | 4,885,000 | (\$274,390) | \$458,826 | \$184,437 | 22 |
| 42 | Town Of Tiverton | HANCOCK ST | 6.5 | 13.0 | 1 | 4,024,792 | 4,885,000 | (\$274,390) | \$458,826 | \$184,437 | 22 |
| 27 | Town Of Tiverton | LAKE RD | 6.3 | 36.8 | 2 | 7,179,170 | 10,612,250 | (\$596,088) | \$753,813 | \$157,725 | 24 |
| 29 | Town Of Tiverton | LAKE RD | 6.3 | 43.6 | 2 | 7,179,170 | 10,612,250 | (\$596,088) | \$753,813 | \$157,725 | 24 |
| 47 | Little Compton | 144 AMY HART PATH | 6.3 | 7.2 | 1 | 3,778,510 | 4,885,000 | (\$274,390) | \$430,750 | \$156,361 | 26 |
| 48 | Little Compton | 128 AMY HART PATH | 6.3 | 26.0 | 1 | 3,778,510 | 4,885,000 | (\$274,390) | \$430,750 | \$156,361 | 26 |
| 46 | Little Compton | 44C SOUTH OF COMMONS ROAD | 6.2 | 8.0 | 1 | 3,654,449 | 4,885,000 | (\$274,390) | \$416,607 | \$142,218 | 28 |
| 30 | Town Of Tiverton | LAKE RD | 6.2 | 42.7 | 2 | 6,943,454 | 10,612,250 | (\$596,088) | \$729,063 | \$132,975 | 29 |
| 22 | Town Of Tiverton | EIGHT ROD WAY | 6.2 | 14.9 | 1 | 3,654,449 | 5,260,000 | (\$295,453) | \$416,607 | \$121,154 | 30 |
| 25 | Town Of Tiverton | EIGHT ROD WAY | 6.2 | 16.2 | 1 | 3,654,449 | 5,260,000 | (\$295,453) | \$416,607 | \$121,154 | 30 |
| 26 | Town Of Tiverton | EIGHT ROD WAY | 6.2 | 13.3 | 1 | 3,654,449 | 5,260,000 | (\$295,453) | \$416,607 | \$121,154 | 30 |
| 34 | Town Of Tiverton | BRAYTON RD | 6.2 | 13.0 | 1 | 3,654,449 | 5,260,000 | (\$295,453) | \$416,607 | \$121,154 | 30 |

Results Summary

- East Providence, Barrington & Warren
 - Screened Out due to insufficient Wind at Municipal Owned Sites
- Bristol, Portsmouth, Middletown and Newport
 - A few lots each, areas reflective of smaller projects – subsequently screened out
- Tiverton
 - Many lots, some on the cusp of the economical wind speed
- Little Compton
 - A few lots, some with a large area and high wind speed
- Little Compton and Tiverton have less developed abutting areas to municipal lots

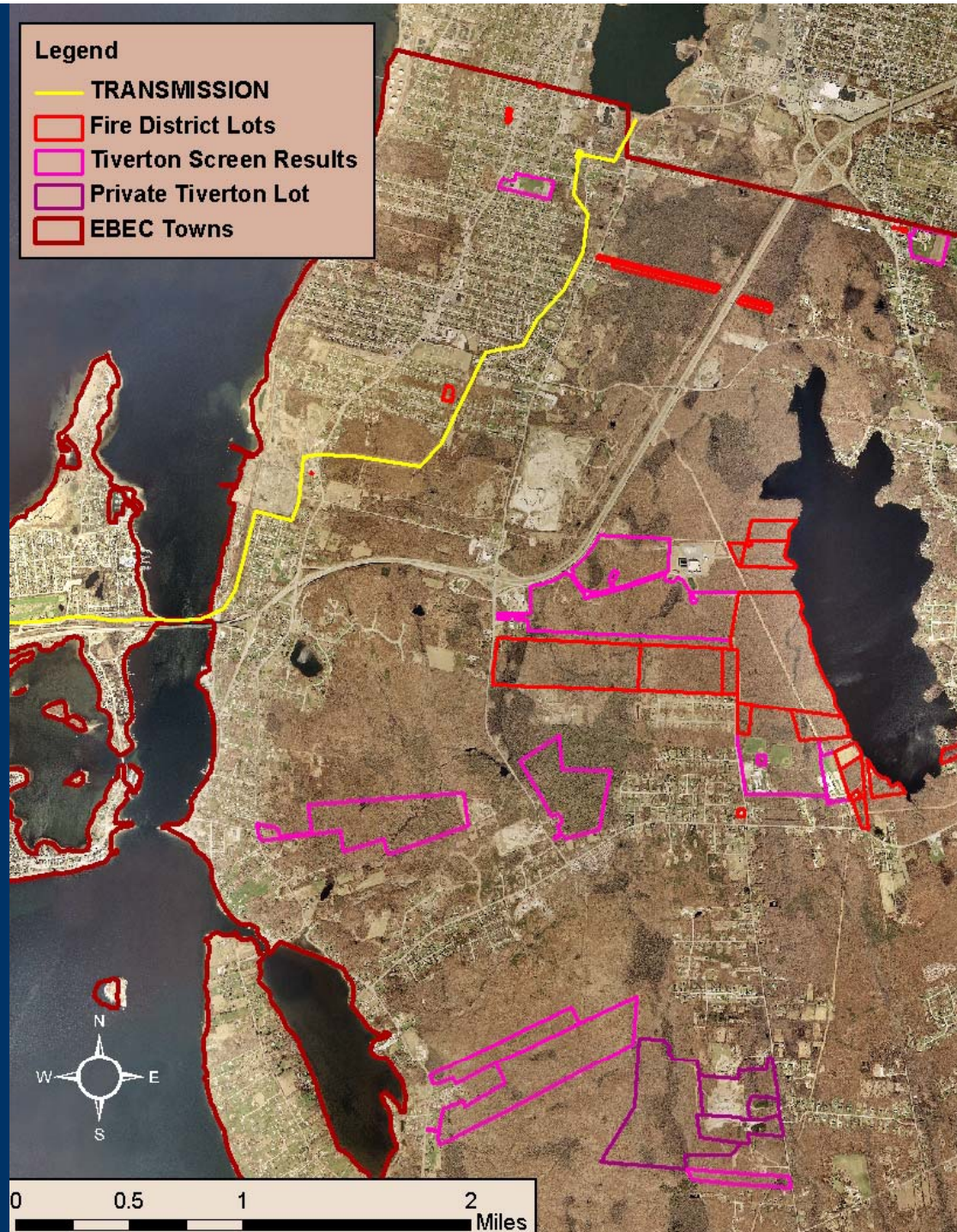


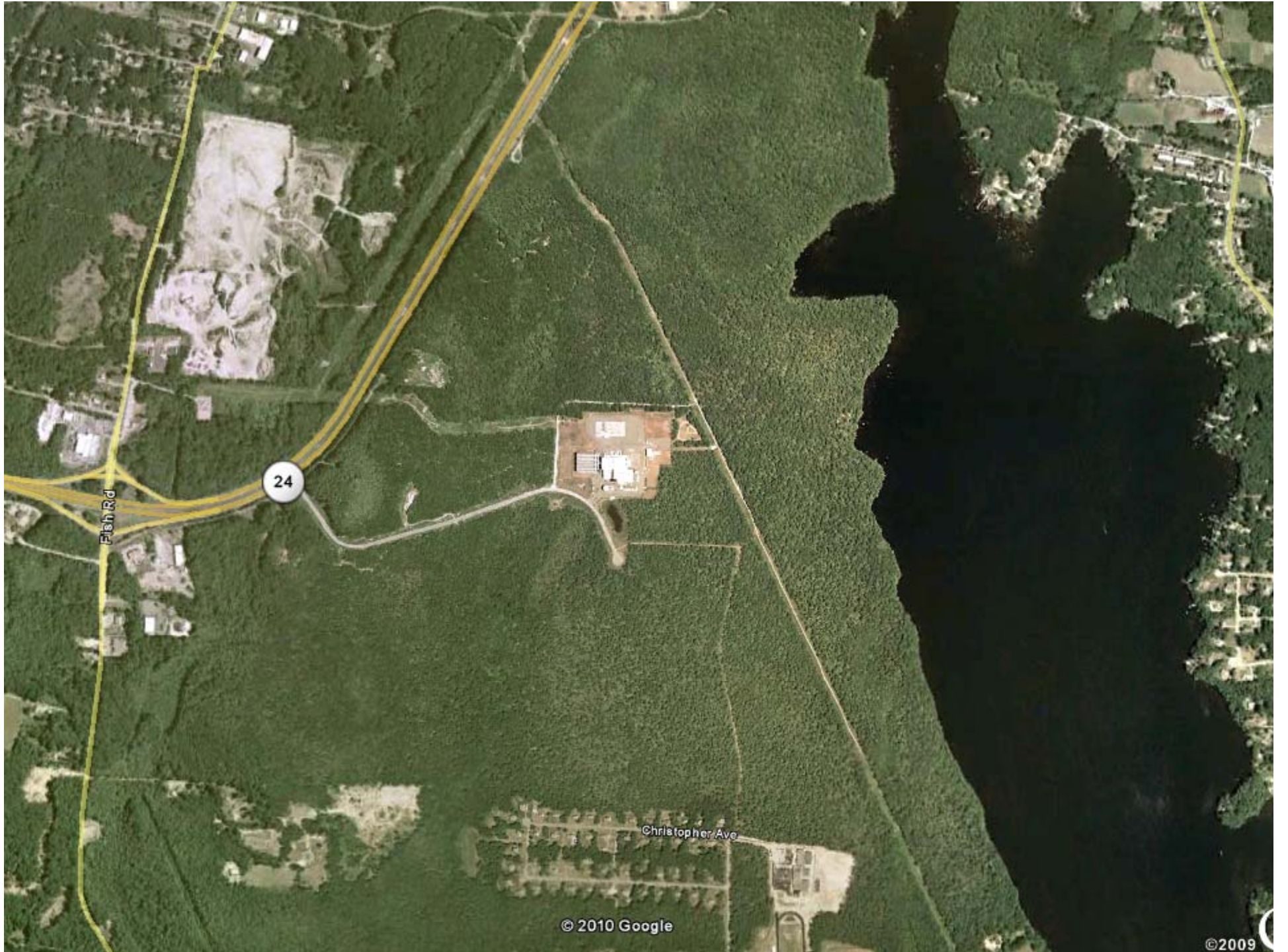
Phase II

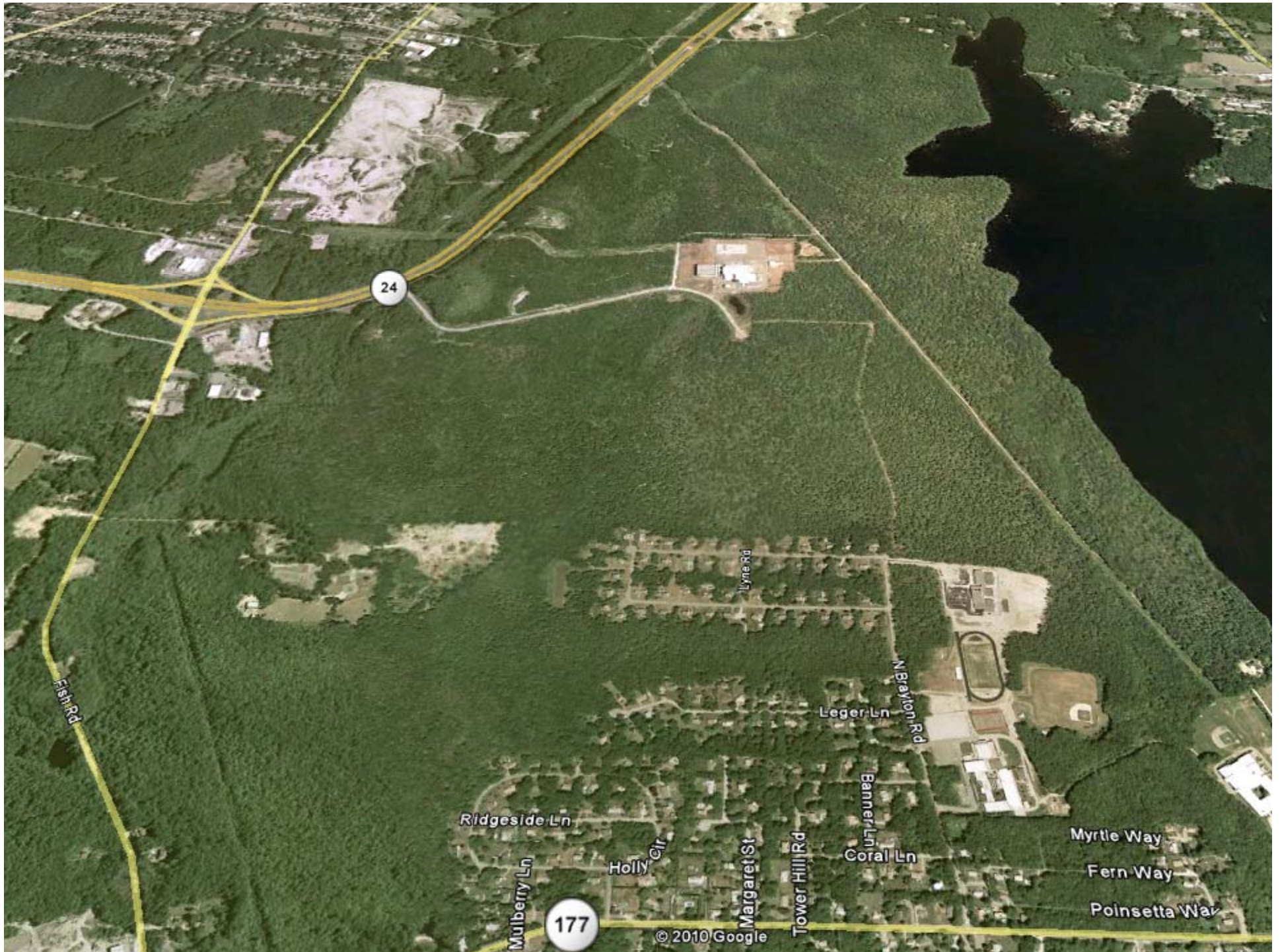
- Develop project(s) from top ranked sites
 - Focus now on Tiverton Industrial Park (Fish Rd.)
 - Town lots + water/fire district lots
- Vet selected sites
 - Meet with town planners, zoning board, water/fire board
 - Deed search
- Joint decision meeting – finalize project definition
- Detailed technical & economic feasibility study
- Evaluate competing strategies (Dzykewicz)



Results Tiverton

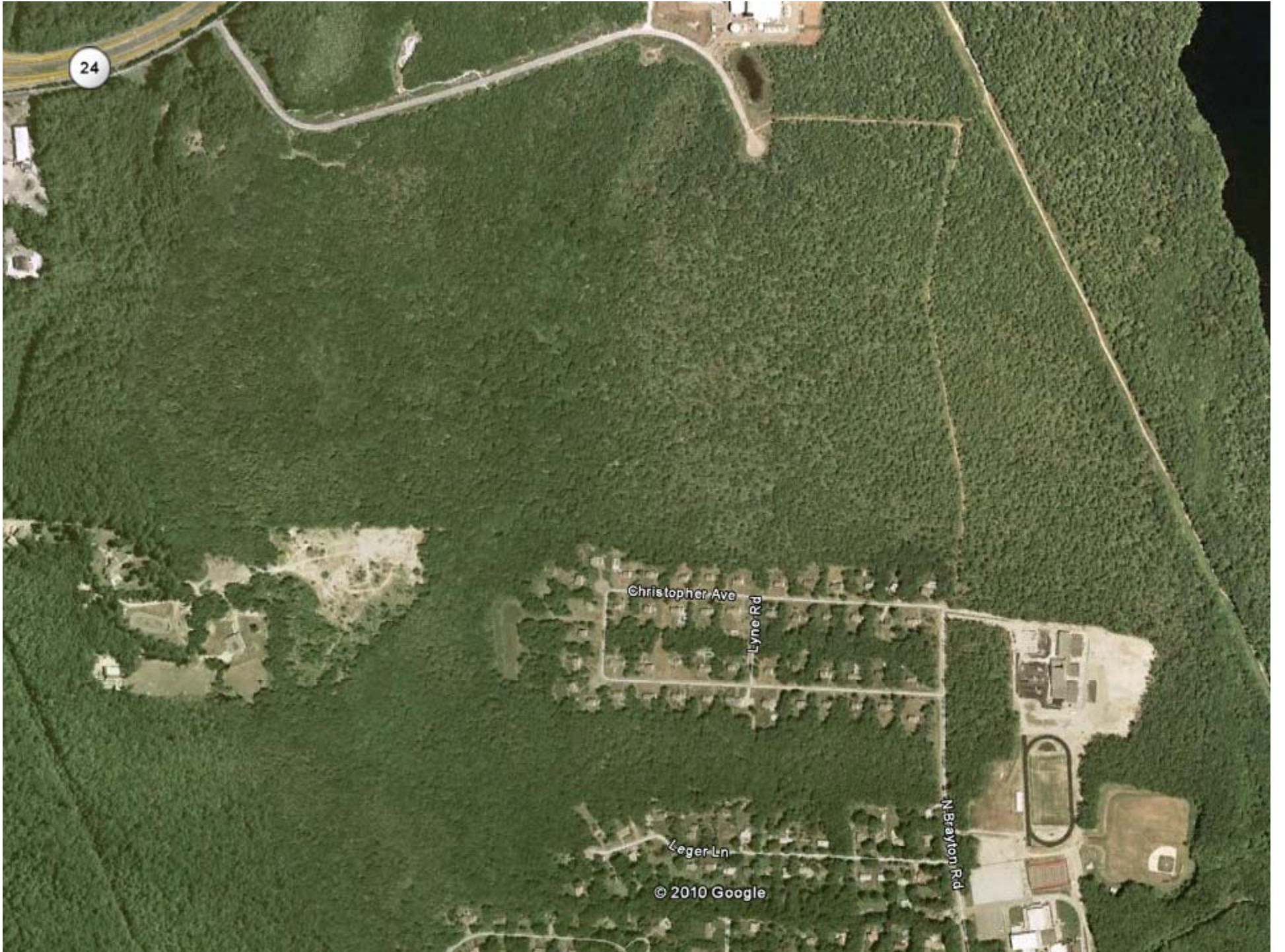








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Christopher Ave

Lynne Rd

Leger Ln

N Brayton Rd

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