Two Rivers-Ottauquechee
REGIONAL COMMISSION

April 28, 2017

Jeff Goodrich
Planning Commission Chair
Town of Norwich
P.O. Box 376
Norwich, VT 05055

RE: Municipal Summary Worksheet - Energy

Mr. Goodrich:

TRORC is pleased to have prepared and enclose a copy of the Municipal Summary Worksheet and maps for your town, which summarizes the type of data that is required to be in an "Enhanced Energy Plan" under the energy planning law passed last year and known as "Act 174". As you are aware, writing an "Enhanced Energy Plan" and seeking a determination of energy compliance is optional for communities. If your town chooses to write one and meets the municipal standards set by the Department of Public Service, the town plan receives substantial deference in renewable energy generation Certificate of Public Good process. The data in the attached document provides analyses and targets derived from regional analyses and targets. Municipalities ***may*** choose to rely on these "municipalized" analyses and targets to meet the standards in this section.

Municipalities which elect to use the analysis and targets provided by the TRORC will be presumed to have met the Analysis and Targets standards. Alternatively, municipalities may develop their own custom analyses and targets or supplement the analyses and targets provided by the RPCs with specific local data; if this option is chosen, the analysis and targets must include all of the same components and meet the standards required of regions, as described in the standard checklist. Some of the numbers such as current electricity use by town will need to be updated when TRORC receives new data. The Summary worksheet, maps, and the excel worksheet that feeds the data into the summary sheet will be emailed out and can also be found on the TRORC website under your respective town page site. If you have any questions about the attached document or energy planning for your community please don't hesitate to contact us.

Sincerely,

Christopher Damiani
Planner

128 King Farm Rd.
Woodstock, VT 05091
802-457-3188
trorc.org
William B. Emmons, III, Chair
Peter G. Gregory, AICP, Executive Director

cc: Peter G. Gregory, Executive Director, Linda Gray, Town Energy Committee, File

Municipal Template - Energy Data

The following is an explanation of the information displayed in the Municipal Template for Norwich.

The intent of the Municipal Template is to provide the municipality with data that can be used to ensure compliance with the requirements of Act 174 and "Enhanced Energy Planning" (24 V.S.A. 4352). The spreadsheet contains data that estimates current energy use and provides targets for future energy use across all sectors (transportation, heating, and electricity). It also sets a target for renewable energy generation within the municipality.

This data is meant to be a starting point for the municipality to begin planning its energy future and to talk about the changes that may need to occur within the municipality to ensure that local, regional and state energy goals are met. This includes the goal that 90% of all energy demand be met by renewable sources by 2050.

Figure 1 - Data Sources

American Community Survey (ACS)

Vermont Department of Labor (DOL)

Vermont Department of Public Service (DPS)

Energy Information Administration (EIA)

Efficiency Vermont (EVT)

Long-range Energy Alternatives Planning (LEAP)

Vermont Energy Investment Corporation (VEIC)

Vermont Agency of Transportation (VTRANS)

Estimates of current energy use consist primarily of data available from the American Community Survey (ACS), the Vermont Agency of Transportation (VTrans), the Vermont Department of Labor (DOL), and the Vermont Department of Public Service (DPS). Targets for future energy use are reliant upon the Long-range Energy Alternatives Planning (LEAP) analysis for the region completed the Vermont Energy Investment Corporation (VEIC). Targets for future energy generation have come from the regional planning commission and DPS. Targets for both future energy use and energy generation have been generally developed using a "top down" method of disaggregating regional data to the municipal level. This should be kept in mind when reviewing the template. It is certainly possible to develop "bottom up" data. For those municipalities interested in that approach, please see the Department of Public Service's Analysis and Targets Guidance.

There are some shortcomings and limitations associated the data used in the Municipal Template. For instance, assumptions used to create the LEAP analysis are slightly different than assumptions used to calculate current municipal energy use. Regardless, the targets established here show the direction in which change needs to occur to meet local, regional and state energy goals. It is important to remember that the targets established by LEAP represents only on way to achieve energy goals. There may several other similar pathways that a municipality may choose to take in order to meet the 90x50 goal.

Below is a worksheet by worksheet explanation of the Municipal Template spreadsheet:

1. Municipal Summary

The Municipal Summary worksheet summarizes all data that is required to be in the Municipal Plan if the plan is to meet the "determination" standards established by the Vermont Department of Public Service.

1A. Current Municipal Transportation Energy Use	
Transportation Data	**Municipal Data**
Total # of Vehicles (ACS 2011-2015)	2,258
Average Miles per Vehicle (VTrans)	11,356
Total Miles Traveled	25,641,848
Realized MPG (VTrans)	18.6
Total Gallons Use per Year	1,378,594
Transportation BTUs (Billion)	166
Average Cost per Gallon of Gasoline (RPC)	2
Gasoline Cost per Year	3,184,552

This table uses data from the American Community Survey (ACS) and Vermont Agency of Transportation (VTrans) to calculate current transportation energy use and energy costs.

1B. Current Municipal Residential Heating Energy Use				
Fuel Source	**Municipal Households (ACS 2011-2015)**	**Municipal % of Households**	**Municipal Square Footage Heated**	**Municipal BTU (in Billions)**
Natural Gas	69	5.1%	6,606,900,000	7
Propane	243	18.0%	26,523,600,000	27
Electricity	61	4.5%	5,494,800,000	5
Fuel Oil	713	52.9%	79,729,500,000	80
Coal	14	1.0%	1,680,000,000	2
Wood	227	16.8%	25,566,900,000	26
Solar	0	0.0%	0	0
Other	11	0.8%	1,320,000,000	1
No Fuel	11	0.8%	762,300,000	1
Total	**1349**	**100.0%**	**147,684,000,000**	**148**

This table displays data from the ACS that estimates current municipal residential heating energy use.

1C. Current Municipal Commercial Energy Use

	Commercial Establishments in Municipality (VT DOL)	Estimated Thermal Energy BTUs per Commercial Establishment (in Billions) (VDPS)	Estimated Thermal Energy BTUs by Commercial Establishments in Municipality (in Billions)
Municipal Commercial Energy Use	111	0.725	80

The table uses data available from the Vermont Department of Labor (VT DOL) and the Vermont Department of Public Service (DPS) to estimate current municipal commercial establishment energy use in the municipality.

1D. Current Electricity Use *

Use Sector	Current Electricity Use
Residential (kWh)	11,075,308
Commercial and Industrial (kWh)	12,927,092
Total (kWh)	24,002,400

*This table displays current electricity use within the municipality with data from the ACS, DPS, and VT DOL. More accurate data will be available soon from Efficiency Vermont (EVT).

1E. Residential Thermal Efficiency Targets

	2025	2035	2050
Residential - Increased Efficiency and Conservation (% of municipal households to be weatherized)	33%	67%	100%

This table displays targets for thermal efficiency for residential structures based on a methodology developed by DPS using data available from the regional Long-range Energy Alternatives Planning (LEAP) analysis and ACS. The data in this table represents the percentage of municipal households that will need to be weatherized in the target years.

1F. Commercial Thermal Efficiency Targets

	2025	2035	2050
Commercial - Increased Efficiency and Conservation (% of commercial establishments to be weatherized)	6%	9%	18%

This table shows the same information as Table 1E, but sets a target for commercial thermal efficiency. Information from the VT DOL is required to complete this target.

1G. Thermal Fuel Switching Targets (Residential and Commercial) - Wood Systems

	2025	2035	2050
New Efficient Wood Heat Systems (in units)	0	0	0

This target was calculated using data from LEAP and ACS. This table provides a target for new wood heating systems for residential and commercial structures in the municipality for each target year. Due to the LEAP model forecasting a large decrease in wood use resulting in a negative number of targets we have put zero in for this section. Towns are encouraged to use efficient wood heat.

1H. Thermal Fuel Switching Targets (Residential and Commercial) - Heat Pumps

	2025	2035	2050
New Heat Pumps (in units)	137	363	761

This table provides a target for new heat pump systems for residential and commercial structures in the municipality for each target year. This target was calculated using data from LEAP and ACS.

1I. Electricity Efficiency Targets

	2025	2035	2050
Increase Efficiency and Conservation	-0.6%	5.7%	9.9%

Data in this table displays a target for increased electricity efficiency and conservation during the target years. These targets were developed using regional LEAP analysis. Towns are encouraged to consider increased efficiency targets.

1J. Use of Renewables - Transportation

	2025	2035	2050
Renewable Energy Use - Transportation	9.6%	23.1%	90.3%

This data displays targets for the percentage of transportation energy use coming from renewable sources during each target year. This data was developed using the LEAP analysis.

1K. Use of Renewables - Heating

	2025	2035	2050
Renewable Energy Use - Heating	51.3%	63.4%	92.2%

This data displays targets for the percentage of heating energy use coming from renewable sources during each target year. This data was developed using information from the LEAP analysis.

1L. Use of Renewables - Electricity

	2050
Renewable Energy Use - Electricity (MWh)	19,167- 23,426

This data displays the target for electricity generation coming from renewable sources within the municipality for 2050. This data was developed using information from the regional planning commission and DPS. This data is the same as the data in Table 1Q.

1M. Transportation Fuel Switching Target - Electric Vehicles

	2025	2035	2050
Electric Vehicles	209	1482	3083

This tables displays a target for switching from fossil fuel based vehicles (gasoline and diesel) to electric vehicles. This target is calculated on Worksheet 2 by using LEAP and ACS data.

1N. Transportation Fuel Switching Target - Biodiesel Vehicles

	2025	2035	2050
Biodiesel Vehicles	368	692	1168

This tables displays a target for switching from fossil fuel based vehicles to biodiesel-powered vehicles. This target is calculated on Worksheet 2. by using LEAP and ACS data.

1O. Existing Renewable Generation

Renewable Type	MW	MWh
Solar	0.50	613
Wind	0.00	0
Hydro	0.00	0
Biomass	0.00	0
Other	0.00	0
Total Existing Generation	**0.50**	**613**

Table 1O shows existing renewable generation in the municipality as of 2015, in MW and MWh, based on information available from the Vermont Department of Public Service.

1P. Renewable Generation Potential

Renewable Type	MW	MWh
Rooftop Solar	2	2,335
Ground-mounted Solar	793	972,075
Wind	250	766,500
Hydro	0	151
Biomass and Methane	0	0
Other	0	0
Total Renewable Generation Potential	**1,045**	**1,741,061**

Renewable generation potential is based on mapping completed by the regional planning commission that is based on the Municipal Determination Standards and associated guidance documents developed by DPS. The renewable generation potential is expressed in MW and MWh by the type of renewable resource (solar, commercial wind, hydro, etc.).

1Q. Renewable Generation Target

	2050
Total Renewable Generation Target (in MWh)	19,167- 23,426

Renewable generation target for municipalities was developed by the town's population percentage within the region.

1R. Sufficient Land

	Y/N
Renewable Sources	Y
Surplus of Generation	8075%

This table shows whether or not there is sufficient land in the municipality to meet the renewable generation targets based on the renewable generation potential in the municipality.

Existing Energy Generation

This map was created as part of a Regional Energy Planning Initiative being conducted by the Two Rivers-Ottauquechee Regional Commission, and the Vermont Public Service Department.

Created:2017

NORWICH

BIOMASS KW

- 19
- 20 - 375

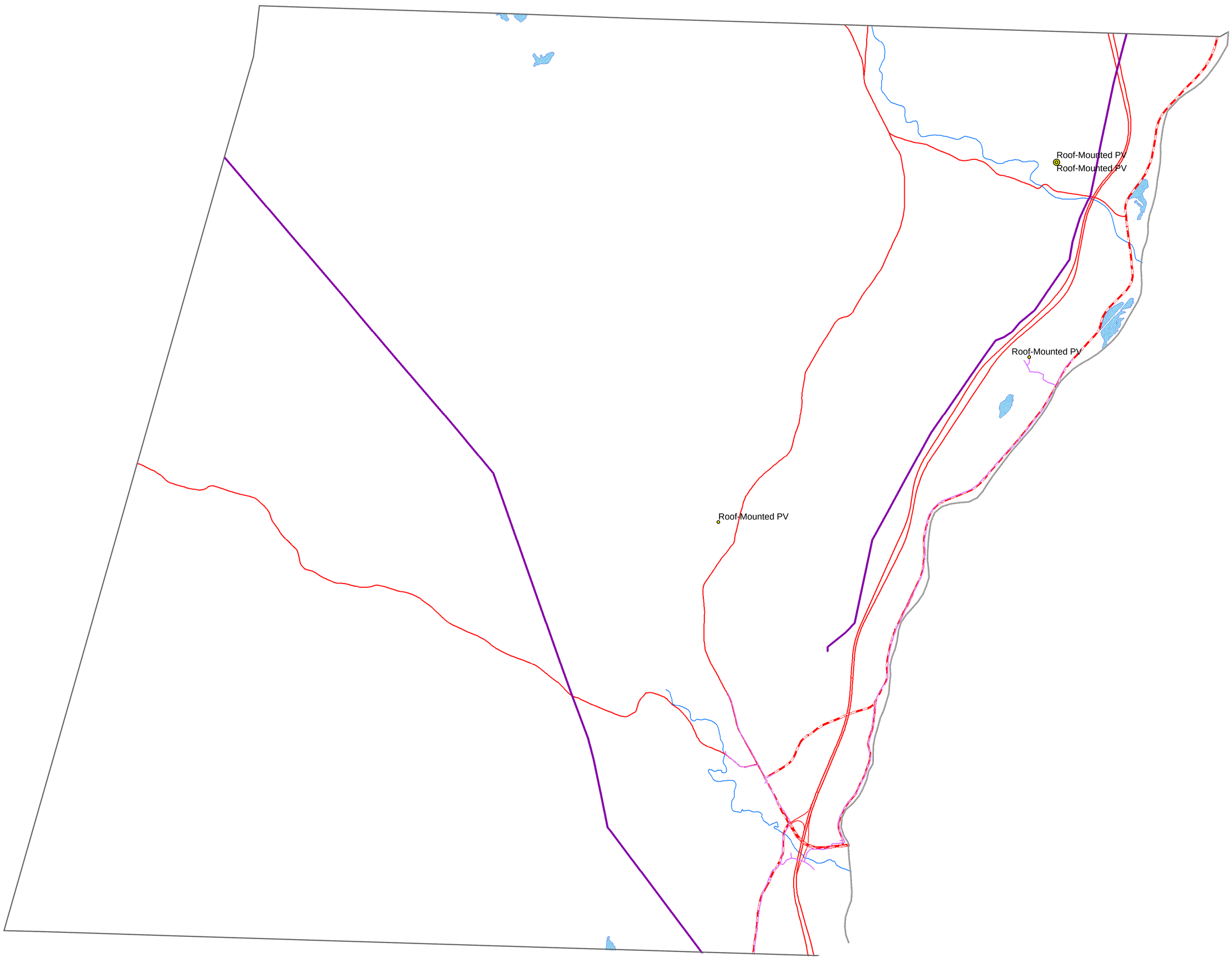
HYDRO KW

- 15 - 100
- 101 - 500
- 501 - 2000
- 2001 - 37400

SOLAR KW

- 15 - 25
- 26 - 100
- 101 - 500
- 501 - 2200

- Substations
- 3 Phase Power Lines
- Transmission Lines
- Lakes/Ponds



0 0.5 1 2 Miles

N

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BIOMASS Energy Potential

This map was created as part of a Regional Energy Planning Initiative.
Created: 2017

NORWICH

0 0.5 1 2 Miles

Biomass
Methodology: This map shows areas of potential for woody biomass production and harvest. The map also illustrates other conditions that may limit the feasibility of extensive harvesting of wood for energy use. These limiting factors are referred to as constraints. The map does not show areas where other types of biomass, such as biomass from grasses or agricultural residue, could be grown/harvested.

Constraints: Physical features or resources that make extensive harvesting infeasible are considered Level 1 constraints. Level 1 constraints include: FEMA floodways, river corridors, federal wilderness areas, rare and irreplaceable natural areas (RINAs), vernal pools, and class 1 and 2 wetlands. These areas have been removed and are not shown in any way on this map.

N

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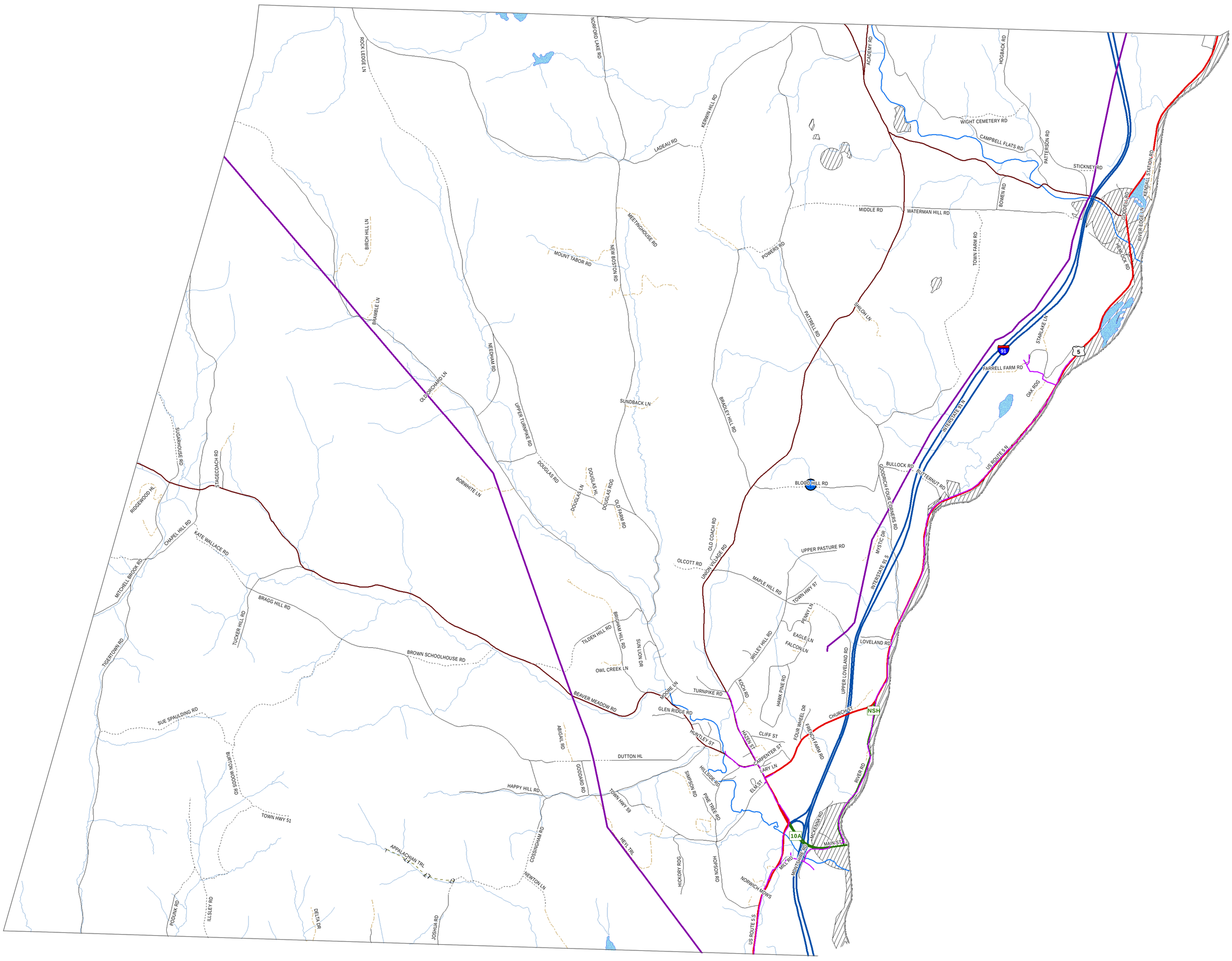
Conserved
- Public Cons
- Private Cons
- Substations
- 3 Phase Power Lines
- Transmission Lines
- Lakes/Ponds
- Rivers/Streams
- Woody Biomass

Hydroelectric Energy Potential NORWICH

This map was created as part of a Regional Energy Planning Initiative.
Created: 2017

- Substations
- 3 Phase Power Lines
- Transmission Lines
- Lakes/Ponds
- Rivers/Streams
- Operational Hydroelectric Facilities
- < 50 kW Capacity
- > 50 kW Capacity
- High Hazard with < 50 kW Capacity
- High Hazard with > 50 kW Capacity
- Impaired Waters
- Stressed Waters
- Designated Outstanding Resource Waters
- 0-3
- 4 - 6
- 7 - 9
- Rare and Irreplaceable Natural Areas (RINAs)



Hydroelectric
Methodology: This map shows areas of resource potential for renewable energy generation from hydroelectric facilities. Sites identified are existing dams that could be developed for hydroelectric generation as well as active hydroelectric facilities. Information on existing hydroelectric facilities was obtained from the Vermont Dam Inventory and data on potential hydroelectric sites was obtained from a study conducted by Community Hydro in 2007~. Potential hydroelectric generation capacity for several of the larger dams are noted below.

~ http://www.vtenergyatlas-info.com/wp-content/uploads/2010/02/DPS-Undeveloped-Hydro-Potential-FINAL-VERSION.pdf

N

0 0.5 1 2 Miles

Hydroelectric Constraint Description
* Rare and Irreplaceable Natural Areas (RINAs) are significant natural communities. They do not Include the following rank descriptions: uncommon to common breeder in VT, common to very common in VT, historic in VT, not applicable, unrankable, unrankable breeding population, and extirpated.

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Solar Energy Potential NORWICH

This map was created as part of a Regional Energy Planning Initiative.
Created: 2017

SOLAR POTENTIAL

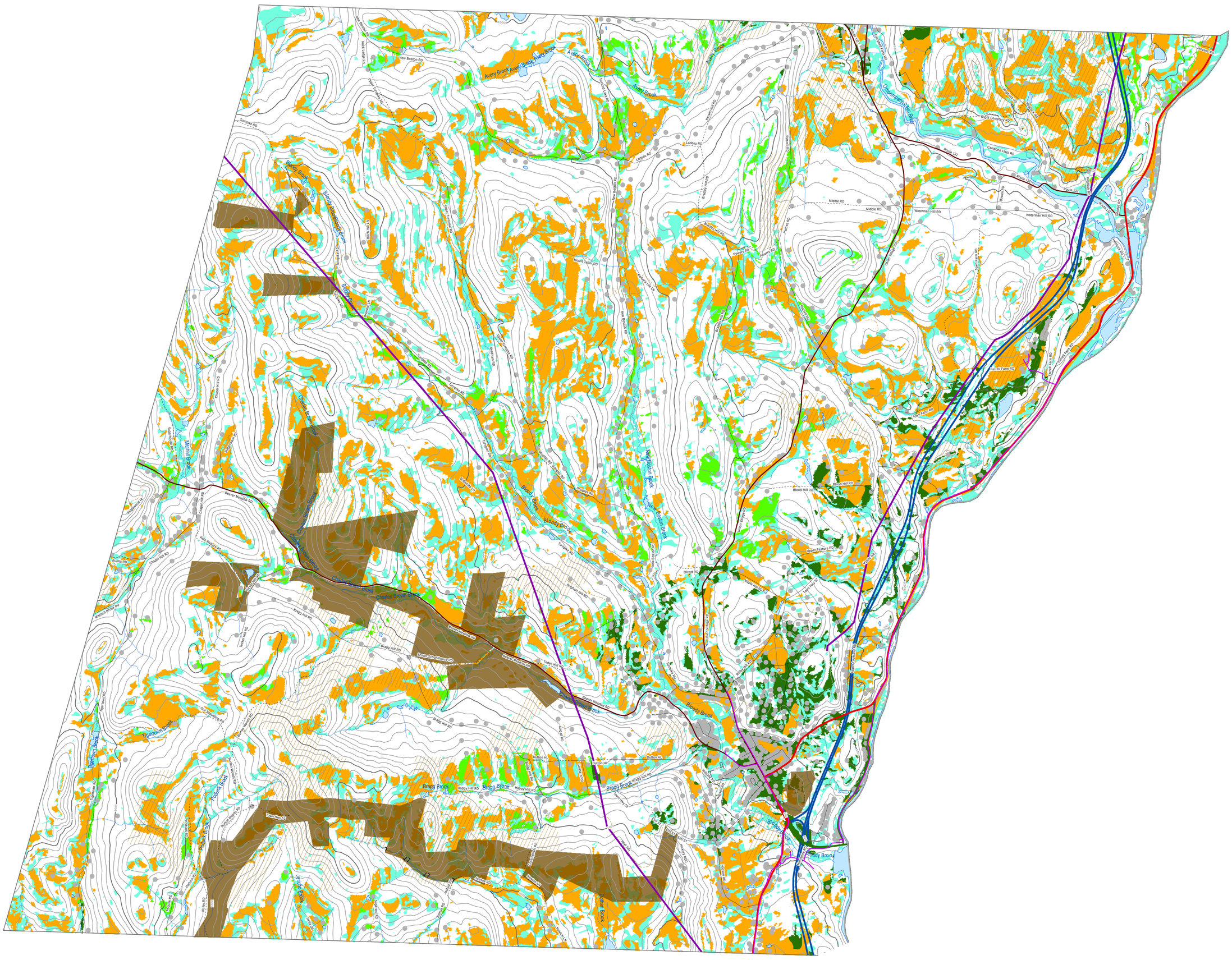
- Substations
- 3 Phase Power Lines
- Transmission Lines
- Structures w/1ac buffer

Conserved

- Public Cons
- Private Cons

Suitability

- Prime
- Constraints
- Prime 1m 3phase
- RAW solar



Solar
This map shows areas of potential electricity generation from solar energy. It includes areas with good access to solar radiation and also considers other conditions that may limit the feasibility of solar energy development. These limiting factors are referred to as constraints. Areas of prime solar potential exist where the natural conditions make development feasible and no constraints are present.

These maps are designed to initially identify areas and follow-up on-site work is required to verify the areas are feasible for projects. They are subject to revision and are NOT intended to green-light or fast-track projects.

DARK GREEN Prime: No Constraints within 1 mile 3 phase power
GREEN Prime: No Constraints no known or possible constraints present
ORANGE Constraints no known but at least one or more possible constraints
BLUE GREEN Raw potential with constraints

Known Constraints
Vernal Pools (confirmed and unconfirmed layers)
DEC River Corridors
FEMA Floodways
State-significant Natural Communities and Rare, Threatened, and Endangered Species
Wilderness Areas, including National Wilderness Areas
Class 1 and Class 2 Wetlands (VSWI and advisory layers)

Possible Constraints
Agricultural Soils (VT Agriculturally Important Soil Units)
FEMA Special Flood Hazard Areas
Protected Lands (Updated 07/26/2016.)
Act 250 Agricultural Soil Mitigation areas
Deer Wintering Areas
ANR's Vermont Conservation Design Highest Priority Forest Block Datasets
Forest Blocks - Connectivity
Forest Blocks - Interior
Forest Blocks - Physical Land Division
Hydric Soils

TRORC Unsuitable areas (included in known constraints)
FEMA Floodways
Wilderness Areas, including National Wilderness Areas
Class 1 Wetland

N

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0 0.5 1 2 Miles

Wind Energy Potential

NORWICH

This map was created as part of a Regional Energy Planning Initiative.
Created:2017

- Substations
- 3 Phase Power Lines
- Transmission Lines
- Lakes/Ponds
- Rivers/Streams

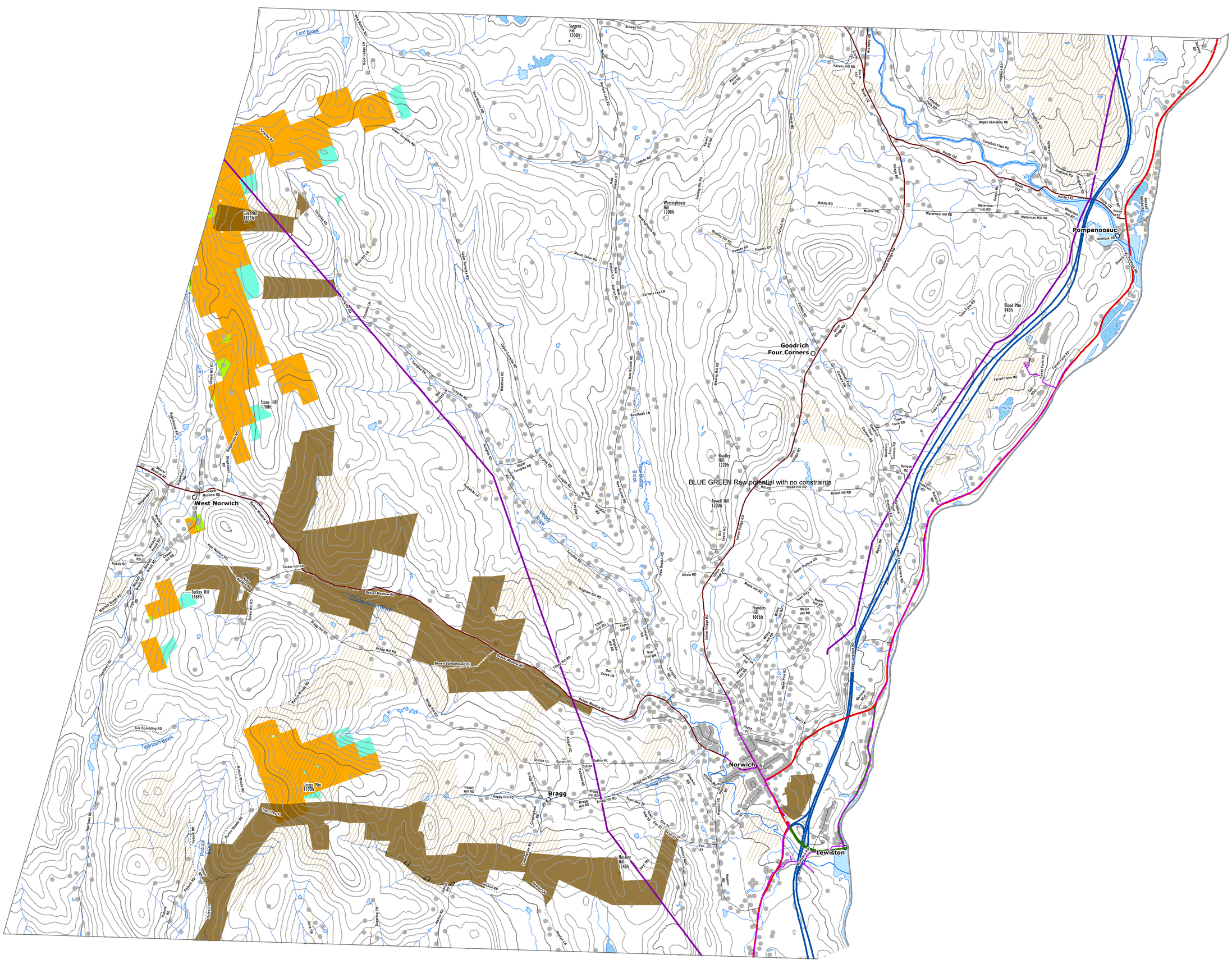
Conserved

- Public Cons
- Private Cons
- Structures w/1ac buffer

Wind Potential

Suitability, HubHeight

- Prime, 50
- Prime, 70
- Constraints, 50
- Constraints, 70
- Prime 1m 3phase
- RAW wind



Wind
This map shows areas of potential wind energy development. It includes areas with good access to wind resources and also considers other conditions that may limit the feasibility of wind energy development. These limiting factors are referred to as constraints. Areas of prime wind potential exist where the natural conditions make development feasible and no constraints are present.

These maps are designed to initially identify areas and follow-up on-site work is required to verify the areas are feasible for projects. They are subject to revision and are NOT intended to green-light or fast-track projects.

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Known Constraints
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Class 1 and Class 2 Wetlands (VSWI and advisory layers)

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TRORC Unsuitable areas (included in known constraints)
FEMA Floodways
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N

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0 0.5 1 2 Miles