Moretown Enhanced Energy Plan

Draft – December 2019

Prepared by the Moretown Energy Committee and Central Vermont Regional Planning Commission

Contents

Introduction

Moretown has a long history of renewable energy generation (the town's first electricity generating hydro dam was built on the Mad River in 1885) and continues to demonstrate a strong commitment to environmental stewardship and thoughtful energy planning. The passage of Act 174 in 2016, which allows towns a higher level of deference in Section 248 proceedings if they meet specific enhanced planning standards, offers an opportunity for Moretown to reexamine the actions the community is taking toward meeting its energy and climate goals. This requires looking comprehensively at how we generate and use energy and considering ways to reduce energy use and shift away from fossil fuels to cleaner, renewable sources of energy.

Moretown's Enhanced Energy Plan serves as an appendix to the Moretown Town Plan which it supports and references throughout. It represents the efforts of numerous community members with guidance and support from the Moretown Energy Committee, Planning Commission, Select Board, and the Central Vermont Regional Planning Commission with the goal of creating a more in-depth local energy roadmap as well as a plan that meets the requirements for a Determination of Energy Compliance (DOEC). A DOEC will give the Moretown Enhanced Energy Plan "substantial deference" before the Public Utilities Commission (PUC) as it reviews renewable energy applications that require a "Certificate of Public Good" (CPG).

Moretown's Enhanced Energy Plan puts State and Regional goals into our local context to achieve the broader climate goals defined in the Vermont Comprehensive Energy Plan and as amended in Act 174 to:

- Meet 25% of energy need with renewable energy by 2025, 40% by 2035, and 90% by 2050,
- Reduce total energy consumption per capita by 15% by 2025, and by more than 1/3 by 2050,
- By 2025, 10% renewable transportation, 30% renewable buildings, and 67% renewable electric power,
- 40% reduction in Greenhouse Gases (GHGs) below 1990 levels by 2030,
- 80-95% reduction in GHGs below 1990 levels by 2050

Moretown adopted its most recent municipal plan in 2016. In 2019, the Moretown Energy Committee began working with CVRPC and the Moretown Planning Commission to draft an enhanced energy plan. It is the goal of this document to be adopted into the 2016 Town Plan as an appendix. The 2016 Town Plan provides key background information on Town energy sources and usage as well as actions to achieve the goals identified therein. The Enhanced Energy Plan seeks to act as an extension of the Town Plan, consolidating information on goals, pathways, and metrics to enable easier guidance and progress tracking. By engaging in this planning process, Moretown can more effectively plan its energy future and track progress, as well as attain more input into generation siting in the Town. By publishing updated energy generation and usage data, and establishing clear actions, the goals of the municipality can remain visible beyond changes in personnel and varying levels of interest from the community.

Rationale

The Vermont Comprehensive Energy Plan (CEP) identified a goal to have 90% of the State's energy needs derived from renewable sources by 2050. In 2016, the Vermont Legislature passed Act 174 to help advance this goal through enhanced energy planning that goes beyond what is outlined in State statute (24 VSA 117 Sections §4348a and §4382 respectively). Through enhanced energy planning, Act 174 enables regions and municipalities to have more input into the PUC's issuing of Certificates of Public Good for renewable energy generation facilities. In order to have a town energy plan receive a DOEC and achieve "substantial deference", local plans must meet standards specified in Act 174 that serve to advance the State goal of 90% renewable energy by 2050. Without an approved enhanced energy plan, municipal plans will receive "due consideration" in the Section 248 review process instead, which connotes a lesser degree of consideration.

Through Act 174, three primary planning areas are identified and need to be met satisfactorily in order for successful compliance. These sections include Analysis & Targets, Pathways & Implementation Actions, and Mapping. All three sections include an evaluation of three energy sectors - thermal (heating), electrical, and transportation. The Analysis & Targets section provides necessary background information to understand the opportunities and needs present in Moretown. The Pathways & Implementation Actions section shows local efforts that will be undertaken in support of the State's goal. These actions are based on the analysis and targets provided to Moretown by the Central Vermont Regional Planning Commission (CVRPC). Finally, the Mapping section allows Moretown to designate certain areas as preferred, or unsuitable, for renewable energy generation. This section is important as it will allow the Town to avoid conflict between development and conservation goals.

Analysis & Targets

This section contains energy data tables provided by the CVRPC as well as some town data. By statute, this section must contain an analysis of resources, needs, scarcities, costs, and problems across the three energy sectors (electric, thermal, and transportation).

This section primarily focuses on background data and targets. Narratives are provided alongside tables, with explanations to clarify the data provided.

In order to effectively evaluate where Moretown needs to go in terms of its energy future, it first needs to understand where and how its energy is currently generated and consumed. The following tables include information provided by the CVRPC for the purposes of this plan.

Data Sources

The Data used in this plan originates primarily from the 2016 American Community Survey (ACS). Other sources include Vermont Agency of Transportation (VTrans), Vermont Department of Labor (DOL), Vermont Department of Public Service (DPS), Energy Information Administration (EIA), and Efficiency Vermont (EVT). The targets that follow were generated by the Long-range Energy Alternatives Planning (LEAP) model, which was completed by the Vermont Energy Investment Corporation (VEIC). For more information on the methodology behind the LEAP model, please see CVRPC's website.

Guide to Energy Tables

A Watt is a measure of power capacity, and a watt-hour is a measure of energy. Often, people associate and understand kilowatt hours (kWh) due to their electric bills. In this plan, all electricity values are labelled kWh, and capacity values are measured in kW.

Heat energy, in this chapter, is measured in British Thermal Units (BTUs). 1 BTU is the amount of heat energy it takes to raise 1 pound of water by 1 degree Fahrenheit. Heat energy in this plan is measured in MMBTUs – Million British Thermal Units.

Transportation

Transportation in Vermont represents 44% of all energy use in the State and is responsible for 52% of the State's energy cost burden[1]. Since transportation is one of the largest sources of greenhouse gas (GHG) emissions in Vermont (53%), switching from gasoline to electric-powered vehicles and reducing the number of vehicle miles driven are critical strategies of the CEP[2]. Setting goals and monitoring progress toward this transition to cleaner transportation requires establishing a current baseline for transportation for the Town. Table 1A provides information on the total number of vehicles registered in Moretown, the estimated number of miles those vehicles drive, as well as the amount of gasoline they use, and the annual cost of fuel.

[1] 2018 Greenhouse Gas Emissions Inventory Brief (1990-2015), VT Agency of Natural Resources
[2] Ibid

Table 1A: Current Municipal Transportation Energy Use[3]	
Transportation Data	Municipal Data
Total # of Vehicles (ACS 2011-2015)	1,336
Average Miles per Vehicle (VTrans)	12,500
Total Miles Traveled	16,700,000
Average Gallons Used per Vehicle per Year (VTrans)	576
Total Gallons Use per Year	897,849
Transportation BTUs (Billion)	108
Average Cost per Gallon of Gasoline (RPC)	$2.31
Gasoline Cost per Year	$2,074,032.00

Annually, residents of Moretown spend over 2 million dollars on gas. Improvements such as increased fuel efficiency and fuel-switching to biodiesel or use of electric vehicles may result in lower costs as well as reduced emissions. In the absence of public transportation and widespread ridesharing to reduce vehicle miles traveled, a focus on cleaner passenger vehicles is a high priority for rural towns.

Table 1B below shows the targets for 2025, 2035, and 2050 regarding transportation fuel switching. Biodiesel and electric vehicles start off similar in numbers in 2025, but electric vehicles soon depart as the preferred method of achieving the State's goal. Electric vehicles will be able to utilize increasing levels of renewable energy to meet residents' transportation needs.

Table 1B: Transportation Fuel Switching Targets[4]			
	2025	2035	2050
Biodiesel Vehicles	200	371	601
Electric Vehicles	115	793	1,583

As electric vehicle adoption increases, it is critical to ensure a clean power mix of resources that generate electricity. To reach our climate goals, the increased adoption of electric vehicles must be met by a parallel increase in renewable energy generation. The State's renewable energy targets are shown in Table 1C, below.

Table 1C: Use of Renewables for Transportation[5]			
	2025	2035	2050
Renewable Energy Use - Transportation	9.6%	31.3%	90.2%

Residential and Commercial Thermal Energy

Vermont has long, cold winters and one of the oldest housing stocks in the country. This combination makes residential heating one of the highest energy uses and costs for most homeowners. Weatherizing homes to reduce heating loss and transitioning from fossil fuel-based heating systems to cleaner, more efficient sources, such as heat pumps and advanced wood heating systems, is a critical strategy of the

[3] 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.

[4] This tables displays a target for switching from fossil fuel-based vehicles (gasoline and diesel) to electric vehicles. This target is calculated by using LEAP and ACS data.

[5] 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.

CEP. The below table provides data on the number of homes, square footage, and energy consumed by fuel source for homes in Moretown.

Table 1D: Current Municipal Residential Heating Energy Use[6]				
Fuel Source	Municipal Households (ACS 2011-2015)	Municipal % of Households	Municipal Square Footage Heated	Municipal BTU (in Billions)
Natural Gas	4	0.5%	8,032	0.48
Propane	275	37.8%	442,806	26.57
Electricity	39	5.4%	70,404	4.22
Fuel Oil	207	28.4%	351,074	21.06
Coal	3	0.4%	6,024	0.36
Wood	195	26.8%	370,472	22.23
Other (Includes Solar)	5	0.7%	10,040	0.60
No Fuel	0	0.0%	0	0.00
Total	**728**	**100%**	**1,258,852**	**75.53**

Across Vermont, most households (78%) are relying on heating oil, natural gas, and propane to stay warm through the cold winter months. Space heating costs in 2018 totaled $248 million. Of that, $185 million left the Vermont economy entirely. Converting to non-fossil sources of heat will help keep our energy dollars in the local economy.

Although primarily a residential community, Moretown has close to 50 commercial establishments. As with homes, these commercial buildings are often older and lack adequate insulation and air sealing in walls and roof structures. They also can benefit from switching from fossil fuel-based heating systems and inefficient air conditioning systems to high efficiency heat pumps and advanced wood heating systems. The following table lists the number of commercial buildings and the energy consumed for heating in total and on an average per building basis.

Conversion Factors

1 MWh = 1,000 kWh

1 MMBTU = 1,000,000 BTUs

1 kWh = 3,412 BTUs

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

Table 1E: Current Municipal Commercial Energy Use[7]			
	Commercial Establishments in Municipality (VT DOL)	Estimated Thermal Energy BTUs per Commercial Establishment (in Millions) (VDPS)	Estimated Thermal Energy BTUs by Commercial Establishments in Municipality (in Millions)
Municipal Commercial Energy Use	46	604	27,784

To meet renewable energy goals in an equitable and efficient way, efforts must include both weatherization and fuel-switching. As of 2018, roughly 10% of homes have been comprehensively weatherized in Moretown, 72 out of a total of over 700. Weatherization goals are listed in Table 1F below. Percent of structures comprehensively weatherized includes amounts of new efficient appliances purchased, as well as services recorded annually by Efficiency Vermont.

Table 1F : Thermal Efficiency Targets[8]			
	2025	2035	2050
Residential – Increased Efficiency and Conservation (% of municipal households to be weatherized)	20%	42%	92%
Commercial - Increased Efficiency and Conservation (% of commercial establishments to be weatherized)	22%	33%	61%

Fuel-switching of heating systems to efficient wood heat systems or cold-climate heat pumps is a key strategy. Efficient wood heat systems can utilize locally-produced biomass while cold-climate heat pumps provide a year-round alternative utilizing locally and regionally-produced renewable energy while also providing cooling. Between 2016 and 2018, Efficiency Vermont data indicates that 2 residents in Moretown switched fuels out of 76 heating system replacements. Table 1G below provides future fuel-switching targets for Moretown.

Table 1G : Thermal Fuel Switching Targets[9]			
	2025	2035	2050
New Efficient Wood Heat Systems (in units)	2	0	23
New Heat Pumps (in units)	88	225	428

[7] This 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.
[8] This table displays targets for thermal efficiency for residential and commercial 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 and commercial structures that will need to be weatherized in the target years.
[9] This table provides a target for new wood heating systems and 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.

Table 1H: Use of Renewables - Heating[10]			
	2025	2035	2050
Renewable Energy Use - Heating	51.9%	66.3%	92.7%

Electricity & Renewable Energy

Continued efforts to promote energy efficiency are essential as the least-cost energy resource and to ensure that the electrical system can support increased loads expected from heating and transportation as those sectors become electrified. The following table lists the current electricity consumption for residential and commercial sectors in kilowatt-hours (kWh) and megawatt-hours (MWh) per year. A megawatt is equal to 1,000 kilowatts and is the unit of electricity most often used when describing larger volumes of electricity, such as at a municipal level compared to an individual home. This translates to about 7,300 kWh per household and 97,100 kWh per commercial building. This reflects how much larger commercial buildings are typically than homes, and how much more electricity they use on a per square foot basis. In Moretown, the commercial sector represents only 6% of buildings but consumes 46% of the electricity used. This highlights the importance of supporting commercial establishments with efficiency measures.

Table 1I: Current Electricity Use[11]	
Use Sector	Current Electricity Use
Residential (Efficiency Vermont) (kWh)	5,300,775
Commercial and Industrial (kWh)	4,466,144
Total (kWh)	9,766,919

Improvements in electrical efficiency continue to progress in Moretown. According to Efficiency Vermont, residential and commercial customers saved a total of 461,144 kWh between 2016 and 2018, which is equivalent to nearly 10% of all kWh used in Moretown in 2018. Combined with thermal sector savings, customers saved $111,160 in utility bills. These improvements included upgrading lighting, heating, air conditioning, and refrigeration systems. The below table projects future electricity efficiency targets needed to achieve energy goals.

Table 1J: Electricity Efficiency Targets[12]			
	2025	2035	2050
Increase Efficiency and Conservation	1.5%	7.3%	15.2%

Table 1K: Use of Renewables - Electricity[13]			
	2025	2035	2050
Renewable Energy Use – Electricity (MWh)	2,667	4,268	10,670

[10] 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.
[11] This table displays current electricity use within the municipality. This data is available from Efficiency Vermont.
[12] 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.
[13] This data displays targets for MWh generation coming from renewable sources within the municipality during each target year. This data was developed using information from the regional planning commission and DPS. This data is the same as the data in Table 1Q.

Moretown has a long history of renewable generation going back to the first electricity producing dam built on the Mad River in 1885. Hydro power continues to be the largest source of electrical generation in the town representing 4.3 MW or 55% of total generation. The methane digester at the former Moretown landfill represents the second largest source at 3.2 MW or 41% of generation. Solar power provides the lowest of the existing renewable generation at 0.26 MW or 3%, but this is not expected to remain the case for long. A critical aspect of the CEP goal to achieve 90% renewable energy by 2050 is a dramatic expansion of solar in Vermont. Already we have seen double-digit growth year over year in the industry with no signs that this is expected to slow down in the near future. The following graph shows the growth in solar in Vermont since 2000. Table 1L shows the distribution of current renewable energy generation by type by MW and MWh.

Table 1L: Existing Renewable Generation[14]		
Renewable Type	MW	MWh
Solar	0.26	316.41
Wind	0.00	0.00
Hydro	4.30	15,067.20
Biomass	3.20	13,090.94
Other	0.00	0.00
Total Existing Generation	**7.76**	**28,474.56**

Moretown currently gets most of its renewable energy from hydroelectric, biomass, and solar sources. Hydroelectricity is provided by two facilities in Moretown: a 920 kW (3,592 MWh annually) facility on the Mad River owned by Algonquin Power Systems, Inc. and a 3,200 kW (14,400 MWh annually) facility on the Winooski River owned by Green Mountain Power. The former landfill in Moretown has a capacity of 3,200 kW and produces 21,024 MWh of biogas annually. These two renewable sources are supplemented by solar, which produces 316.41 MWh. As of 2019, Moretown has 72 solar installations, and is ranked 32nd in the State for solar (Vermont Community Energy Dashboard).

Table 1M: Renewable Generation Potential[15]		
Renewable Type	MW	MWh
Rooftop Solar	0.96	1,175
Ground-mounted Solar	410.71	503,700
Wind	759.25	2,327,861
Hydro	0.00	0
Biomass and Methane	0.00	0
Other	0.00	0
Total Renewable Generation Potential	**1,170.92**	**2,832,735**

Moretown's potential renewable energy generation in Table 1N includes opportunities in rooftop solar, ground-mounted solar, as well as wind. The Town has no opportunities for new hydroelectricity, nor

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

[15] 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, wind, hydro, etc.).

biomass production according to the LEAP projection. These projections must be compared to the targets below for Moretown's renewable energy generation.

Table 1N: Renewable Generation Targets[16]			
	2025	2035	2050
Total Renewable Generation Target (in MWh)	2,667	4,268	10,670

In view of these targets, Moretown's energy capabilities allow multiple options to meet the State goal. For example, by maxing out rooftop solar, Moretown would achieve 44% of the 2025 goal and 11% of the 2050 goal. The 2050 goal – 10,670 MWh – could be attained by building only 2% of all potential ground-mounted solar. With this in mind, Moretown may be able to avoid potential land use conflicts while achieving their energy goals. Moretown has sufficient land and generation potential to meet these targets (see Table 1O), but will need to focus its efforts proportionately over the transportation, thermal, and electricity sectors.

Table 1O: Sufficient Land[17]	
	Y/N
Solar	Y
Wind	Y

[16] Renewable generation targets for municipalities were developed by the regional planning commission.

[17] 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.

Pathways

The following pathways and implementation actions will help the Town of Moretown effectively support State goals as outlined in the 2016 Comprehensive Energy Plan. The objectives listed below will be addressed through a variety of pathways including land use and siting of developments (including renewable energy generation); efficiency of building construction and weatherization; cleaner transportation; and fuel switching from fossil-based fuels to more sustainable and renewable options.

A. Conservation and Efficiency

Objective A-1: Increase conservation of energy by individuals and organizations.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Promote overall building efficiency improvements (lighting, smart thermostats, appliances, etc.) through public education	Energy Committee	High/Sustained 1-2 Years	Resources and rebate information is shared at events and on Front Porch Forum
2	Partner with State and area weatherization programs and neighboring energy committees to promote building efficiency upgrades Provide targeted outreach to medically-vulnerable senior citizens and low-income community members to expand awareness of weatherization assistance.	Energy Committee, Efficiency Vermont, Capstone, Moretown's Care and Concern Committee, Weatherization Assistance Program, ButtonUp program, community volunteers	High/Sustained 1-5 Years	At least 5 - 10 Moretown buildings are weatherized each year through 2025; progress is documented on town's energy dashboard Weatherization upgrades for vulnerable community members are prioritized with volunteers assembled as needed

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
				An efficiency forum that features residents who have completed efficiency projects is hosted annually
3	Inform and engage Moretown residents in energy-related activities	Energy Committee, Energy Coordinator	High/Sustained 1-8 Years	Energy Committee provides a report on activities annually for inclusion in the Town Report with ongoing outreach through Front Porch Forum.
4	Continue to support a Moretown Energy Committee and publicize its work to residents	Planning Commission, Selectboard, Town Administration, Moretown Energy Committee	High/Sustained 1-8 Years	Energy Committee grows and is active throughout the duration of the plan.
5	Continue and sustain participation in Button Up events to promote weatherization by individuals.	Energy Committee, Efficiency Vermont	High/Sustained 1-8 Years	Moretown will participate in and hold Button Up events annually for the duration of this plan.

Objective A-2: Promote energy efficiency in the design, construction, renovation, operation, location and retrofitting of systems for buildings and structures.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Add link to Moretown's energy dashboard website to the municipal website to foster public awareness of progress towards goals established in this plan.	Town Administration, Energy Committee	High 1-3 Years	Municipal website is updated with energy dashboard link and public awareness and usage of Moretown's energy dashboard increases.
2	Provide residents and developers with energy code information when applying for land use permits for new construction and alterations to current structures.	Town Administration, Zoning Administrator, Energy Committee	High 1-3 Years	Materials are prepared for distribution and made available to the public.
3	Hold public meetings to encourage residents to bundle on-site usage of renewables with efficiency upgrades	Energy Committee, Planning Commission	Medium 4-6 Years	4 meetings focused on renewable energy generation are held in municipality during the term of this plan.
4	Consider the adoption of the State Energy Stretch Code as the baseline energy code for Moretown	Planning Commission, Energy Committee, Selectboard	Medium 4-6 Years	A resolution considering the adoption of these codes is brought before the

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
				Planning Commission and Selectboard, following a presentation by the Energy Committee.

Objective A-3: Identify ways to decrease the use of fossil fuels for heating.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Hold an annual "Gear Up for Winter" workshop to promote the upgrading of current heating systems.	Energy Committee	High/Sustained 1-8 Years	Annual meeting held in December for duration of plan, and email list is kept of attendees.
2	Identify feasibility of cold climate heat pumps or advanced wood heat systems in municipally-owned buildings.	Moretown Energy Committee, Selectboard	High 1-4 Years	An inventory of current heating expenditures and fuels for all municipal buildings is created and a discussion on budgets for upgrades is held.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
3	Identify opportunities for district heating in the Moretown Village area	Moretown Energy Committee	Medium 4-6 Years	An analysis of current and necessary densities is conducted and results presented before the Planning Commission.

Objective A-4: Demonstrated municipal leadership by example regarding efficiency of municipal buildings.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Review 2009 energy audit of municipal buildings to identify completed projects; determine need for an updated audit.	Energy Committee	Medium 4-6 Years	Energy Committee holds a meeting with Selectboard on priorities, funding opportunities, and new audit needs.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
2	Assess energy usage trends in municipal buildings.	Energy Committee	Medium 4-6 Years	Energy Committee shares usage trends data with Selectboard at a public meeting.
3	Leverage municipal resources provided through Vermont Climate Action Communities program	Selectboard, Moretown Energy Committee, Planning Commission	Medium 4-6 Years	Moretown becomes a member town

B. Reducing Transportation Energy Demand, Single Occupancy Vehicle Use, and Encouraging Renewable or Lower-Emission Energy Sources for Transportation

Objective B-1: Encourage increased use of transit as a primary method to complete daily trips and reduce demands on existing infrastructure such as roads and parking.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Assess the transit needs of Moretown residents.	Energy Committee	High 1-3 Years	A paper and electronic survey will be distributed to community members to gauge transit interest, car ownership rates, common destinations, and park and ride usage.
2	Partner with Moretown and Waterbury to promote usage of the Waterbury Commuter and the Link Express by residents commuting to area employment centers and downtowns.	Planning Commission, Selectboard, Green Mountain Transit, Mad River Valley Transportation Advisory Committee	Medium 4-6 Years	A local campaign to encourage Moretown residents to carpool or bike to the bus is launched.

Objective B-2: Promote the shift away from single-occupancy vehicle trips to reduce congestion, impacts to local facilities, and support alternative options for transportation needs.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Promote public awareness of village park-and-ride.	Planning Commission, Selectboard	High 1-3 Years	Meeting is held with CVRPC to identify possible funding opportunities for new signage.
2	Pursue a GoVermont grant to promote creative local approaches to shared commuting and alternative transportation.	Moretown Energy Committee	High 1-4 Years	Energy Committee receives a GoVermont grant to fund 1-2 community forums on local ridesharing options.
3	Promote usage of the Go! Vermont webpage by local residents.	Town Administration	High 1 Year	Go! Vermont web page is added to the Moretown website.
4	Encourage bike to school and bike to work days.	Energy Committee, Moretown Elementary School, area employers	Medium 2-6 Years	Energy Committee organizes at least 4 bike to school/work days during the term of this plan.

Objective B-3: Promote the shift away from gas/diesel vehicles to electric or non-fossil fuel transportation options to reduce dependency on non-renewable fuel sources for transportation.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Promote local EV demonstrations.	Energy Committee	High 1-3 Years	Moretown promotes 2 area EV demonstrations during the term of this plan and EC gains access to a list of attendees.
2	Utilize Moretown's location on 100B to install an EV charging station in the village.	Energy Committee, Drive Electric Vermont, CVRPC	Medium 4-6 Years	An EV charging station is built in Moretown during the term of this plan.

Objective B-4: Facilitate the development of walking and biking infrastructure to provide alternative transportation options for the community.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Invest in increased signage in the village to highlight sidewalks, road crossings, and bike paths.	Selectboard, Town administration, and Planning Commission.	Medium 4-6 Years	Signage in Village is increased, grant money is at least identified and funding sources compiled for this project.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
2	Assist Selectboard with additional sidewalk project proposals.	Energy Committee, Sidewalk Committee	Medium 4-6 Years	Provide letter of support and input as needed for proposals to implement additional sidewalk segments in village and North Moretown.

Objective B-5: Demonstrated municipal leadership with respect to efficiency of municipal transportation to show an on-going commitment on behalf of the Town of Moretown.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Conduct an inventory of municipal vehicle miles traveled for the duration of this plan and include in capital budget process.	Selectboard, Energy Committee	High 1-3 Years	Energy Committee will work with Selectboard to inventory vehicle miles traveled and present findings annually.

C. Patterns and Densities of Land Use Likely to Result in Conservation of Energy

Objective C-1: The Town of Moretown is committed to reducing sprawl and minimizing low-density development by encouraging density in areas where infrastructure exists or is planned to support growth.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Promote energy-efficient accessory dwellings to increase density.	Planning Commission, Selectboard	High 1-3 Years	Explore possible updates to zoning regulations.

Objective C-2: Strongly prioritize development in compact, mixed-use centers when feasible and appropriate and identify ways to make compact development more feasible throughout the Town of Moretown.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Prioritize a village zoning district, utilizing Form-Based Code, to incentivize concentrated development in Moretown's historic village center.	Planning Commission	High 1-3 Years	Meetings are held by Planning Commission to assess the need to reform zoning ordinance.

D. Development and Siting of Renewable Energy Resources

Objective D-1: Evaluate generation from existing renewable energy generation including the identification of constraints, resource areas, and existing infrastructure by energy type.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Maintain up-to-date list of current solar PV sites on the Moretown website to recognize the achievement of those generating power.	Town Administration, Energy Committee	High 1-3 Years	Website includes a list of current renewable generation sources

Objective D-2: Evaluate generation from potential renewable energy generation including the identification of constraints, resource areas, and existing infrastructure by energy type.

Implementation Action		Responsibility	Priority/Timeline	Measure of Success
1	Discuss with Selectboard the potential for solar + storage as a source for emergency back-up power to protect critical infrastructure.	Energy Committee, Selectboard, Fire Department, School Principle	High 1-3 Years	We have scouted resources and risks in this area.
2	Hold a public forum to identify the qualities of preferred sites in Moretown as a precursor to identifying specific preferred sites.	Energy Committee, Planning Commission, Selectboard	High 1-3 Years	A list of qualities is discussed and recorded that encompasses what preferred sites in Moretown may hold. A map is created identifying those

				resources is made.

Mapping

The siting and generation of renewable resources is a critical part to identifying whether or not the region can meet its share of the state's renewable energy goals by 2050. Furthermore, this analysis is important to determine where resources are available throughout the region to ensure no one municipality is unduly burdened with supporting more than should be reasonably anticipated. Finally, this information will better position Moretown to evaluate the renewable energy generation options that are available to meet these goals.

To this end, maps were created for the Moretown that identify resources related to solar, wind, hydroelectric, and woody biomass. Maps were also created to identify constraints that may limit the overall area of possible resource development within the town. The following information will address the evaluation of current and future generation potential within Moretown.

Existing Renewable Resource Generation

As noted in the Analysis and Targets section, Table 1L identifies the existing renewable generation for the Town of Moretown. Information on existing generation is a representation of all projects that were issued a Certificate of Public Good by the Public Service Board through the end of 2018. Projects that are currently under review are not included in these numbers, therefore, additional renewable energy generation may be developed that will not be noted in the total generation represented in Table 1L.

Potential Renewable Energy Generation

Table 1M in the Analysis and Targets section identifies potential generation of renewable energy for Moretown. This information is based on mapping data provided by the Vermont Center for Geographic Information (VCGI) and the Department of Public Service. This information includes specific data related to prime resource areas for solar and wind development which is an indication of where the conditions are most ideal for generation of the specific resource. Also included with this data is information regarding constraints to be considered when evaluating areas for renewable energy development. Additional detail regarding known and possible constraints is discussed below.

Constraints

As part of this effort, the Central Vermont Regional Planning Commission has identified information for each municipality related to renewable energy generation that includes an analysis and evaluation of resource areas within each municipality and how those resource areas are impacted by statewide and regionally identified constraints. In order to determine the impacts, an understanding of the constraints is discussed below.

For the purpose of this plan, constraints are separated into two main categories; known and possible. Known constraints are those areas where development of a renewable resource is very limited and therefore is not likely to occur. Known constraints that have been identified by the State include:

- Vernal Pools (confirmed or unconfirmed)
- River Corridors as identified by the Vermont Department of Environmental Conservation
- Federal Emergency Management Agency Identified Floodways
- State-significant Natural Communities and Rare, Threatened, and Endangered Species
- National Wilderness Areas
- Class 1 and Class 2 Wetlands (as noted in the Vermont State Wetlands Inventory or Advisory Layers)
- Regionally or Locally Identified Critical Resources

Similarly, the State has identified a list of possible constraints to be considered. Possible constraints identify areas where additional analysis will need to occur in order to determine if development of renewable energy resources is appropriate. In some cases, conditions may be prohibitive, but in others the conditions may be suitable for renewable energy development. The possible constraints include:

- Agricultural Soils
- Federal Emergency Management Agency Special Flood Hazard Areas
- Protected Lands (State fee lands and private conservation lands)
- Act 250 Agricultural Soil Mitigation Areas
- Deer Wintering Areas
- Vermont Agency of Natural Resources Conservation Design Highest Priority Forest Blocks
- Hydric Soils
- Regionally or Locally Identified Resources

In addition to the items listed above, the Central Vermont Regional Planning Commission, through its Regional Energy Committee, has identified additional constraints to be included for all the municipalities that were noted as being regionally significant. For the purposes of this mapping exercise, all of the regional constraints are considered possible constraints. The Regional Energy Committee determined that, like the statewide possible constraints, conditions could be such that developing renewable energy resources in these locations could occur but should be studied further at the municipal level to determine if the specific conditions regarding these locations are suitable. The possible regional constraints that were identified include:

- Elevations above 2,500 feet
- Slopes greater than 25%

- Municipally Owned Lands
- Lakeshore Protection Buffer Areas of 250 feet

Methodology

With all the known and possible constraints identified, this information was overlaid on the resources maps for solar and wind resources. Where known constraints existed the resource areas were deleted. Where possible constraints existed, the resource areas were shaded. The resulting areas included those lands where prime resources exist without any constraints and prime resource areas with possible constraints. The total area within these two categories served as the basis to determine the amount of resource that is available for potential development within Moretown.

As noted in Table 1M of the Analysis and Targets section, based on the solar, wind, and hydroelectric potential within Moretown, approximately 2,832,735 megawatt hours of energy could be produced, well above the town's allocation of 10,670 megawatt hours by 2050 as noted in Table 1N. When planning for solar development, it is understood that 1 MW requires 8 acres in Vermont. However, due to private land ownership and landowner priorities, the State of Vermont advises municipalities to plan for 1 MW requiring 60 acres. This translates to about 522 acres, or 2% of Moretown's land, needing to be available for possible solar development. The potential energy generation for the Town of Moretown increases when other sources of renewable energy generation such as biomass, biogas, and methane are included. No specific generation numbers are listed in Table 1M for these types of energy generation as their siting is not specifically tied to the availability of a resource, therefore calculating a potential for generation would be difficult.

Transmission Infrastructure

In addition to identifying and calculating possible generation of renewable energy based on resources and constraints, the mapping included in this plan also incorporates the existing three phase power infrastructure throughout the municipality. This is important to include because renewable energy generation needs three phase power to provide energy generation back to the grid. Without three phase power, renewable energy generation would be limited to scales necessary to only serve uses in close proximity and that do not require transmission infrastructure.

Similar to limits on three phase power are potential limitations on existing transmission infrastructure and the ability to transmit energy from its point of generation to the possible users. As noted previously, the mapping includes three phase power, but it also includes information on current transmission infrastructure. This is another component to consider when identifying where specific generation types should be located to ensure the transmission capacity exists within the grid or to identify areas where upgrades may be needed before development of renewable energy generation can occur. Based on the factors noted above, it

may be appropriate for mapping to identify areas where significant energy loads are currently occurring or anticipated based on future land use and zoning.

Green Mountain Power, which serves a minority of Moretown compared to Washington Electric Co-op, has a map available online to show grid capacity for distributed generation. In Moretown, any connection of a new solar system to the grid is subject to a tariff fee of $37/kW of AC (alternating current) capacity. There are three substations within close proximity to Moretown, if not within. The substation in Waterbury has at least 20% capacity remaining, the substation in northern Moretown on 100B has less than 10% capacity remaining, and the substation closest to Moretown Village is at its limit, and any new connections may experience higher costs. It is believed that GMP will use the revenue generated from the $37/kW tariff to upgrade these grid constraints as feasible.

Preferred & Unsuitable Siting Locations

The Town of Moretown recognizes the preferred locations that have been identified by the State of Vermont's Net Metering Rules. Additional preferred locations may be identified after an analysis of the needs with the community have been conducted. The state preferred locations include but are not limited to:

- Parking lots
- Gravel pits
- Brownfield sites
- Landfills
- Rooftop installations

The Moretown Energy Committee held a public forum on renewable energy in September of 2019. The outcome of the meeting was focused on identifying those areas deemed preferred or unsuitable, for energy generation in Moretown. Preferred areas, as identified by the meeting participants, include:

- Town Buildings and unforested Town Land (where feasible),
- Sites in close proximity to existing 3 Phase Power,
- Properties in or previously in Industrial Use or other disturbed areas,

Regarding areas unsuitable for renewable energy development, the participants and the Energy Committee agreed on the following local possible constraints in Moretown:

- Parcels with no access or access only via a Class 4 road should not be considered for renewable energy development,
- Parcels along the Mad River Byway shall be reviewed for scenic impacts and should not be considered for renewable energy development
- Impacts to forest throughout Town, but primarily in a priority forest block, shall be considered and minimized wherever possible.

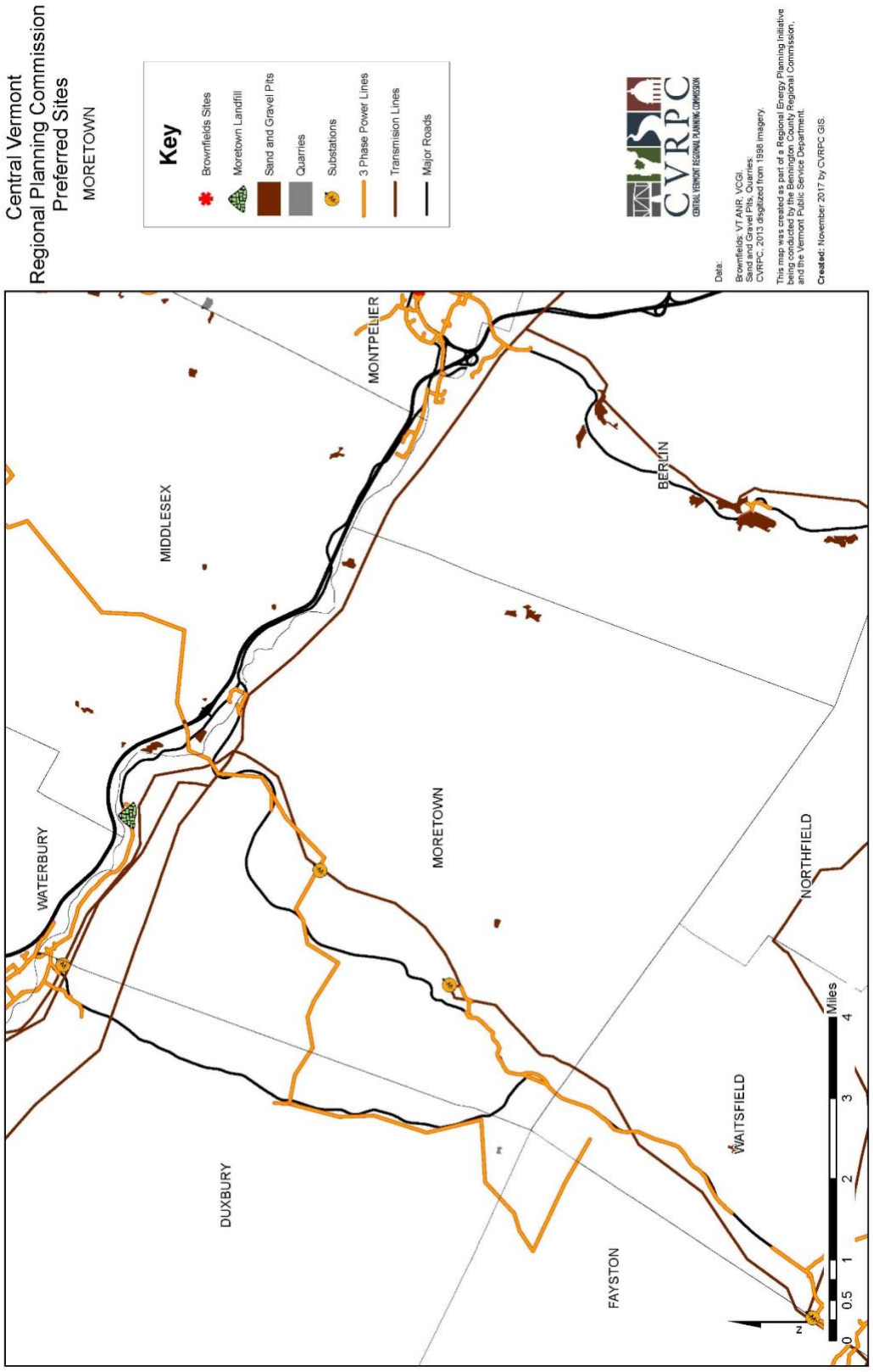
Local Mapping

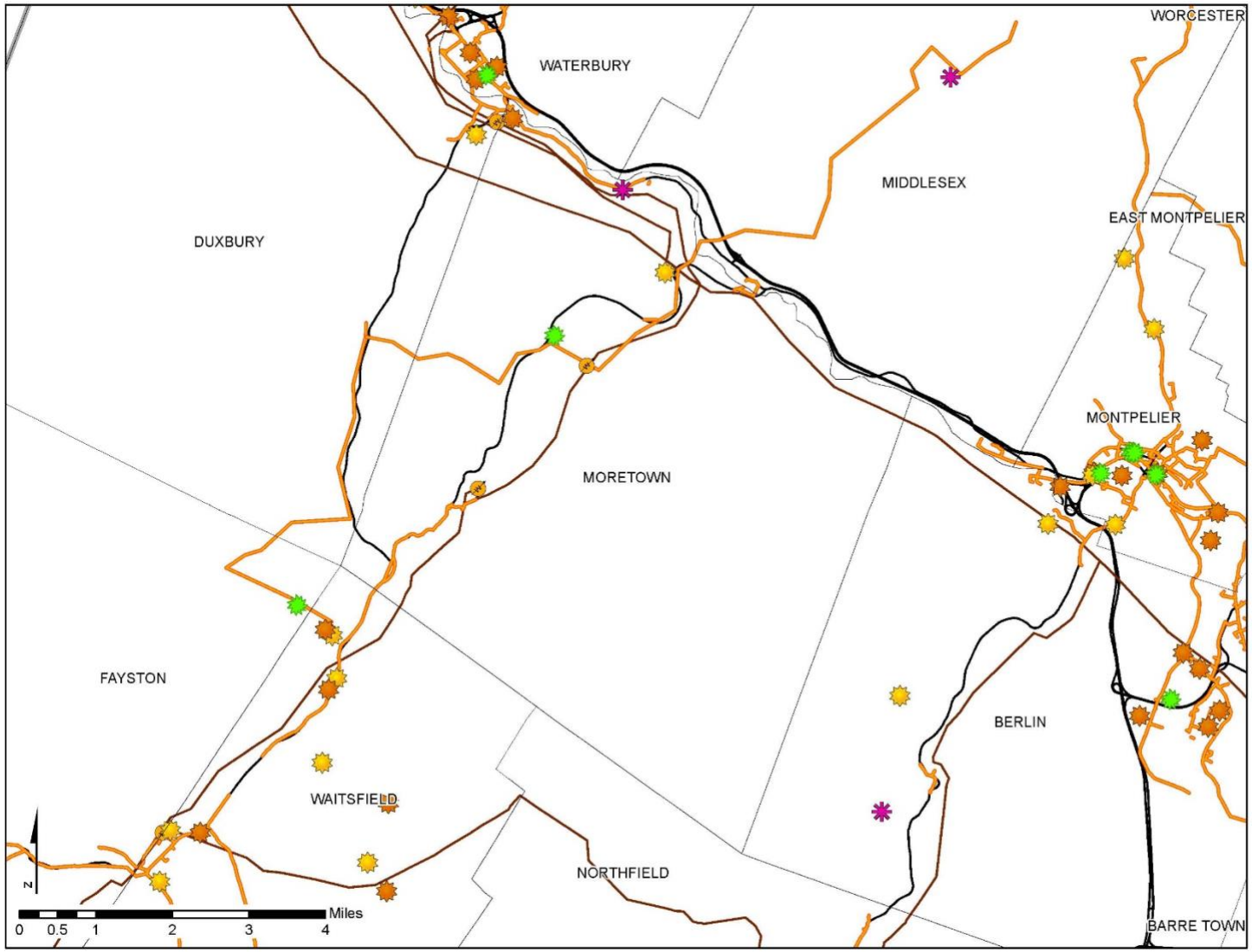
To provide a more specific visual representation of resources and constraints, mapping was developed by the Central Vermont Regional Planning Commission that includes:

- Solar Resource Areas
- Wind Resource Areas
- Hydroelectric Resource Areas
- Known Constraints
- Possible Constraints
- Woody Biomass Resource Area
- Existing Renewable Generation Sites
- Statewide Preferred Generation Sites

These maps should be used as a starting point to determine what areas may exhibit characteristics consistent with conditions that would support renewable energy development. More detailed review and analysis should be conducted to determine specific boundaries for resource areas or constraints. These maps can be found in Appendix A.

Appendix A: Maps





Central Vermont Regional Planning Commission Existing Renewable Energy Generation

MORETOWN

Key

- Biomass for Heat - Current Sites
- Wind Generation - Current Sites

Solar Sites - Current Generation > 15 KW

- Ground-mounted PV
- Roof-Mounted PV
- Substations
- 3 Phase Power Lines
- Transmission Lines
- Major Roads

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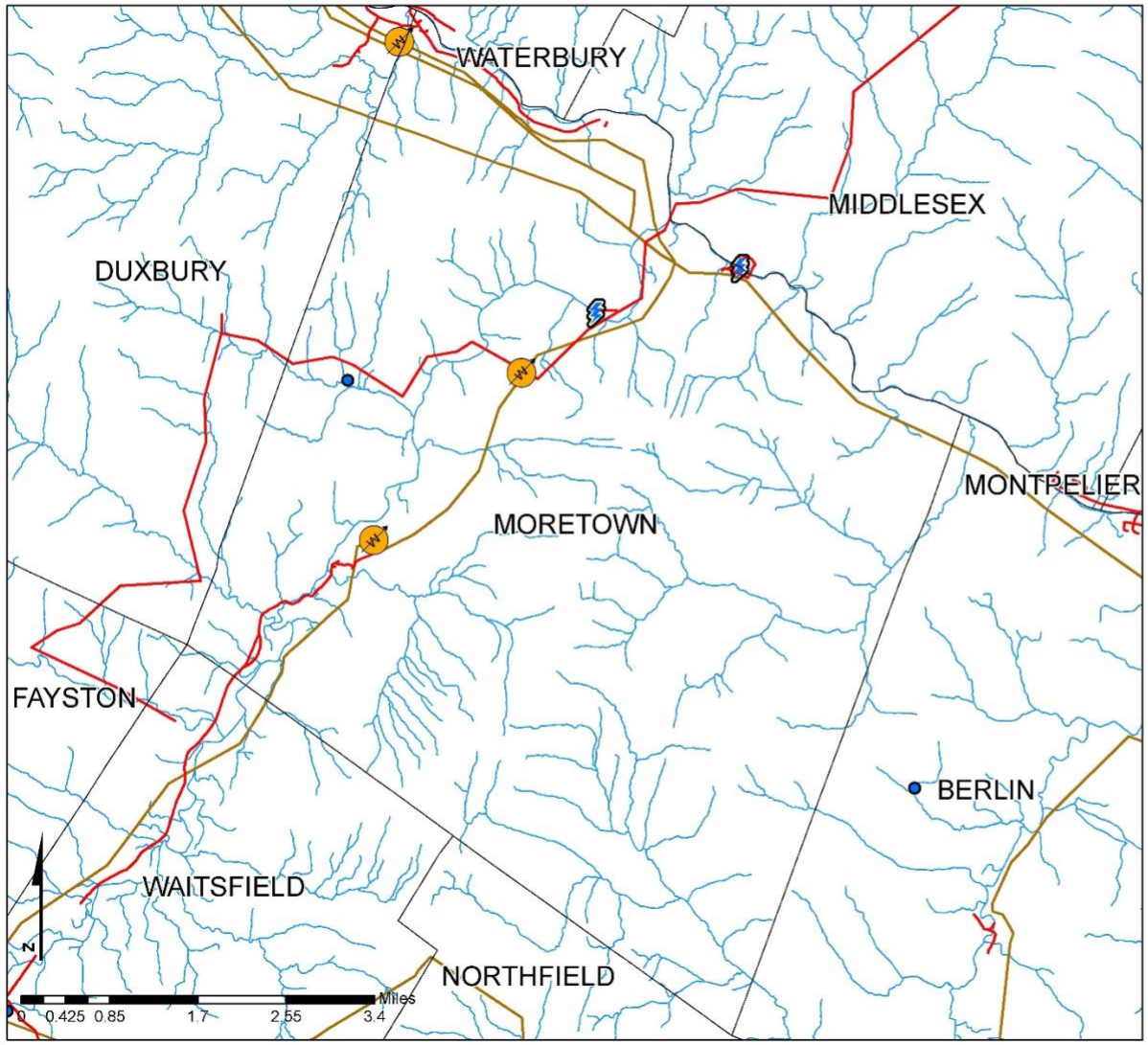
Data:

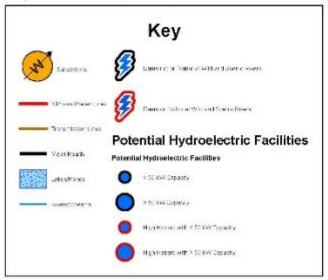
Wind and Biomass generation:
VT Energy Dashboard
Solar Sites: VT Energy Dashboard

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

Created: November 2017 by CVRPC GIS.



MORETOWN
Hydroelectric Resources Map



Methodology

This map shows areas of resource potential for renewable energy generation from hydroelectric , i.e., dams that could be converted in to hydroelectric facilities as well as active hydroelectric sites. Existing hydroelectric dam information was extracted from the Vermont Dam Inventory, while potential hydroelectric sites were derived from a study conducted by Community Hydro in 2007.1 Based on estimates conducted within the report, this map categorizes dams based on their potential hydroelectric generation capacity, and the downstream hazard risk that would be involved in hydroelectric production at each site.

High hazard potential dams are those where failure or mis-operation will probably cause loss of human life. The other rankings were grouped together and their failure or mis-operation results in no probable loss of human life, but could cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. These dams are often located in predominately rural or agricultural areas, but could be located in areas withpopulation and significant infrastructure.

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

Created: December 2016 by CVRPC GIS.
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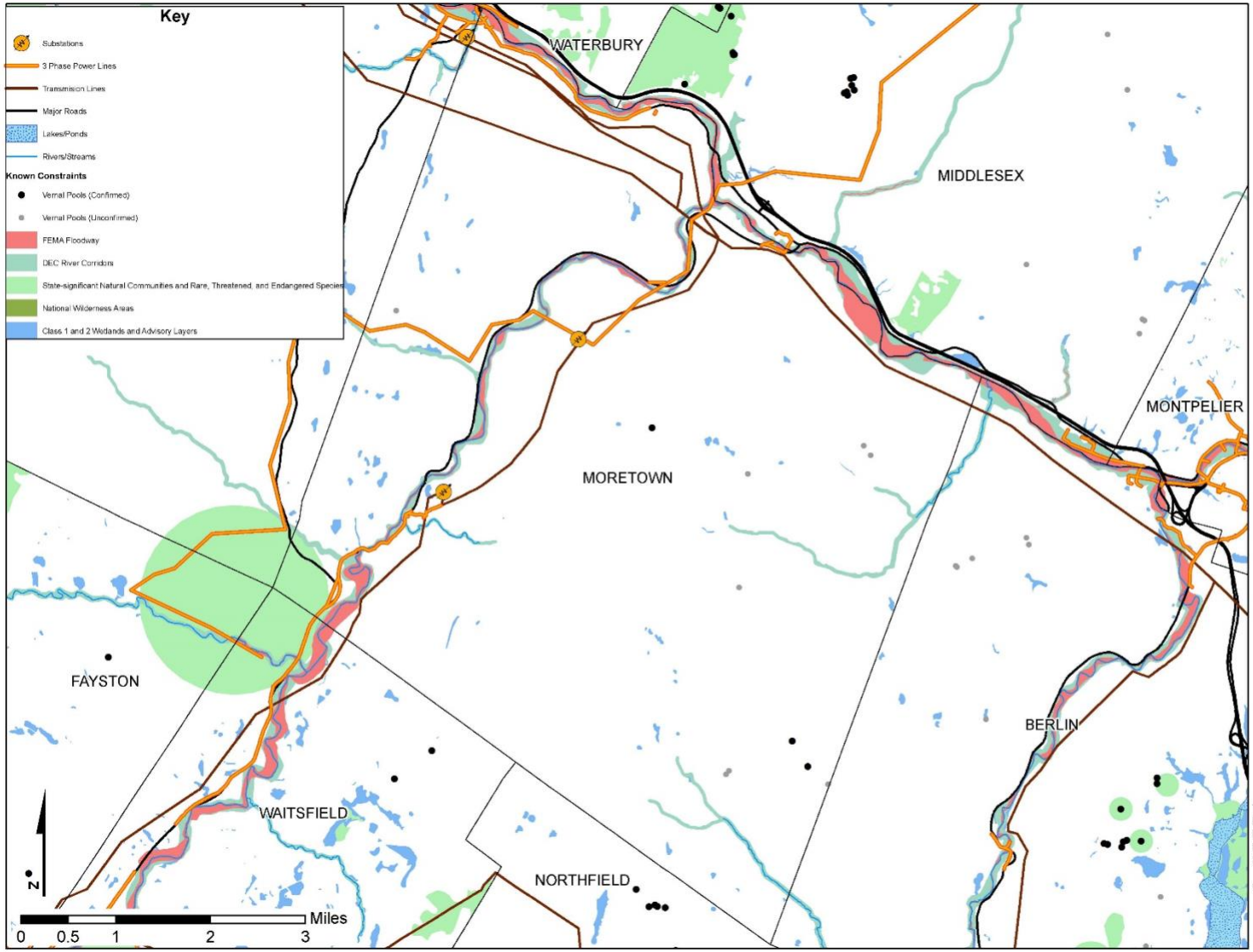

MORETOWN
Known Constraints Map

Known Constraints

These constraints signal likely, though not absolute, unsuitability for development based on statewide or local regulation or designated critical resources.

Link to Data -
http://vcgi.vermont.gov/opendata/act174

Known Constraints
Vernal Pools incuding confirmed and unconfirmed -
Vermont Fish and Wildlife
DEC River Corridors -
DEC WSMD Rivers Program 1/2/15
FEMA Floodway included in Zones AE -
FEMA Map Service Center
State-significant Natural Communities and Rare, Threatened, and Endangered Species -
Vermont Fish and Wildlife, Natural Heritage Inventory
National Wilderness Areas -
USDA Forest Service
Class 1 and Class 2 Wetlands (VSWI) and Advisory Layers - VT Watershed Management Division

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

Created: December 2016 by CVRPC GIS.

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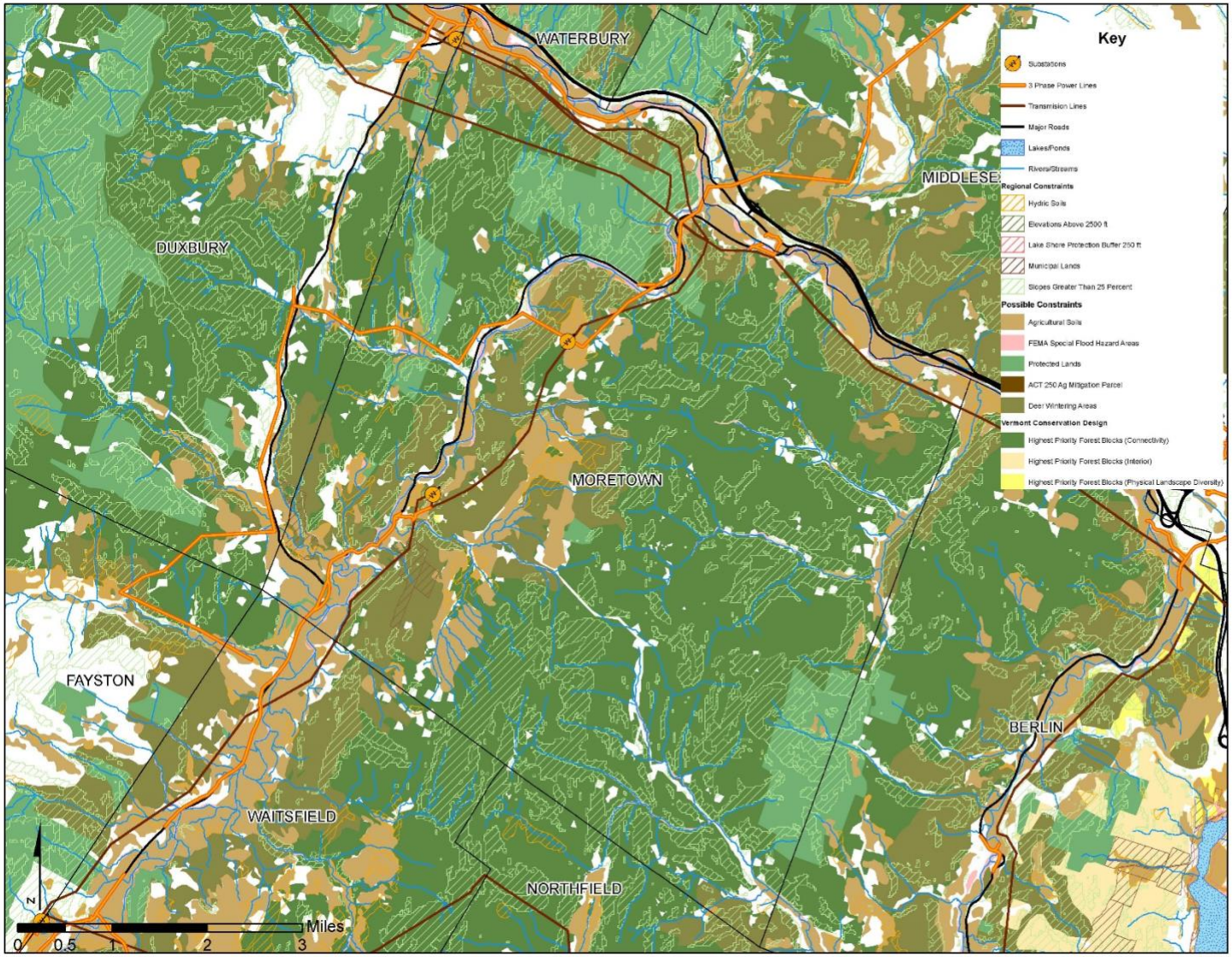


MORETOWN
Possible Constraints Map

Possible Constraints

These constraints signals conditions that would likely require mitigation, and which may prove a site unsuitable after site-specific study, based on statewide or regional/ local policies that are currently adopted or in effect.

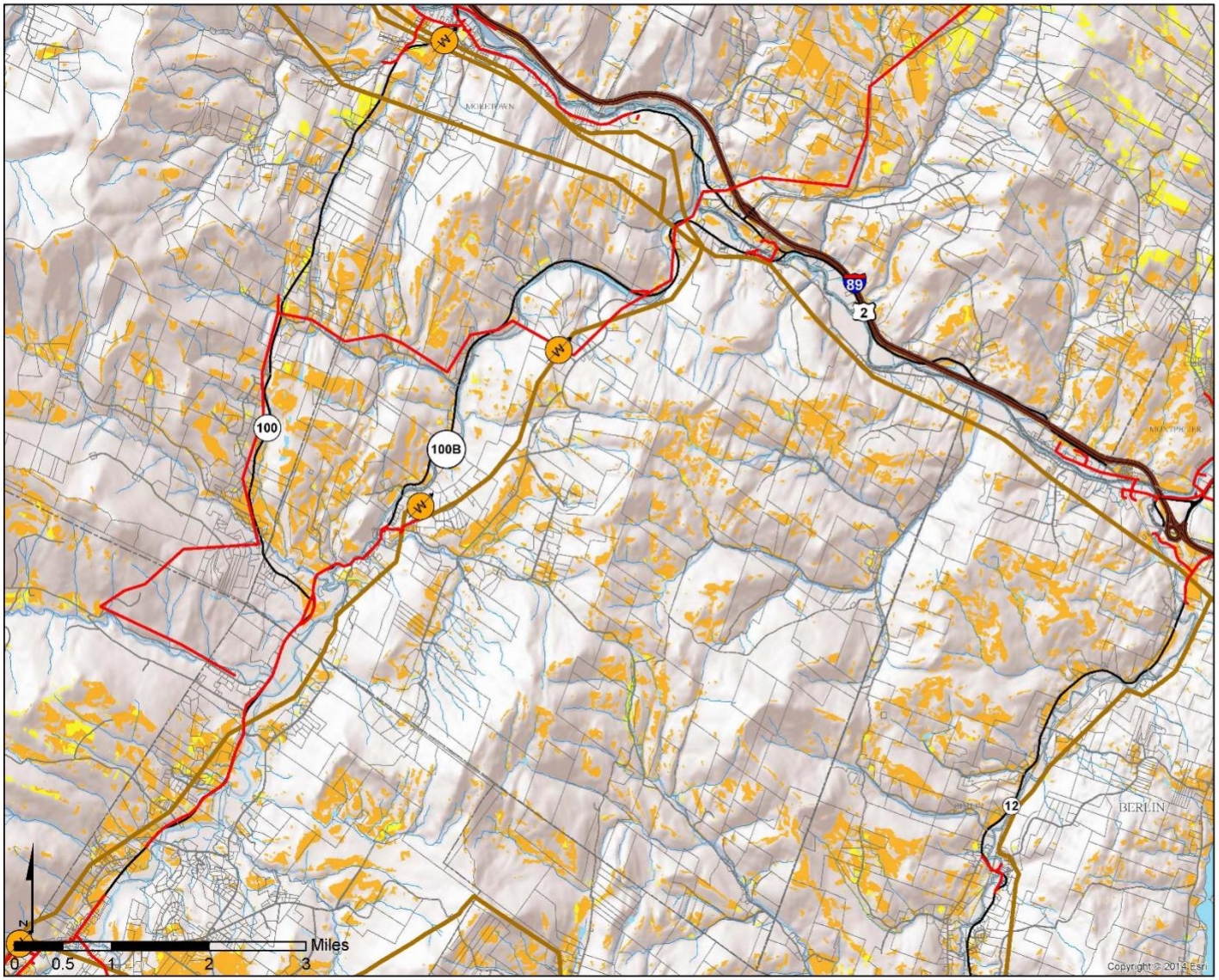
Link to Data - http://vcgi.vermont.gov /opendata/act174

Possible Constraints Data Sources
Agricultural Soils include local, prime and statewide classifications - NRCS
FEMA Special Flood Hazard Areas include Zones A and AE - FEMA Map Service Center
Protected Lands - Include State fee lands and private conservation lands - VCGI
Act 250 Ag Mitigation Parcels include parcel as of 2006 - VT Dept. of Ag
Deer Wintering Areas - VT Fish and Wildlife
Vermont Conservation Design include the following Highest Priority Forest Blocks: Connectivity, Interior, and Physical Landscape Diversity) - VT Fish and Wildlife
Hydric Soils include soils that have hydric named components in the map unit - NRCS

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

Created: December 2016 by CVRPC GIS.

CVRPC



MORETOWN

Solar Resources Map

Legend

- Substations
- 3 Phase Power Lines
- Distribution Lines

Solar Potential

- Prime (No Constraint)
- Secondary (Possible Constraint)
- Parcels

Roads

- Interstate
- US Highway
- Vermont State Highway
- Town Class 1-3

Known Constraints

Areas not shown on map
Vernal Pools
River Corridors
FEMA Floodways
Natural Communities & Rare, Threatened and Endangered Species
National Wilderness Areas
Wetlands Class 1 and 2

Possible Constraints

VT Agriculturally Important Soils
FEMA Special Flood Hazard Areas
Protected Lands
Act 250 Agricultural Soil Mitigation Areas
Deer Wintering Areas
Highest Priority Forest Blocks
Hydric Soils
Elevations Above 2500Ft
Lake Shore Protection Buffer 250 Ft
Municipal Lands
Slopes Greater Than 25 Percent

Created by: CVRPC GIS 4/4/2017
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Act174_Energy\Solar Resources 11X17

Data is only as accurate as the original source materials.
This map is for planning purposes.
This map may contain errors and omissions

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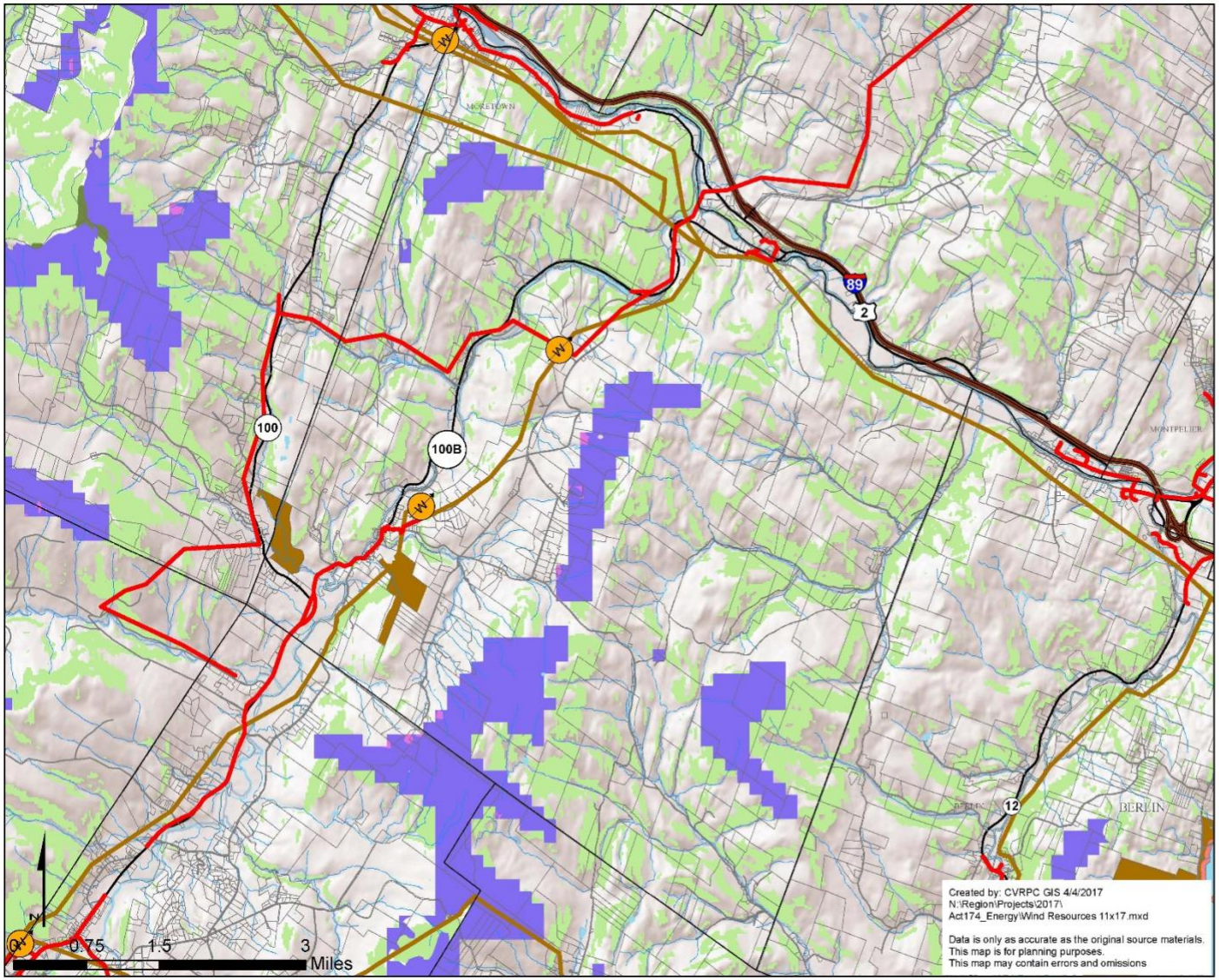


MORETOWN
Wind Resources Map

Legend

- Substations
- 3 Phase Power Lines
- Transmission Lines

Wind Potential

Prime Wind (No Constraint)
Hub Height (m)
50 70

Secondary Wind (Possible Constraint)
Hub Height (m)
50 70

- Parcels

Roads

- Interstate
- US Highway
- Vermont State Highway
- Town Class 1-3

Regional Constraints

- Elevations Above 2500 ft
- Lake Shore Protection Buffer 250 ft
- Municipal Lands
- Slopes Greater Than 25 Percent

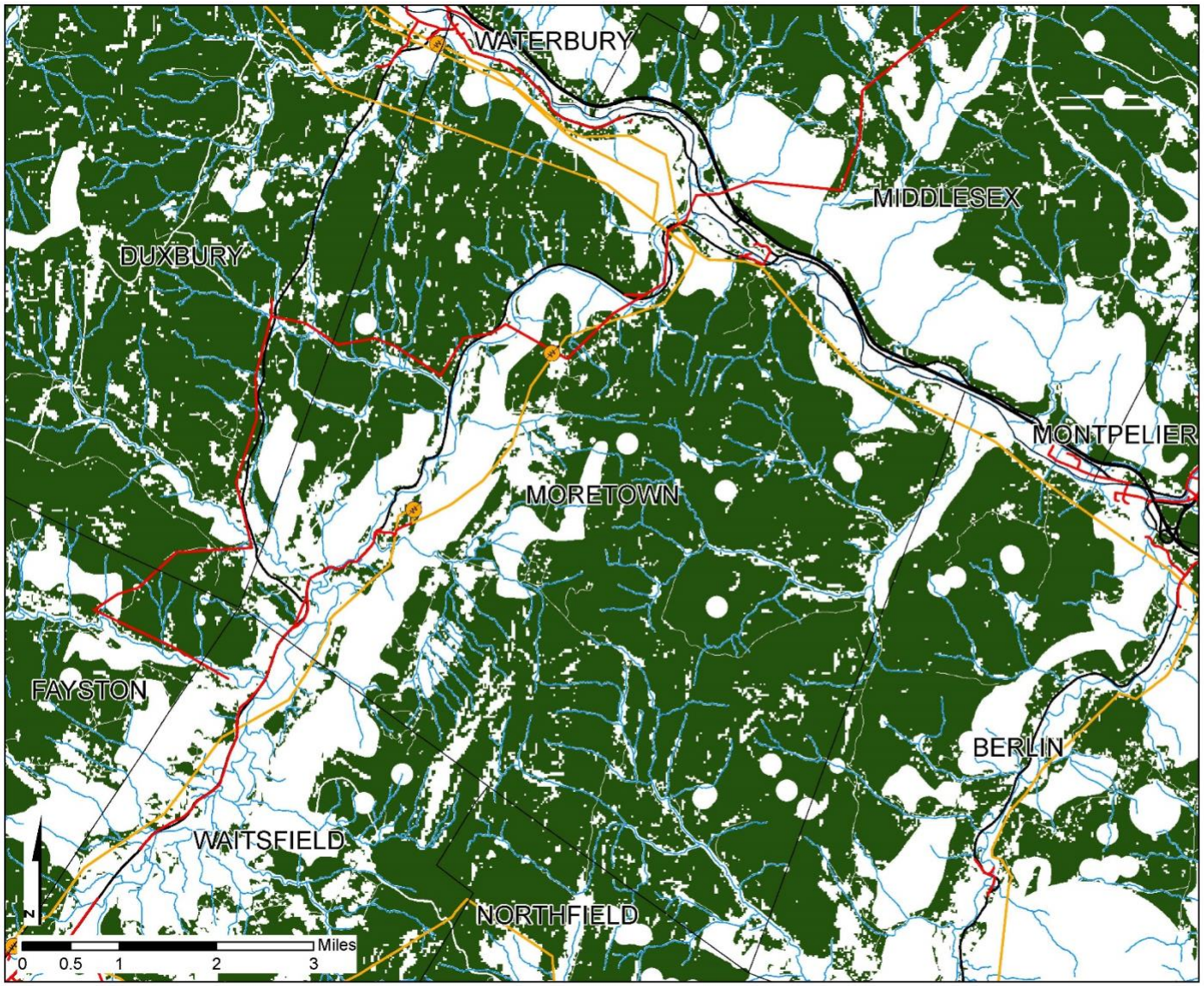
Known Constraints

Areas not shown on map
Vernal Pools
River Corridors
FEMA Floodways
Natural Communities & Rare, Threatened and Endangered Species
National Wilderness Areas
Wetlands Class 1 and 2

Possible Constraints

VT Agriculturally Important Soils
FEMA Special Flood Hazard Areas
Protected Lands
Act 250 Agricultural Soil Mitigation Areas
Deer Wintering Areas
Highest Priority Forest Blocks
Hydric Soils

CVRPC
CENTRAL VERMONT REGIONAL PLANNING COMMISSION



MORETOWN
Woody Biomass Resources Map

Key

- Substations
- 3 Phase Power Lines
- Transmission Lines
- Major Roads
- Lakes/Ponds
- Rivers/Streams
- Woody Biomass

Methodology

This map shows areas of resource potential for woody biomass, i.e., locations where forested areas are. This map also considers various other conditions, such as ecological zones, that may impact the feasibility of renewable energy/alternative heating source. These conditions are referred to as constraints. This map does not include areas where other types of biomass, such as biomass from agricultural residue, could be grown/harvested.

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

Created: December 2016 by CVRPC GIS.

CVRPC
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