PROPOSED AMENDMENTS TO THE

Central Vermont Regional Plan

2016

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Central Vermont Regional Planning Commission
29 Main Street, Suite 4, Montpelier, Vermont 05602-2952
Phone: 802-229-0389 Fax: 802-223-1977
Email: cvrpc@cvregion.com Web: www.centralvtplanning.org

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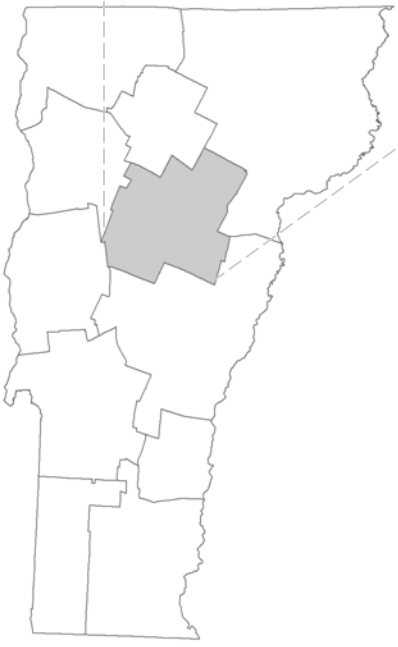
29 Main Street, Suite 4, Montpelier, Vermont 05602-2952
Phone: 802-229-0389 Fax: 802-223-1977
Email: cvrpc@cvregion.com Web: www.centralvtplanning.org

Staff:

Executive Director	Bonnie Waninger
Program Manager	Dan Currier
Senior Planner	Clare Rock
Senior Planner	Pam DeAndrea
Senior Planner	Eric Vorwald, AICP
Planner	Ashley Andrews
Planner	Laura Ranker

Central Vermont Region



State of Vermont

The Central Vermont Region is comprised of 23 municipalities in Washington and Orange Counties. As its name implies, the Region lies at the geographic heart of the State. Accordingly, it embodies many of the most celebrated qualities of Vermont's culture and landscape, and also serves as its political hub.

CENTRAL VERMONT REGIONAL PLANNING COMMISSION

Commissioners:	
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Barre Town	Byron Atwood
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Calais	John Brabant
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Fayston	Carol Chamberlin
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Middlesex	Ronald Krauth
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Moretown	Dara Torre
Northfield	Laura Hill-Eubanks
Orange	Lee Cattaneo
Plainfield	Bram Towbin
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Waitsfield	Don La Haye
Warren	Dan Raddock
Washington	Gary Winders
Waterbury	Steve Lotspeich
Williamstown	Vacant
Woodbury	Michael Gray
Worcester	Bill Arrand

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Introduction

1

PREAMBLE

The Central Vermont Regional Planning Commission (CVRPC) was created in 1967 under Vermont Statute Title 24, Chapter 117, to provide planning assistance to municipalities within the Region and create a forum for addressing those issues which transcend municipal boundaries. This same piece of legislation requires Regional planning agencies to prepare plans which are consistent with statewide goals and compatible with the plans of their member municipalities and adjoining Regions. This document seeks to satisfy that mandate.

CVRPC is not a part of state government, but is a creature of State Statute and bound by that Statute. Representatives appointed by the legislative bodies of its member communities govern the Commission's activities and policies.

OVERVIEW OF THE REGION

The Central Vermont Region is comprised of 23 municipalities in Washington and Orange Counties. As its name implies, the Region lies at the geographic heart of the State. Accordingly, it embodies many of the most celebrated qualities of Vermont's culture and landscape, and serves as its political hub, as well. Unfortunately, our problems are also typical of those in evidence throughout the State: a sluggish economy, inefficient use of resource lands, stressed infrastructure, and increased energy costs and consumption, among them.

Located along the northern spine of the Green Mountain range in the Central Vermont Region, Camels Hump, elevation 4,083 feet, is the highest undeveloped mountain in the state.

Physically, the Region is transected by several north-south running mountain chains (e.g. Green Mountains, Northfield Range, Worcester Range, Irish Hills, Woodbury Mountains, and Groton Range) separated by fertile river valleys. The valley of the Winooski River is the exception to this pattern cutting across the mountains as it flows west to Lake Champlain. (See map: Topography)

It was in the valleys where early settle-

ment began where population, commerce, and infrastructure have historically been concentrated in compact hamlets, villages, and cities. Often the surrounding countryside and wilderness supplied the raw materials (e.g. lumber, granite, wool, grains, milk, etc.) for the manufacturing concerns of these centers.

Robinson sawmill, Calais, constructed 1803, is the oldest standing sawmill in Vermont.

In recent decades however, people, and to a lesser extent, commerce has shifted into the countryside. As a result of this trend, many of Central Vermont's rural municipalities have doubled their population while our largest cities have not grown at all, and even declined.

The reasons for shifting land use and habitation patterns are several: the emergence of commuter lifestyles, a population seeking rural environs, and the growth of resort areas and second home development, among them. All of these have been enabled by the advent and subsequent dominance of the automobile.

The fact that much of the Region's new growth has occurred along transportation corridors is no accident, and is often encouraged by land use regulations. Not until very recently have we noticed the more disturbing aspects of "strip development" and suburban sprawl.

Still, while Central Vermont is no longer immune to the perils and pitfalls of life in modern America, it remains a place of unique beauty, character, and promise. We are not yet "just like everywhere else." In fact, Central Vermont is diverse beyond its size. We are home to a golden dome, and an interstate highway, remote logging roads, covered bridges, fast food restaurants, a culinary institute, a military college, road houses, opera houses, ski condos, hunting camps, conservatives, liberals, farmers, artisans, lawyers, activists, teachers, bureaucrats, politicians, merchants, the unemployed, the elderly, and perhaps most importantly, children.

PURPOSE OF THE PLAN

Title 24 VSA Chapter 117 Section 4347 "Purposes of Regional Plan" states:

> "A Regional plan shall be made with the general purpose of guiding and accomplishing a coordinated, efficient and economic development of the Region which will, in accordance with present and future needs and resources, best promote the health, safety, order, convenience,

prosperity and welfare of the inhabitants as well as efficiency and economy in the process of development. This general purpose includes, but is not limited to recommending a distribution of population and of the uses of the land for urbanization, trade, industry, habitation, recreation, agriculture, forestry and other uses as will tend to:

(1) create conditions favorable to transportation, health safety, civic activities and educational and cultural opportunities;

(2) reduce the waste of financial, energy and human resources which result from either excessive congestion or excessive scattering of population;

(3) promote an efficient and economic utilization of drainage, energy, sanitary and other facilities and resources;

(4) promote the conservation of the supply of food, water, energy and minerals;

(5) promote the production of food and fiber resources and the reasonable use of mineral, water, and renewable energy resources; and

(6) promote the development of housing suitable to the needs of the Region and its communities."

While the above language outlines the purposes of the Plan from a statutory standpoint, CVRPC views the Plan primarily as a means to enhance the lives of the Region's residents. Accordingly, the preservation and enhancement of the "quality of life" for all Central Vermont residents is the guiding principle of this Plan and the work of the Central Vermont Regional Planning Commission (CVRPC).

The term "quality of life" encompasses an array of factors that influence the level of satisfaction and enjoyment we are able to achieve in our day-to-day lives. As such, any analysis of quality of life must address both our basic needs and our desires and aspirations. Among these are:

1) A Safe Environment - Central Vermonters desire clean air, water and land, a safe multi-modal transportation system, and access to quality health care and emergency services;

2) Job Opportunities - We desire meaningful, secure jobs paying livable wages.

3) Natural Beauty - We place a high value on the scenery and resources the landscape provides.

4) Educational Quality - Central Vermonters of all ages should have access to affordable, quality educational opportunities to enrich their lives and improve their skills.

5) Low Crime Rate - Central Vermont residents should live safe from crime.

CVRPC hopes this Plan reflects our desire to live in a Region that will be a model of health, wealth, knowledge, beauty, culture, and community for many generations to come. It is a goal of CVRPC to define, quantify, and track these elusive concepts over the next five year planning period.

IMPLEMENTATION

This Plan presents the most recent demographic and statistical data available during the period over which it was written. Much of this information comes from the 2000 U.S. Census; however, a variety of other sources are used, as well, including state and local reports. In addition, demographic projections ("Economic and Demographic Forecast, Central Vermont Regional Planning Region 2000 to 2020") were developed for CVRPC by Economic & Policy Resources, Inc. These projections are incorporated by reference as an appendix to the Plan. Data sources have been identified for all charts and tables cited in the text.

In the course of preparing this Plan, CVRPC agreed to compile data that is not included in the body of the 2003 Plan, but which may be significant or useful in identifying and understanding important Regional trends in the 2016 Plan. CVRPC intends to track these indicators over the life of the Plan (and beyond) in order to monitor changes in the Region's quality of life and help identify meaningful policies and programs for the future.

Throughout this document are specific policies, recommendations, strategies, offers and proposals designed to reflect the values of Central Vermont residents and help realize the goals of this Plan. It is primarily through the statutory functions and obligations of CVRPC, and the initiative of the Region's municipalities, that these and other aspects of the Plan will be implemented. Title 3 Section 4021 of the Vermont Statutes also stipulates that State agency plans must be compatible with Regional plans, as well as approved municipal plans. In this regard, CVRPC believes that the definition of growth centers used by State agencies should be compatible with that

of the Regions. An implementation program is included in Appendix A-6.

COMPATIBILITY STATEMENT

It is the Commission's belief that this Plan is compatible with the plans of our neighboring Regions and with those of municipalities within the Central Vermont Region. In other words, and in accordance with Chapter 117 mandates, this Plan "as implemented, will not significantly reduce the desired effect of the implementation of the other plan(s)."

It can be seen that almost everywhere the Central Vermont Region abuts other Regional commissions' jurisdictions, land uses are either very low intensity or near wilderness in nature as significant mountain ranges bound us to the west and east. In addition, most human activity is focused toward the center of the Region. Because of this geography, opportunities for land use (or other conflicts) with neighboring Regions are limited.

There was a conscious effort in the writing of this Plan not to usurp the authority or planning functions of Central Vermont's municipalities. This is made clear in the Plan's purpose statement, and elsewhere, in policies which support local initiatives and offer Commission assistance in the realization of the same.

Furthermore, the Regional Planning Commission does not believe there are any significant conflicts between this Plan and any municipal plan that has received the approval of this Commission. Should a conflict arise between this Plan and a municipal plan approved by this Commission, such conflict should generally be resolved at the most locally appropriate level. As such, the municipal plan should take precedence on impacts that are local in scope, while the Regional Plan should prevail where "substantial Regional impact"[1] may result. Individual projects may have aspects that fall under either jurisdiction. For instance, a large, new commercial de-

[1] Development projects of substantial Regional impact are those that will have substantial and ongoing impact on two or more municipalities, including the host municipality. Among the development projects of substantial Regional impact are those that will likely impact on a resource within the Region which is widely used or appreciated by people outside of the locality in which it is located. Development projects of substantial Regional impact are those which may affect settlement patterns to the extent that the character or identity of the Region (or its sub-Regions) is significantly affected. Development projects of substantial Regional impact are those that are likely to alter the cost of living, availability of choices, access to traditional way of life or resources widely used or appreciated by Regional residents. In addition, because CVRPC has defined housing as a critical need for the Region, CVRPC will participate in the Act 250 review for any project which proposes to: increase the total number of year round housing units (according to the most recent U.S. Census) in its host municipality by more than 2%; or create more than 30 housing units of any type; or create more than 5 "affordable" housing units, as defined by VSA Chapter 117 Section 4303.

velopment could have transportation impacts that extend beyond the host community, but have aesthetic concerns that are purely local. It should also be noted that, in accordance with CVRPC's Act 250 Review Policies, the Commission's position on any Act 250 project shall be based solely upon those aspects of a project that may have Regional impact.

CVRPC also recognizes that it is possible that even where the Regional Plan and the local plan appear to be compatible, differences in the interpretation and application of plans can and do occur. CVRPC will attempt to identify such discrepancies as early as possible in any relevant review process and notify the affected municipality accordingly. CVRPC will offer to meet with representatives of any municipality with which it may have a disagreement in an attempt to resolve any differences prior to issuing a final position or decision. However, CVRPC will retain its statutory right to reach independent judgment in any and all such instances.

Copies of the proposed Plan have been sent to neighboring Regional planning commissions and all Central Vermont municipalities in order to solicit feedback, comments and suggestions

STATEMENT OF BASIC POLICIES

The Central Vermont Regional Planning Commission is charged with promoting mutual cooperation among its member towns in the planning and development of sites and infrastructure necessary to meet the future needs of the Region's residents. This Plan is intended to guide future growth and development, infrastructure investment and environmental protection in Central Vermont by providing a framework within which the basic human needs of clean air and water, access to employment, food and shelter, and emergency services sufficient to provide personal safety can be satisfied. In doing so, it strives to promote a healthy natural environment, quality educational systems, and broad access to recreational and cultural opportunities. Although this Regional Plan has a statutory life of only eight years, it is written using the year 2016 as a bench mark while keeping an eye toward the even more distant future.

Attainment of goals set by this Plan will require a commitment to a vision of the Region as a community. In planning for the long term public interest of the Region, CVRPC can play a vital role in assessing the strengths and opportunities by finding and building solutions to those issues that transcend town boundaries. Towns no longer function as self-sufficient islands in providing services, employment and education. The interrelationships and interdependence between towns within the Region are clear.

The goals and objectives of each element of this Plan implement the following broad policies of the Central Vermont Regional Planning Commission:

- CVRPC in cooperation with its member municipalities and neighboring Regions seeks to guide the future of development to gain the maximum benefit for the least cost.
- CVRPC is dedicated to the promotion of the economic, social and educational well being of the Region and its residents by supporting the creation of opportunities for self-improvement while protecting individual rights and liberties.
- CVRPC encourages planning that identifies, respects and preserves our important historic, natural, cultural, and recreational resources.
- CVRPC promotes housing availability to meet the needs of people of all socio-economic levels.
- CVRPC seeks to maintain a healthy environment and to respect the Region's historic settlement patterns.
- CVRPC promotes diversified economic development and the creation and/or maintenance of sufficient jobs for all residents.
- CVRPC encourages development patterns which result in more energy efficient transportation patterns.
- CVRPC encourages investment in public facilities and services in areas of population and economic growth.
- CVRPC supports the identification and utilization of economic growth centers as a method of achieving development patterns that are mutually advantageous to the environment and the socio-economic needs of the Region's towns.

(The use of the word "encourage" in this Plan is intended to mean "to foster or give support to" and is not intended to indicate any mandates.)

ACKNOWLEDGEMENT OF CHANGING CONDITIONS

By law, Regional plans in Vermont have a statutory life of eight years. The information and policies presented in this document represent CVRPC's best effort to pre- sent an accurate and useful picture of conditions in Central Vermont at the beginning of a planning period starting in the summer of 2016. We recognize, however, that we live in dynamic times and that some of the facts, issues, and concerns presented here may change over the life of this Plan. If conditions warrant amendments to the Plan prior to its expiration date, the Commission will respond accordingly.

2016 Central Vermont Regional Plan
Land Use Element

2

The land, or more broadly, the natural earth, is the source of all that sustains human life. This fact is sometimes easy to forget in modern America. Water pours from our taps. Food is purchased, often already prepared, under the fluorescent lights of the supermarket. Clothing hangs from a rack at the corner boutique. Shelter is erected for us out of "construction materials" on "building lots."

Yet, we remain inextricably dependent upon natural systems. Traced to their origins, all of life's necessities are products of the earth and its processes. So are we.

Over the past several decades, Vermont has witnessed dramatic cultural change. Technological advances in the areas of transportation and telecommunications have been the primary agents of this transformation, opening up what was a fairly insular, self-sufficient rural society to the "outside world." With this exposure came new people, new development, and new social, economic, and land use patterns. Some of the changes the State has experienced have been beneficial; some have not.

While people may always argue about the pros and cons of technology and land development, they are part of our current reality. The challenge before us now is to guide these forces of change so as to bring about a marriage between our culture and our place that is sustainable, harmonious, and mutually beneficial. In the years to come, nothing will say more about the success of our efforts than the way in which people use the land and its resources.

DISCUSSION: TRENDS

In recent decades, the amount of land in agricultural production and wetlands has diminished, as forested and developed lands have expanded. While it is always difficult to predict the future, especially for the long term, certain expectations regarding land use seem reasonable, at least over the life of this Plan. Among them are:

Central Vermont Land Uses, 2002*

Land Use	Acreage	Percent of Region
Forest Land	404,127	77.53%
Ag/Open Land	66,257	12.71%
Scrub/Shrub	18,113	3.47%
Residential	15,600	2.99%
Surface Waters	6,075	1.16%
Wetlands	3,233	0.62%
Commercial/ Services	2,837	0.54%
Industrial	1,560	0.46%
Institutional/Government	1,317	0.25%
Roads and Parking Lots	1,132	0.22%

*The information for this table was derived from the interpretation of aerial photographs supplemented by field checks. Figures for "developable" land include only those portions of a parcel committed to a given use and not necessarily the entire acreage of the

- Land in agricultural production will continue to decrease. While the rate of change could depend on a number of factors, including Federal policies and pricing, development pressures, market influences, and taxation policy, the rate of loss is expected to slow given stronger protective measures now in existence, the emergence of land trusts, and the fact that most of the marginal farms are no longer in business leaving only the finest soils still in production. Some of the farmland lost over the next five years will revert to the forest/brush category and some will be converted for development.

- Wetland acreage will stabilize due to the existence of strict, protective regulations at the Federal, State, and sometimes local level.

- Acreage in forestland may increase slightly, but will not change dramatically. Conversion to development will probably be offset by vegetative succession of abandoned farmland.

- Developed land will increase. The amount of land converted to development will be a function of several variables, including: the Regional economy, population trends, regulatory controls, and the patterns of growth.

PRODUCTIVE RESOURCES

Central Vermont possesses "working landscapes" where people manage, nurture, and harvest the resources of nature. Farmlands, forest lands, and lands containing mineral resources are vitally important to the economy and character of our Region. This Plan encourages the protection of resource production lands and the livelihoods of the people who use them by recognizing their benefits, promoting their products, and rethinking the attitudes, policies, and land use patterns that threaten their existence.

Agricultural Land

In spite of the general decline of agriculture, farming and farmlands continue to con- tribute many millions of dollars annually to the economy of the Region, and directly provide over one thousand jobs to its residents, and many more indirectly. According to the 2005 Vermont Occupational Employment Projections, farming and forestry is still projected to account for about 1,000 jobs in Central Vermont in 2012.[1] The lure of our pastoral landscape yields substantial indirect benefits from tourists, as well.

In addition, the case can be made that preserving farms and farmlands may help pre- serve urban economies. Sprawling suburbs, office parks and shopping malls in now agricultural areas would likely contribute to the demise of downtown businesses and neighborhoods.

Farming helps to define the Region's cultural identity and provides Central Vermont

[1]Vermont. Department of Labor: 2004- 2014 Occupational Employment Projections.

residents with open space, recreational opportunities, aesthetic pleasure, and a sense of place. More importantly, farms and farm soils, if protected now, can assure us of some degree of Regional self-sufficiency in the event that outside food supplies dwindle, are cut off, or become prohibitively expensive. While such scenarios may seem far-fetched for the short term, a number of circumstances already in motion could make them a reality within our lifetimes. Among such circumstances are: global climate change, dwindling and expensive energy reserves, disease susceptible mono- culture farming in major production areas, soil salinization and water shortages in these same locations, trade fluctuations, and worldwide population increases.

Farmlands provide a variety of environmental functions from which we all benefit. They provide wildlife habitat. They capture carbon dioxide, thereby maintaining air quality. They help protect the integrity and function of our flood plains and wetlands. They can help maintain water supplies through groundwater recharge. Farms, as they exist in Central Vermont, are part of, and contribute to, the natural systems that sustain life.

In light of all this, a strong, healthy agricultural economy is vital to the Region's well- being. The limited supply of primary agricultural soils, their general suitability for septic systems, combined with agriculture's increasing dependence on higher quality land make it crucial that land use decisions dis- play foresight and recognize the importance of these soils to future generations. As such, it is a primary goal of this Regional Plan to preserve and promote a viable agricultural economy, culture, and land base.

Vermont Agricultural Soils

See map: *Central Vermont Primary Agricultural Soils*

Agricultural Value:

1, 2, and 3 have few limitations restricting their use; these soils are level to gently rolling and are the most productive.

Soils in classes 4, 5, 6, and 7 have more limited agricultural value due to slope, excessive wetness or shallow depth to bedrock.

Classes 4 and 7 are Federally classified as "statewide," but within Vermont agricultural values 1 through
7 are all categorized as "primary agricultural soils."

Vermont soils are identified by USDA/NRCS in its publication *Farm-land Classification Systems for Vermont Soils (June 2006 edition*).

USDA/NRCS acknowledges those soils with agricultural values of 1 through 7 as demonstrating the characteristics needed for various agricultural uses. This compilation is updated when necessary, is avail- able in print, on the internet, and on CD-ROM.

Complete details are available at: www.nrb.state.vt.us/llup/publications/importantfarmlands.pdf

The Vermont Center for Geographic Information: www.vcgi.org

Your nearest office of the USDA/NRCS, or online at:

www.vt.nrcs.usda.gov/soils/

http:/websoilsurvey.nrcs.usda.gov

Forest Land

Although forests cover 74% of the state today, Vermont wasn't always the "Green Mountain" state. At the time of European settlement, forests covered almost all of Vermont, but wide-scale clearing begun in the early 1800s significantly changed the landscape to an agricultural haven. Clearing reached its peak in the mid to late 1800s and reduced forest cover to about 35% of the state. Over the last century westward expansion, the decline of the sheep industry, and reduced timber harvesting have contributed to the steady regrowth of Vermont's forests.

Forests provide many benefits to Central Vermont residents. The timber industry contributes to the economy, providing jobs and important wood and paper products. Forests contain habitat essential to a variety of wildlife species and help protect and replenish surface and groundwater supplies. They also perform an important atmospheric cleansing function, protecting the quality of the air we breathe. Many recreational pursuits are dependent on, or enhanced by, forests, as is the aesthetic quality of the Region. Additionally outdoor recreation and tourism are major contributors the Vermont economy.

While approximately 77% of the total land area in Central Vermont is forest land, for the first time in a century Vermont is experiencing an overall loss of forest cover. While it is hard to pin down the exact amount of acreage, a US Forest Service report indicates Vermont may have lost up to 69,000 acres of forest land between 2010 to 2015. Forest fragmentation is due to the conversion of forests to agriculture and commercial uses, yet the main cause is scattered residential development. It occurs incrementally and over time non-forested pockets tend to multiply and expand. Eventually the forest is fragmented and reduced to scattered, disconnected forest islands. The remnant forest islands resulting from this fragmentation are surrounded by land uses that threaten the health, function, and value of those forest islands for animal and plant habitat, and for human use. As forest fragments become ever smaller, practicing forestry becomes operationally impractical, economically nonviable, and culturally unacceptable. Based upon information contained within the ANR Act 171 Guidance document, 25-years ago, 19,000 family forest landowners owned parcels up to 10 acres in size. By 2012, there were 43,000 family forest landowners. Overall, economically and environmentally sustainable forest management is very difficult on lands smaller than 50 acres.

In 2016, the Vermont Legislature passed Act 171 which amended multiple provisions related to timber harvesting and forest management. The act amends municipal and regional planning goals to encourage management of forestlands to improve forest blocks and habitat connectors and encourage the use of locally grown forest products. The Act defines a "forest block" as a contiguous area of forest in any stage of succession and not currently developed for non-forest use. A forest block may include recreational trails, wetlands, or other natural features that do not themselves possess tree cover. These can be different

sizes and are identified by the land cover of an area and not bounded by political or parcel boundaries.

The State of Vermont maps and ranks important and significant landscape features, as contained within the online mapping tool BioFinder. To view the Region's Highest Priority Interior Forest Blocks and the Region's Highest Priority Connectivity Blocks see Natural Resource Map #3. Together these data layers represent a connected network of forest that provides high-quality interior forest habitat.

It should be noted this map does not identify all of the Region's productive forestland. Productive forestlands are defined as all large tracts which in themselves, or when combined, form a major economic unit for long-term timber production. It is important that these lands are conserved through sound, long-term forest management programs, and compatible patterns of growth and development.

Mineral Resources

The mineral deposits of Central Vermont are recognized as an important resource. The presently known mineral resources of the Region include granite, talc, asbestos, chromite, verde antique, sand and gravel.

The granite quarries of Barre Town and granite industries of Barre City, Berlin, Calais and Montpelier are major contributors to our economy and living monuments to a colorful part of our Regional heritage. While sand and gravel deposits are less renowned, they play an important part in local and personal economies and are relied upon by municipalities for road building and maintenance materials.

The products of earth resource operations are so important that we must accommodate them even as we guard against their more harmful aspects. This is an example where the planning process can be used to encourage locations and operating procedures that could minimize the conflicts and uncertainties of the regulatory process.

RESOURCE PROTECTION

Within our Region's boundaries are many ecologically sensitive areas and resources that serve as symbols of our natural heritage and barometers of the Region's environ- mental health.

These environmentally sensitive lands are not mere amenities. They have great value for education and research and for the understanding and appreciation of natural systems and

processes. They perform critical ecological functions, enhancing the stability and diversity of ecosystems. They also provide aesthetic relief and recreational opportunities, and hence, economic benefit.

The preservation of ecologically sensitive places is a goal of this Plan. Human use of such areas should be accomplished in a manner which protects their integrity and function.

Resource protection lands include: protected lands, wildlife habitat, high elevation areas, steep slopes, critical resource areas, groundwater recharge areas, surface waters, wetlands, floodplains and scenic areas. (See maps: *Natural Resources 1* & *Natural Resources 2*)

Wildlife Habitat

Our native wildlife species are valued by Central Vermont residents in a variety of ways for a variety of reasons. Some merely enjoy their presence as a reflection of nature's spirit. Some rely on wildlife for sport, food, or income (direct and indirect). Others have scientific or academic interests in wild creatures. For many of us, a combination of the above factors plays a role in our appreciation of wildlife.

Our most critical wildlife species are generally thought of as those which yield significant economic return, provide for sport and subsistence hunting, are symbolic of wilderness values, or face the threat of extirpation or extinction. We know that viable habitat is the single most important survival need for most of these species; yet for many, habitat loss and fragmentation is a real and present threat.

Based upon information contained within the 12/14/17 draft ANR Act 171 Guidance document titled "Planning: A Key Step Towards Protecting Forest and Wildlife Resources", "habitat connectors" are those areas of land or water that links larger patches of habitat within a landscape to allow for the movement, migration, and dispersal of animals and plants. They can be a forest block, riparian area, or a specific road crossing that wildlife repeatedly use. Forest fragmentation contributes to the loss of wildlife habitat, and the loss or decline of habitat connectivity and minimizes a species' ability to travel between hunting, breeding and migration grounds.

As noted above within the Forest Lands section of this chapter, the State of Vermont maps and ranks lands

and waters that support important ecosystems, natural communities, habitats, and species. The Region's Highest Priority Connectivity Blocks are comprised of habitat blocks that are of the greatest importance for wildlife movement and genetic exchange on a regional scale. Together with the Region's Highest Priority Interior Forest Blocks these data layers represent a regionally connected network of forest that provides high-quality interior forest habitat. The inclusion of Highest Priority Surface Water and Riparian Areas identifies additional lands along streams, rivers, lakes and ponds which also serve as wildlife corridors. See Natural Resource Map #3.

Additionally, the Vermont Department of Environmental Conservation has defined and mapped the following significant habitats: deer wintering habitat , bear reproduction zones, natural communities and any areas necessary to support the food, shelter or breeding needs of endangered species (See Natural Resources Map #1).[3]

High Elevation Areas and Steep Slopes

Areas of high elevation and steep slopes garner multiple considerations for resource protection. Slopes between 15-25% grade are typically considered "steep" in Vermont and elevations about 2,500 feet are regulated at the State level, with some com- munities regulating at lower elevations. Soils in these areas are often more sensitive to erosion, as at high elevation they can be shallow to bedrock, and on steep slopes are being willed by gravity to move. Where soils are more erodible, disturbance of them is more likely to lead to effects on water quality, as soils and their nutrients are washed into surface waters. Additional sediment in rivers can lead to bank destabilization and streambank erosion. High elevation areas also have an important role in the watershed overall, as the starting point for much precipitation that will eventually run over the land to valley water bodies.

Special scenic and wildlife habitat values are connected to high elevation areas as well.

At some elevations, climatic conditions are just right for supporting certain species that are rare at lower elevations. Vermont has long identified with the scenery of its mountains, and ridgeline vistas are inherently formed by lands at highest elevation. In Central Vermont the Camels Hump State Park is established as an ecological area**,** to protect scarce and rare plants and preserve natural habitat and wilderness aspect.

3 Vermont. Department of Environmental Conservation. Critical Habitats.

Critical Resource Areas

For the purposes of this Plan critical resource areas include:

- National Natural Landmarks: a designation that encourages and supports the voluntary conservation of sites that illustrate the nation's geological and biological history, and to strengthen the public's appreciation of America's natural heritage;

- State-designated Natural Areas: limited areas of land which have retained their wilderness character, although not necessarily completely natural and undisturbed, or have rare or vanishing species of plant or animal life or similar features of interest which are worthy of preservation for the use of present and future residents of the State and may include unique ecological, geological, scenic, and contemplative recreational areas on State lands;

- Sites listed on the Vermont Rare, Threatened and Endangered Species, and Significant Natural Communities as designated by the Vermont Natural Heritage Inventory; and

- Elevations over 2,500 feet as shown on USGS topographic maps.

Groundwater Recharge Areas

Well over half of Central Vermont's residents, and many of its businesses and industries receive their water from subterranean sources. In our rural areas, this figure rises to almost 100%. In general, groundwater sources in Central Vermont are plentiful and of good quality. In addition, groundwater is usually less susceptible to seasonal fluctuations and contamination than surface water making it an ideal source for public, urban supplies.

Incidents of groundwater contamination are on the rise, however, primarily due to improper activities within those areas which serve to replenish supplies.[4] Sources of groundwater contamination in Central Vermont include domestic sewage, landfills, improperly disposed of hazardous wastes, leaky underground storage tanks, pesticides and fertilizers.

4 Greenberg, A.S. Groundwater Quality Protection and Planning: A Guide for Local Government, UVM, 1991.

Supply quantity is threatened in some locations, as well, because of an increase in impermeable surfaces in aquifer recharge areas.

Once contaminated, groundwater supplies are difficult and expensive to rehabilitate. New sources may be hard to find, costly to develop, and susceptible to the same fate as the tainted source, if treated similarly. It is critical, therefore, that our existing and future groundwater supplies are protected. The future of our municipalities and their prospects for new growth and development depend upon the quality and quantity of this important resource.

The State of Vermont has adopted an aggressive groundwater management strategy designed to promote a proactive approach to the protection of subterranean water supplies. This strategy includes the delineation of critical recharge zones (known as Wellhead Protection Areas or WHPA's) for public water supply systems and the establishment of land use guidelines to reduce contamination potential on these sites. Al- though WHPA's have no individual regulations attached to them, existing State regulatory programs will regard them as "red flags" indicating the need for special

consideration of proposed development activities. In addition, the Department of Environmental Conservation requires that a "source protection plan" that minimizes the contamination risk within WHPA's be developed.

Surface Waters

The Region's lakes, ponds, rivers and streams represent an invaluable resource. They provide water for drinking, and domestic and industrial uses. They generate hydroelectric power. They dilute and assimilate various effluent. They provide recreational and aesthetic values for public use and enjoyment. They also contribute to the propagation of fish and wildlife and to economic development.

Streams, rivers and lakes with adequate vegetative buffers on their shorelines enhance the benefits of the resource. Vegetative buffers protect shorelines from flood flow and ice damage, prevent bank erosion, are aesthetically pleasing, and maintain a cool water temperature, an adequate oxygen level for fish habitat, and effluent assimilation capacity.

Unfortunately, the demands that we place upon surface waters are often incompatible and detrimental to their overall quality and function. Our challenge is to balance our needs with respect to surface waters and to adjust current development practices so as to minimize their harmful impacts.

Floodplains and Fluvial Erosion

Canoeing on Wrightsville Reservoir, Middlesex, Vermont.

Floodplains are areas of land adjacent to a water body that are frequently inundated by water. While these places serve important ecological functions, including flood-water storage, sediment trapping, nutrient filtering and aquifer recharge, they also can be hazardous to human life and property. Arising from a variety of causes, including heavy rain, melting snow, ice jams, poor drainage and dam breaks, flooding is the most frequent, damaging and costly type of natural disaster experienced in the State and Region. In fact, over the last 50 years flood recovery costs have averaged $14 million per year (not adjusted for inflation) statewide.

Floods cause damage in two distinct, but related, ways. Inundation can fill structures with water and cause property damage and drowning. It is a great concern for those living in or near flood hazard zones. Surprisingly, however, fluvial erosion, including bank failure and changes in river channel courses during floods, actually causes more damage.

Unfortunately, our society's historical response to floods has been to treat the symptoms rather than the causes of floods – repairing damages rather than preventing them. Furthermore, some of the traditional "cures" actually exacerbate the problem they attempt to fix. The disaster response paradigm is changing, however, and CVRPC has been taking an active role in both inundation mitigation and fluvial erosion hazard mitigation.

Fluvial erosion along the Mad River, Waitsfield, Vermont. Image courtesy of VTDEC River Management Program.

In response to recent program and mapping changes made by the Federal Emergency Management Agency (FEMA) to the National Flood Insurance Program (NFIP), we have been working with our member municipalities to help them identify and correct any deficiencies in their flood hazard regulations and/or maps. This program identifies

those areas within a flood hazard zone (the area inundated by water during a flood with a statistical probability of occurring once every 100 years – i.e., the "One Hundred Year Flood") and prescribes development review guidelines and procedures for lands within regulated areas. Compliance with these Federal standards is required for continued NFIP eligibility. Residents of municipalities that lose eligibility would face prohibitive costs for insurance protection outside of the program. Most of the Central Vermont Region is facing a 2009 deadline for program compliance.

On the fluvial erosion front, we have been working with the State of Vermont and member towns to conduct fluvial erosion hazard assessments for many river and stream segments in the Region. Using field surveys and GIS technology, we have completed (or will soon complete) erosion hazard maps for sections of the main stem of the Winooski River and many of its tributaries, including the North Branch, Jail Branch, Stevens Branch, Kingsbury Branch, as well as and the Dog and Mad Rivers. It is hoped that municipalities will use this information to help avoid future life and property damage.

According to the Vermont River Management Program, "the largest single source of flood losses, both in terms of cost and the number of people affected, is damage to transportation infrastructure." Undersized, or blocked bridges and culverts are a main culprit in exacerbating flooding and erosion hazards. Accordingly the Commission has, through our Bridge and Culvert Program, completed detailed inventories of these structures to provide our municipalities with information on the exact locations and specifications.

Finally, we continue to work with our communities on pre-disaster mitigation planning (see Utilities, Facilities and Services Element) in order that they meet the Federal eligibility requirements for disaster recovery and mitigation funding.

Wetlands

Wetlands are areas of land that are "inundated or saturated with water for varying periods of time during the growing season."[5] Wetlands help make the environment more livable. They are among our most productive and diverse biological communities. They purify surface and underground water supplies. They are natural flood storage areas during wet periods and replenish reservoirs during dry spells.

Although wetlands can sometimes present significant and costly obstacles to development, over the past century or so more than one half of the original wetland acreage in New England has been destroyed. Now that we are beginning to understand the important ecological functions that wetlands perform, these special areas are receiving greater protection.

[5] Vermont Agency of Natural Resources, Department of Environmental Conservation, Vermont Wetlands Conservation

Scenic Areas

Central Vermont is a place of celebrated natural beauty. Its scenic landscapes not only enrich lives and spirits and attract new businesses and residents, they also provide the basic ingredient for one of the Region's most important industries - tourism. Each year thousands of visitors travel here to see the mountain vistas, pastoral scenes, fertile valleys, historic villages, Interstate 89 (which has received awards for its scenery), remote back roads, and woodlands ablaze with autumn color. Thus, it is in our best interest, both psychologically and economically, to preserve the best of Central Vermont's visual splendor.

LAND DEVELOPMENT ISSUES

As our population increases and ages, more people require shelter, jobs, and places to purchase and manufacture goods. Consequently, growing areas, or areas preparing for growth, must find the ways and means to accommodate new construction. In Central Vermont, the pace of new construction has greatly exceeded the rate of population growth over the past few decades. In fact, since 1970 the number of new housing units and businesses here has increased at more than twice the rate of the population. This fact is, in part, indicative of society's appetite for new products, personal services, and independent living, and in part due to comparatively large growth in the Region's 18 - 64 year old age cohort group.

Given the uncertainties of the economy and vagaries of society, it is difficult to say whether this trend will continue unabated over the next few decades. However, it is safe to forecast that growth and development will continue at some level, and that the Region must be prepared to accommodate this growth for the good of its residents and its economy. At the same time, it is important to acknowledge that there are physical, ecological, and economic limits to current patterns of growth and development. Accordingly, the development policies presented in this element are intended to guide new land development so as to maximize its economic and societal benefits while avoiding, to the extent practicable, its environmental and societal pitfalls.

Residential

Over the past few decades, the rate of housing growth has grown faster than that of population growth (see chart: Housing Units vs. Population in the Central Vermont Region 1970-2000). A decrease in average household size, a larger adult population, and an increase in the number of vacation units are primarily responsible for this phenomenon. (For more discussion see: Housing Element.)

Housing Units vs. Population in the Central Vermont Region 1970-2000

1970		1980	1990	2000
Total Housing units	17,208	23,655	27,577	29,912
Percent change		37.5%	16.6%	8.5%
Total Population	50,688	56,290	59,619	63,276
Percent change		11.1%	5.9%	6.1%
New units		6447	3922	2335
Population increase		5602	3329	3657

SOURCE: United States Census Bureau. Selected Housing Characteristics. 2000

Commercial/Industrial

Like residential growth, commercial and industrial expansion has out paced population increases in Central Vermont. In fact, the 80's witnessed a 46% growth in the number of business establishments in our Region compared to a modest 11% growth in the number of residents. With an increase in the Region's working age population, more business growth is likely and necessary.

Employment statistics seem to indicate that the location of many of Central Vermont's new business establishments reflects the increasing consumer base of the Region's rural towns and semi-rural bedroom communities. In fact, between 1982 and 1990,

3559 of the 4328 new jobs (82%) and 361 out of 471 new employers (77%) were established outside of the Region's urban core (i.e. Barre City and Montpelier).[6]

6 Vermont Department of Labor Statistics

Often, new businesses have located along the state highways and collector roads which bring commuters back and forth to work and tourists to and from their destinations. While only a few locations have experienced full blown "strip development," most of the Region's major corridors are witnessing the early stages of this impact. The above generalizations are not intended to apply to traditional home occupations or modestly scaled self-employment enterprises. Such activities generally do not alter the character of the areas in which they are situated, offer goods and services which may be inappropriate or unnecessary in densely settled locations, and are usually so small in scale and impact so as to have, individually, no Regional significance. For more discussion see: Economic Element.

Stormwater Management

In a pristine environment, stormwater is managed by the landscape's natural features. Surface flow is inhibited by vegetation and most water is able to infiltrate the ground through pervious, un-compacted soils. That which does not, settles into depressions and wetlands or finds its way into streams and rivers where excess water collects on undeveloped flood plains, retreating harmlessly, in time.

In a developed landscape, the situation is different. Falling precipitation is intercepted by roofs, parking lots, roads, sidewalks and other impervious surfaces which increase the quantity, velocity, and concentration of surface runoff. Water flowing over such surfaces picks up a variety of pollutants (e.g., gas, oil, animal waste, road salt, anti- freeze, etc.), as well as debris, thermal gain, and speed - all of which can have severe consequences on water quality and aquatic biota. Fast moving, channelized surface flows can erode roads and other structures, overwhelm combined stormwater systems, contribute to the occurrence and severity of downstream flooding, and cause sedimentation in rivers, lakes and streams. As urbanization continues, soils are disturbed by new construction, vegetated buffers are lost, and the pressure to develop in less suitable locations (e.g., steep slopes, higher elevations) increases.

While growth and development have the potential to decrease water quality and in- crease flooding, that is not necessarily the case. Good land use planning and site de- sign can do much to reduce the impacts of stormwater runoff (and even help correct existing problems) by minimizing impervious surfaces, maintaining and/or providing vegetation, and employing Best Management Practices (BMP's) and structural controls during and after construction.

Brownfields

Brownfields are defined by the United States Environmental Protection Agency (U.S. EPA) as "real property, the expansion, redevelopment or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant. " Typical prior uses that may fall into this category in Central Vermont include old town dumps, photo developing sites, mill complexes, factories, dry cleaners, auto repair shops, gas stations and even some agricultural sites.

According to the U.S. EPA, it is estimated that there may be over 450,000 brownfield sites in the United States. Yet a report undertaken by the Northeast-Midwest Institute, a non-partisan research organization, suggests that there may be nearly 1 million sites nationwide. Estimates vary for different reasons. Existing inventories of brownfield properties may consider commercial and industrial properties listed on the real estate market but, not account for those not for sale and/or abandoned. Estimates may include only those properties which are currently enrolled in a brownfield assessment or
clean-up program. The Vermont Department of Environmental Conservation's (VT DEC) Brownfields Response Program Sites List currently lists 52 brownfield sites currently undergoing investigation and remediation. Regardless, most properties with an industrial or manufacturing history may be a brownfield.

Brownfield sites often remain vacant and underutilized due to concerns over liability and unknown environmental assessment and clean-up costs; yet many sites can be rehabilitated. Redevelopment or re-use of potentially contaminated sites has many benefits:

- Eliminates eye sore properties,
- Promotes/supports historic use patterns,
- Protects human and environmental health, and
- Strengthens the local economy.

Since brownfield sites are often in already developed areas, their reuse can help to promote compact land use and in-fill development. According to the U.S. Environ- mental Protection

Agency ’s web site “for every acre of brownfields redeveloped, it is estimated that an average of 4.5 acres of greenfields are saved. ”

CVRPC has been very active in the area of brownfield rehabilitation since the last Regional Plan adoption. Beginning in 2004, we have received over a half million dollars in EPA grants to assist our communities in assessing and reclaiming these important properties. To date, CVRPC ’s Brownfield Program has funded an extensive environ- mental site assessment for the Salt Shed on Stone Cutters Way in Montpelier and plans are now underway to transform the former industrial site to a mixed use development. Additional sites that have benefited from the program include the Railroad Turn Table, also located along Stone Cutters Way, next to the Salt Shed (for future use as a “pocket park ”), the MWT site in Northfield Falls (for the purpose of selling the property to the current tenants of the building and to retain business in a historic mill building), and two municipally owned sites in the Town of Warren (to assess their potential for the creation of affordable housing and public recreation space).

Noise

Any undesired sound can be considered “noise.” Noise pollution is defined as “continuous and unrelenting sounds at all levels or episodic and excessively loud sounds. ” While it must be recognized that noise necessarily accompanies certain business and transportation operations, new development should make all reasonable efforts to minimize noise impacts and shall not exceed acceptable standards in residential areas. Among the techniques available are: restricting hours of operation or construction, using vegetated buffer zones to filter sound, taking advantage of topography in designing projects to provide sound barriers, the use of structural barriers (i.e. earth berms and sound walls), and architectural design and materials. Higher noise levels may be appropriate and unavoidable within assigned industrial, commercial, and mixed use zones.

FUTURE LAND USE

State Statute directs Regional Plans to include a “land use element, which shall consist of a map and statement of present and prospective land uses. ” (24 V.S.A. § 4348). The Map identifies general Planning Areas that will be used to guide land use and development in the Central Vermont Region.

The Planning Areas are not meant to be detailed representations of current conditions, nor are they intended to be distinct areas of segregated future land uses. The Planning Areas focus on the overall pattern and form of development across the rural to urban spectrum rather than on specific densities or uses, which are more properly defined at the local level.

Future Land Use Planning Areas

Regional Centers are the Region's core downtowns, plus their surrounding mixed-use neighborhoods, which accommodate high density commercial, institutional, industrial and residential uses. Regional Centers in Central Vermont include portions of the City of Montpelier, Barre City and Waterbury Village, each of which contains a state-designated Downtown district and infrastructure that includes urban road networks, sidewalks, public spaces and public water and wastewater systems. These areas pro-vide regional services and employment and are areas where efforts to reduce travel demand through ridesharing, transit and multi-modal transit options are critical.

Regional centers are not only the dominant attractors of work and personal business trips in the Region, they also attract significant numbers of trips from the outside the Region. The Region's greatest concentrations of office space, retail space, bankingservices and other generators of personal business are located in downtown Montpelier and Barre City. Relative to the other downtown areas, Montpelier and Waterbury have more office space (such as the State Office Complex). Barre City also has State Offices at the McFarland House and City Place, and has more manufacturing and industrial land uses.

Central Vermont Regional Planning Commission
Designating Future Land Uses

The following criteria and data are used when staff and Commissioners make land use area designations in the CVRPC Regional Plan. (Criteria are generally in order of priority.) Boundaries of land use area designations are for general planning purposes only and may contain errors and omissions. Data should be verified during permitting processes per the provisions of the regulatory authority.

Area Designation Criteria:

1. Is it consistent with the state land use planning goals found in 24 V.S.A., §4302 (compact centers surrounded by rural areas)?
- Proximity to villages/downtowns/growth centers designated by the Vermont Downtown Board and/or recognized hamlets, town centers or regional centers identified by CVRPC's Regional Plan
- Is the area walkable (compact configuration allowing for less than ¼ to a ½ mile round trip)?
- Is there a visual or physical break (river, steep slope, change in density or type)?

2. Proximity to existing infrastructure
- Public wastewater, water, sidewalks, highways and transit, schools, recreation parks, other town services

3. Current Conditions
- Orthophotos: development density and extent
- Road network: potential access and connections
- Resource constraints: conserved lands, steep slopes, rare threatened and endangered species and significant natural communities, wetlands, floodplains, elevations about 2500 ft, and lake shore buffers.

4. Town planning and zoning
- What does the locally adopted and regionally approved Town Plan say?
- Do the town zoning districts match current infrastructure and future land use plans?

There is one State-designated Growth Center within the Region and its boundaries are adjacent to the City of Montpelier 's Designated Downtown. Growth Center designation in Vermont recognizes municipalities that demonstrate a capacity to plan and in- vest in vital, walkable, mixed-use centers and must include and support a designated Downtown, Village Center or New Town Center. A Growth Center has clearly defined boundaries that can accommodate a majority of commercial, residential, and industrial growth anticipated by the municipality or municipalities over a 20-year period.

Town Centers are less densely populated settlements and smaller than regional centers, but similarly accommodate many of the same residential, civic, commercial and light industrial uses. Typically referred to as "Villages," factors in determining the presence and boundaries of a Town Center include: a state-designated village center, local road network and availability of public utility infrastructure, relatively dense development and smaller lot sizes (1 unit per acre or higher), a mix of land uses, and a distinct separation from surrounding rural areas.

The Region's largest Town Centers that provide water and wastewater infrastructure and also serve as sub-regional retail and employment centers include Waitsfield Village/Irasville and Northfield Village. Additional Town Centers that provide water and/ or wastewater infrastructure, or both, include Warren Village, Cabot Village, Colbyville (Waterbury), Marshfield Village, Northfield Falls, Plainfield Village, Williamstown Village, Washington Village, East Barre, Worcester Village and Waterbury Center.

East Montpelier Village, East Calais, Maple Corner, Woodbury Village, Moretown Village, Duxbury Village, Middlesex Village and Roxbury Village round out the twenty existing Town Centers recognized in this Plan.

A subcategory of Town Centers in this Plan is New Town Centers. "New Town Center," as defined by the State, means the area planned for or developing as a community's central business district, composed of compact, pedestrian-friendly, multistory, and mixed use development that is characteristic of a traditional downtown, supported by planned or existing urban infrastructure, including curbed streets and sidewalks and on-street parking, storm water treatment, sanitary sewers, and public water supply." Though there are no state-designated New Town Centers within the Region, the Town of Berlin desires to encourage the expansion of the historic town area in the vicinity of Berlin Four Corners to adjacent areas to serve as a location of a mix of small-scale commercial, high density residential and civic uses in a traditional village setting.

Policies:

1. In order to maintain the existing settlement patterns, higher density residential, commercial, and industrial development should be located in Regional Centers and Town

Centers.

2. Small-scale shopping centers, designed to complement the historic character and support the vibrancy of community centers, are most appropriate in Town Centers or Hamlets (see Rural Areas). Community and Regional Shopping Centers, however, are less appropriate in Town Centers or Rural Areas and should be located in Regional Centers as a first priority and Mixed-Use Commercial areas as a second priority.

3. Encourage infill, redevelopment, adaptive reuse of existing buildings and reuse of "brownfield" sites in Regional and Town Centers. Encourage the revitalization and reuse of viable historic structures whenever possible.

Strategy 3a: Work with municipalities to align local capital planning and public investment strategies with infill and redevelopment goals.

Strategy 3b: Support implementation of infill and redevelopment activities identified in the 2015 Vermont Downtown Action Team reports (Barre City, Northfield, Waterbury, Waitsfield and Warren).

4. Municipalities should consider use of innovative tools such as "form- based" land use regulations. These types of regulations focus less on specific uses and more on the physical form of the built environment, utilize dimensional standards to shape how buildings relate to each other, to streets, and to other public spaces.

Strategy 4a: Explore opportunities to conduct a regional workshop focused on Implementing Form-based Land Use Regulations.

5. Continue to work with municipalities and VTrans to reduce conflicts between traffic needs and human-scale functions of Regional and Town Centers through practices like traffic-calming measures, pedestrian-safety improvements and gateway treatments. Priority for the use of public funding for the maintenance or improvement of infrastructure shall be for those that support concentrated development in Regional and Town Centers.

Shopping Center Definitions
(*Source: Bennington County Regional Plan*)

A shopping center may include one or multiple stores, in single or multiple ownership, functioning together as one integrated complex. For the purposes of the Regional Plan, the following definitions apply:

Small-Scale Shopping Center: A shop- ping center with a store or stores that sell daily living needs and convenience goods such as food, medicine, clothing, and hardware, and may also include service businesses (e.g., laundry, hair salon, bank, auto or bicycle shops). These centers range in size from 10,000 to 30,000 sq. ft. of gross floor area.

Community Shopping Center: A shopping center with a store or stores that sell a broad range of goods (such as food, clothing, furniture, appliances, sporting goods) and which also may include personal and professional service establishments. Large grocery stores, department stores, and movie theaters are often found in these centers. Gross floor area in a community shopping center may range from 30,001 to 300,000 sq. ft.

Regional Shopping Center: A shopping center (or "shopping mall") including stores that sell a wide variety of merchandise and services – similar to but larger and more extensive than a community shopping center – usually built around one or more large anchor department stores. These centers exceed 300,000 sq. ft. in gross floor area.

Strategy 5a: Support identification of corridors for new roads or road segments in and around Regional and Town Centers as part of a local planning process, and support for construction of those roads and utility infrastructure to help drive growth in a way that supports compact center development.

Figure 1: Connected Streets. *The diagrams above illustrate two different traffic patterns created by new development (shown in light gray). The diagram on the left highlights several smart growth principles by integrating the new roads with the existing road and providing for a mixture of uses at a density consitent with compact development (Smart Growth Vermont).*

6. Priority for the use of public funding for the development of affordable housing and assisted living facilities shall be for those located within Regional and Town Centers in order to increase access to services.

7. The placement of municipal and other government buildings should be in established Regional and Town Centers in order to maintain and enhance the vitality of these areas.

8. Encourage the development of public places and cultural events within Regional and Town Centers.

9. Support the creation of off-road bike and pedestrian paths that connect Regional and Town centers with residential areas and neighboring centers in a hub and spoke pattern.

10. Identify key areas with flood storage capacity and encourage floodplain protection measures such as land acquisition or restrictive land use regulation in areas up- stream of Regional and Town Centers.

Industrial consists of areas where existing and future commercial and industrial activities are encouraged, including new development and redevelopment. Largely clustered in the vicinity of the Region ’s urbanized areas, these include industrial parks and active quarries in Barre City, Barre Town, Berlin, Montpelier, East Montpelier, Middlesex and Northfield. A small industrial district is also located on the border of Fayston and Waitsfield, the location of the Mad River Industrial Park.

The specification of commercial/industrial sites allows for location of these types of businesses without creating adverse impacts on adjacent land uses. Large-scale commercial/industrial uses, which are important to the region, need to be located in areas where off-site impacts such as noise, traffic and light/glare can be mitigated.

Policies

1. Industrial uses are encouraged to locate first in existing industrial areas and secondly in industrial areas assigned in municipal plans which are in accordance with the goals and policies included in this plan.

2. It is acknowledged that commercial activity and small scale, individual industrial activities will take place in other parts of the region as directed by town plans, which can address the town needs with more specificity.

Mixed-Use Commercial include areas of commercial, office and mixed-use development built in a spread out pattern and served by water and wastewater infrastructure. Typically dominated by commercial service industries, the intent of this land use cate- gory is to transform these areas into higher-density, mixed-use settlements through infill and redevelopment. These areas in the region are concentrated along US 302, Fisher Rd, VT 12 and south of Route 2 in Berlin, and also includes South Barre in Barre Town.

Planned commercial or mixed uses within existing linear commercial zoning districts along major road corridors must be developed carefully to avoid sprawl, traffic congestion, and safety hazards.

Municipalities should not encourage strip development because additional development of this type would negatively impact the economic vitality of commercial areas in nearby Regional and Town centers. Communities should give substantial consideration to the long term impacts of creating or ex- tending strip development.

"Strip Development"

Title 10: Chapter 151, the Vermont statute dictating the Act 250 land use permitting process, defines "strip development" as follows:

"Strip development" means linear commercial development along a public highway that includes three or more of the following characteristics: broad road frontage, predominance of single-story buildings, limited reliance on shared highway access, lack of connection to any existing settlement except by highway, lack of connection to surrounding land uses except by highway, lack of coordination with surrounding land uses , and limited accessibility for pedestrians. In determining whether a proposed development or subdivision constitutes strip development, the District Commission shall consider the topographic constraints in the area in which the development or subdivision is to be located."

Policies

1. Encourage the transformation of existing commercial areas into areas serving a mix of uses, including residential, and offering diversified transportation options, while also conforming to traditional historic development patterns.

Strategy 1a: Work with towns to incorporate standards such as placement of buildings near the road with parking areas to the side and rear, attractive building design, application of access management principles and provision of pedestrian facilities within the center and facilities that connect to sidewalks and public transit.

2. Large scale retail constituting a substantial regional impact should be permitted only if it includes exemplary building and site design as described above in Policy 1, and is determined to have a net beneficial impact based on an independent economic and community impact study that may be requested by the host municipality and/or CVRPC.

Resort Centers are developments that are associated with large-scale recreational facilities, which in Central Vermont are concentrated around ski area facilities in the Mad River Valley.

Downhill facilities and associated development at Lincoln Peak (Warren) and Mt. Ellen (Fayston) of Sugarbush Resort and Mad River Glen (Fayston) all provide recreational facilities, services and jobs and contribute to the Region 's seasonal housing stock. Sugarbush Resort has been undergoing substantial expansions at Lincoln Peak for the past decade as part of a Lincoln Peak Base Area Redevelopment Master Plan to im- prove base area/guest facilities and to increase the bed base of the resort.

Access to these resort areas are provided via VT Rte 100 together with VT Rte 17, German Flats Rd., the Sugarbush Access Rd. and seasonal transit services.

Policies:

1. The Towns of Warren and Fayston have developed specific ski area planning districts and regulations in its municipal plan and zoning bylaw to ensure that development is consistent with town goals. As the impacts of these resorts extend be- yond municipal boundaries, this Plan recognizes that the Town of Waitsfield participates with the Towns of Warren and Fayston participate in the Mad River Valley Planning District (MRVPD). Also including representation from Sugarbush Resort and the Mad River Valley Chamber of Commerce, the MRVPD carries out a program of planning for the future of the Mad River Valley and conducts studies regarding key issues, such as affordable housing, recreation and trail planning and economic development that are incorporated into local plans. Future growth at Sugarbush Resort and Mad River Glen that is compliant with local plans and bylaws is consistent with this Plan.

2. The focus of alpine ski area development in the Region should remain on the expansion of existing facilities rather than development of new ones.

Rural areas encompass the majority of the Region's land area and are generally rural in character. Much of the Region's residential development in recent decades has occurred in these areas in a low-density pattern along transportation routes. These areas encompass much of the Region's large forest blocks, sand/gravel/mineral de- posits, and prime agricultural soils that, when in productive use, contribute to the working landscape and have significant economic value. Rural areas also include residential, small-scale commercial and industrial, and recreational uses.

New subdivisions can be planned to incorporate the positive characteristics of earlier rural settlements, such as a community identity, public open spaces, and preservation of important resources (such as agricultural soils and forest blocks). Many of these objectives can be realized by clustering lots to create a Hamlet-type character around the homes, while setting a significant percentage of the project area aside as open space reserved for agriculture, forestry, wildlife habitat or public recreation.

Hamlets are smaller than villages, and are typically concentrated residential settlements woven into the fabric of Rural Land Use Planning Areas that may or may not provide minor commercial and civic services. Hamlet areas are identified on the Future Land Use Map by center points; when making land use decisions using the policies in this Plan, Hamlet Areas must include the locally recognized extent of the hamlet as it is delineated in the appropriate town plan.

Hamlets in the Region include Riverton (West Berlin), South Village (Northfield), Cogswell, Upper Graniteville, Lower Graniteville, Upper Websterville, Lower Websterville, East Orange, Orange Village, Adamant, North Montpelier, East Montpelier Center, Putnamville (Middlesex), East Warren and South Woodbury.

Policies:

1. Development should be designed to minimize its impact on the viability of agricultural operations or its contribution to fragmentation of forest Blocks. .

Strategy 1a: Provide guidance and training on regulatory and non-regulatory tools for open space and resource protection available to towns for use in town plans and regulations. Encourage implementation of tools such as conservation subdivisions, clustered development, transfer of development rights, building envelopes and variable lot size in all subdivision development, and especially within rural residential and productive rural lands.

2. Development is encouraged to be built outside of farms and along the edges of forests, preferably with buffers between such development and agricultural uses or environmentally sensitive areas.

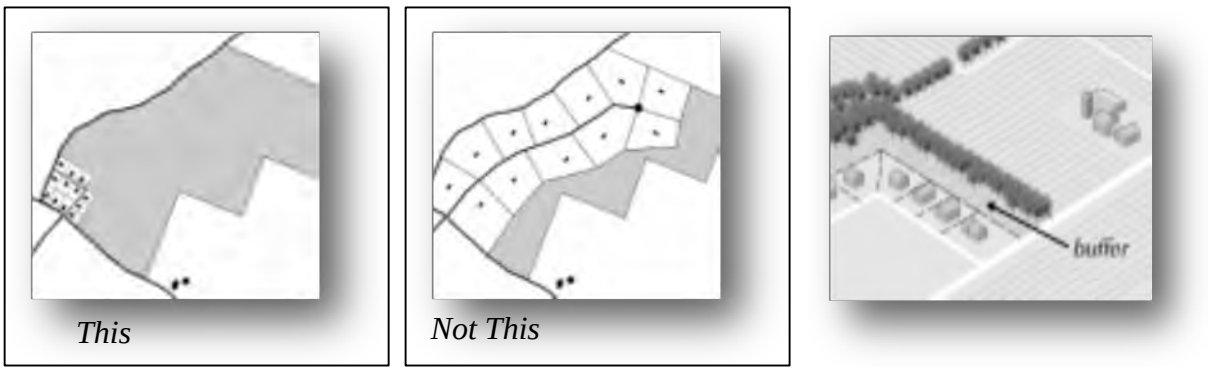


Figure 2. Avoiding Fragmentation and Minimize Use Conflicts*: Incorporate buffers between developed and resource lands to avoid conflicts between incompatible uses — maintain a well-defined edge between developed and open land. (Smart Growth Vermont).*

3. Policies that enable owners of farm and forestland to bear the financial responsibility of resource protection should be supported.

4. Development that diminishes the rural character of the area as defined by local and regional plans is discouraged. Development is encouraged to incorporate the following principles:

- Convenience and safety of vehicular and pedestrian movement, including measures such as traffic calming, within the site, and in relation to adjacent areas or roads.

- Compact development that allows for use of shorter power lines and shorter, narrower, and interconnected roads that result in lower maintenance costs.

- When new roads are being constructed, consideration should be given to burying power and phone lines, if practicable.

5. Develop and expand existing Hamlets in a form that maintains traditional density and residential settlement pattern. Encourage towns to enable this pattern of development in local land use regulations.

6. Wildlife connectivity areas should be protected from fragmentation and uses that reduce their viability for movement of wildlife, particularly where they connect forest blocks.

7. Non-residential uses, including small service businesses, small professional offices and inns are acceptable land uses for Rural Areas provided that such uses are planned as relatively small in size or scale, are not primary or dominant uses in an area, do not unduly conflict with existing or planned residential, forestry or agricultural uses, and do not unduly affect rural character. Towns should limit the number and size of such establishments to prevent a proliferation of scattered commercial development that does not serve the needs of the community.

8. Occupations that are customarily practiced in residential areas, and which do not affect the character of those areas, are another form of small-scale commercial use common in and appropriate for rural areas. Small professional offices, antique shops, and craft studios are examples of such "customary home occupations. "

9. Cross country ski centers, mountain biking facilities and other outdoor recreational areas represent an economically viable means of maintaining rural open spaces with little secondary development; both expansion and development of new facilities are consistent with this Plan.

Resource areas are dominated by lands requiring special protection or consideration due to their uniqueness, irreplaceable or fragile nature, or important ecological function. These include:

- Protected lands;
- Elevations above 2,500 ft (elevations above 1,700 ft in Waitsfield, as regulated);
- Slopes of 25% or more;
- Rare, threatened or endangered species and significant natural communities;
- Wetlands;
- Special flood hazard areas; and
- Shoreline protection areas;

Both Highest Priority Forest Blocks and Highest Priority Connectivity Blocks are also present within the high elevations and encompass areas of steep slopes, areas with rare, threatened or endangered species, significant natural communities and wetlands. As a subcategory of Resource lands, this plan recognizes *critical resource areas (see page 2-9 for a description)* as key sites that are particularly sensitive and should be given maximum protection. Please refer to the callout box on the following page for the methodology used to determine Resource areas.

Policies:

1. Conservation of the natural landscape and careful management of lands is sought for these areas. Development in these areas should be subject to extensive planning, review and conditions that ensure its protection.

2. Any development proposed within critical resource areas shall provide evidence as to why the development cannot be avoided, and shall provide mitigation for natural resources impacted by the development.

3. The extension of permanent roads, energy transmission facilities, and utilities into Resource areas is discouraged.

4. Development on wetlands, steep slopes of 25% or more, and ridge lines should be avoided.

5. Avoid or limit development and investment in identified flood hazard areas, where feasible.

6. Avoid development that fragments forest blocks and habitat connectors.

Future Land Use Map
Resource Data and Sources

Data is for general planning purposes only and may contain errors and omissions. Data should be verified during permitting processes per the provisions of the regulatory authority. Scale limitations exist and data is only as accurate as the original source.

- Protected lands: This data consists of both private and public protected lands. These include VT State Forests, Parks, Wildlife Management Areas, Town Forests, and Land Trust Easements.
Source: Vermont Conserved Lands Database, VT Land Trust, and Towns

- Elevations above 2,500 ft (elevations above 1,700 ft in Waitsfield, as regulated): This data consists of all areas about the elevation of 2500 ft and in Waitsfield VT above 1,700 ft.
Source: USGS contours over 2500 ft and Town of Waitsfield Land Use Regulations

- Slopes of 25% or more: This data includes all areas with slopes of 25% or more.
Source: CVRPC slope analysis using 10 meter Digital Elevation Model.

- Rare, threatened or endangered species and significant natural communities: This data consists of all mapped rare, threatened or endangered species and significant natural communities as identified by the Vermont Fish and Wildlife Department, Natural Heritage Inventory.
Source: Vermont Fish and Wildlife Vermont Natural Heritage Inventory http:// www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=229831

- Wetlands: This data consists of all mapped class 2 wetlands as identified in the Vermont Significant Wetlands Inventory.
Source: Vermont Department of Environmental Conservation Water Quality Division Wetlands Section

- Special flood hazard areas: This data consists of FEMA mapped Special flood hazard areas Zone A and AE.
Source: FEMA Digital Flood Insurance Rate Map data

- Shoreline protection areas: This data consists of all lakes and ponds greater than 10 acres plus a buffer of 250 feet (Lake Shore Protection areas in Calais, as regulated) .
Source: CVRPC selected Vermont Hydrologic Dataset lakes and ponds greater than 10 acres and then buffered those by 250 ft and the Town of Calais Land Use Regulations.

GENERAL LAND USE GOALS, POLICIES, AND STRATEGIES

Goal 1:

To promote sound management, conservation and use of the Region's natural resources.

Policies:

1. Municipalities are encouraged to establish conservation commissions (under V.S.A. 24, Chapter 118) to assist in the identification, study, maintenance and protection of important natural resources.

2. Encourage the improved identification and mapping of surface and groundwater resources.

Strategy 2a. Work with State and Federal partners, such as U.S. Geological Survey, VT Geological Survey, and the Agency of Natural Resources in delineating ground watersupply, aquifers, and groundwater protection areas.

Strategy 2b. Support towns in identifying wetlands and vernal pools that are not already mapped by the State of Vermont.

3. Support the betterment of surface water quality in the Region.

Strategy 3a. Storage and utilization of fertilizers, pesticides, petro-chemicals, herbicides, sludge, or other potentially harmful industrial, agricultural, commercial or residential materials, must be accomplished in a manner compatible with existing regulations.

Strategy 3b. CVRPC opposes the downgrading of surface water classifications unless such action is required to accommodate treated effluent from new or expanded municipal sewage treatment facilities. The Commission also opposes the upgrading of surface water classifications where such upgrading might be misleading or dangerous to users.

Strategy 3c. Where a proposed project involves a discharge into, or withdrawal from, any of the Region's surface waters, consideration should be given to the short and long term impact on such waters and to applicable health and water regulations. The potential degradation of water quality, the impact on wildlife, the assimilative capacity of waters, and the effect on the Region's ability to support future growth should be evaluated. Protection of the public health, safety, and welfare shall be the primary objectives.

Strategy 3d. Native vegetated buffer strips in riparian zones and shoreland areas should be protected or maintained according to Best Management Practices outlined in the Vermont Handbook for Shoreland Development and VT ANR Guidance Regarding Riparian Buffers to protect functional habitat and improve water quality.

Strategy 3e. Encourage and assist with the acquisition of conservation easements along waterways according to priorities identified in River Corridor Plans.

Strategy 3f. Assist with and support efforts to remove dams that are not serving a useful purpose and other artificial barriers from rivers and streams. Help identify dams that are not serving a useful purposes and that should be listed for removal in conformance with state and federal rules and regulations.

Strategy 3g. Assist landowners in identifying funding opportunities to support buffer- plantings on their properties that would support stream bank and shoreland restoration.

Strategy 3h. High density development in proximity to surface waters should consider community septic systems to permit adequate setback of the leaching area, or connections to public systems, if possible.

4. Encourage enhanced educational opportunities on watershed functions, protection and restoration, particularly those targeted to youth.

Strategy 4a. Develop a clearinghouse of resources that could be used by teachers and other groups working with youth to provide education on these topics.

5. Avoid or limit development and investment in identified flood hazard areas. Where established economic and institutional centers exist , development in these centers shall adhere to strict floodplain management standards to minimize flood damage and public safety risk.

Strategy 5a. Continue to conduct outreach to municipalities regarding the most recent state River Corridor maps as delineated by the VT Agency of Natural Resources and their implications.

Strategy 5b. Encourage and provide technical assistance to municipalities in enhancing the regulatory standards in their municipal flood hazard regulations, including the in- corporation of River Corridor regulations.

Strategy 5c. Fill and new structures within mapped floodways as identified on FEMA Flood Insurance Rate Maps shall be prohibited, except where a substantial public benefit is provided. ”

Strategy 5d. Wetlands that provide a flood storage function as determined by the VT Wetlands Program should be left undisturbed or development should be required to provide compensatory storage or restoration on-site or in the immediate vicinity, if disturbed.

Strategy 5e. Assist municipalities in identifying and limiting development on lands adjacent to waterways that provide flood storage or other beneficial function through acquisition, easement, deed restriction or zoning that encourages cluster design, particularly for those upstream floodplains that provide flood protection functions for the Region ’s downtowns and village centers.

Strategy 5f. CVRPC will have a FEMA Certified Floodplain Manager on Commission staff.

6. Improve flood resilience planning, education and outreach activities to create a citizenry aware of flood risks, potential costs, and actions that can serve to reduce risk and future property loss.

Strategy 6a. Continue to assist municipalities in developing local hazard mitigation plans and flood resilience elements as part of municipal plans.

Strategy 6b. Promote participation in FEMA 's Community Rating System, where appropriate; Assist un-enrolled towns in applying for the Community Ratings System and assist towns already involved in the Community Ratings System in improving their rating.

Strategy 6c. Consider coordination of a multi-jurisdictional Program for Public Information, an ongoing effort to prepare, implement, and monitor a range of public information activities.

Strategy 6d. If requested, perform an audit of municipal web sites and communication methods and recommend additional information and communication methods that will increase local awareness of flood risks, municipal flood resilience planning, and actions property owners and residents can take.

Strategy 6e. Partner with the Vermont Agency of Natural Resources to coordinate Region-wide flood resilience-related trainings targeted to real estate agents, developers, business owners and other stakeholders with interest in floodplain management.

7. Minimize fragmentation of forest blocks and habitat connectors.

Strategy 7a. Promote the Use Value Appraisal (Current Use Program) and other non-regulatory approaches to forest conservation and management, including support of forest products and conservation easements.

Strategy 7b. Encourage municipalities to identify forest blocks and habitat connectors and plan for the minimization of forest fragmentation.

Strategy 7c. Work with municipalities to incorporate development review standards in zoning and subdivision regulations that address forest and wildlife resources.

Goal 2:

To enhance and support the viability of the Region's resource based industries.

Policies:

1. CVRPC supports and encourages the protection and continued productivity of viable primary agricultural soils, productive forest land, and mineral resources. Sound land use planning including flexible development options, fair government pricing taxation and subsidy programs, agricultural diversity, and promotion of value-added products and industries are viewed as means to this end.

2. Public improvements are considered a significant reason for farmland's metamorphosis into prime development land. The installation of sewer or water lines, and roads across or into the immediate vicinity of agricultural parcels or primary agricultural soils can encourage the development of farmland. For this reason they require careful review. Such improvements will be discouraged unless:

- such a position would conflict with the local plan; or
- the improvements are required to implement the settlement pattern goals set forth in this Plan or in that of a Central Vermont municipality;
- there is an overriding public need being served; or
- adequate permanent protection is inherent in the development proposal; or
- parcels or soils affected are determined to be "not viable" for reasons of size, topography, surrounding land use, or potential productivity.

3. CVRPC encourages municipalities to identify locally significant agricultural and forest parcels and/or districts through locally and consensually developed land evaluation and site assessment programs (e.g. LESA and FLESA). Such identification can assist in establishing protection priorities and programs.

4. CVRPC recommends continuation of, and participation in, the Use Value Appraisal Program as a means to promote continuing sound management of resource lands by taxing them fairly and according to their current use.

5. CVRPC will, in conjunction with other stakeholders and relevant organizations, consider methods to determine the amount of agricultural land required to meet the Region's long term requirements under a "worst case scenario" regarding food importation.

6. The extraction of sand and gravel should not be unduly detrimental to surrounding land uses or the environmental quality of the area. A reclamation plan should be included as part of any extraction proposal. Possible alternative uses should be identified in local plans. Municipalities are encouraged to map the important, accessible sources.

7. New developments that encroach upon resource lands, and the occupants thereof, are encouraged to respect the rights of resource land owners to continue existing operations, and undertake appropriate expansions, according to accepted practices.

Goal 3:

To encourage the historic settlement pattern of compact village and urban centers separated by rural countryside while promoting development in economically viable locations.

Policies:

1. New development should be planned so as to respect the historic settlement pat- tern of compact villages, neighborhoods, and urban centers separated by rural countryside. Accordingly, CVRPC:

- Endorses the concept of creating new villages to accommodate new growth.
- Endorses "smart growth" planning principles as embodied in this Plan and sup- ports the designation of "Growth Centers" – be they identified in local plans or through the State process codified in Act 183. We would also support efforts to simplify the State Growth Center designation process so as to make its benefits more accessible to a broader cross-section of communities.
- Will assist municipalities in conducting the studies required to prepare applications to the Downtown Board for State Growth Center Designation.
- Supports the appropriate expansion of existing settlements, particularly where excess infrastructural capacity exists. (The existing settlements within Central Vermont are those areas currently served by public water and/or sewer systems or characterized by

higher densities of development. Existing settlements include, but are not limited to, the downtowns and cities, the villages and the myriad concentrated residential neighborhoods.)

- Encourages PUD, "cluster" or "open space" design for new residential and commercial developments, particularly those outside of existing settlements or planned growth areas and discourages the development of commercial and residential sprawl.
- Encourages "in fill" development and adaptive reuse of buildings in existing settlements.
- Supports and encourages revitalization efforts directed towards strengthening and improving villages and cities.
- Recognizes that some environmental and development "trade-offs" will be necessary to achieve desired growth patterns. To this end, CVRPC believes that mandatory mitigation of any agricultural soils or habitat losses, even at a reduced ratio, within State designated Growth Centers is counterproductive to enticing development and recreating traditional land use patterns.
- Believes that land use restrictions should not unduly hinder self-employment for residents. Such opportunities may help reinforce traditional land use patterns through economic incentives.
- Believes that land use plans should not unnecessarily infringe upon the land-owner's ability to enjoy and profit from the investment and use of private property.
- Encourages municipalities and individual landowners to identify sites which may qualify for assessment and/or cleanup under the EPA ’s Brownfields Grant Pro- gram.
- Encourages municipalities to undertake build-out modeling in order to better evaluate development capability and future growth potential under current zoning, as well as to examine the potential impact of employing alternative density strategies.

2. To seek ways to overcome the economic disincentives to development within existing built-up areas, including the high costs associated with the construction of, or hookup to, necessary infrastructure. CVRPC:

- Recognizes Tax Increment Financing (TIF) as a valuable tool for supporting infra-structure development in planned growth areas and supports amending current State law to make it more practical for communities to implement.
- Over the next five years CVRPC will continue to work with municipalities to prepare a regional land use map that incorporates the developing land use plans of its municipalities and displays locally and/or State designated growth centers. In conjunction with this effort, CVRPC will provide technical assistance in growth center planning, upon request,

and in conjunction with State guidelines.

- will recognize growth center designations and employ them to attempt to achieve desired growth patterns through its influence over public expenditures and development review decisions, where applicable.
- Will provide assistance to municipalities seeking such funding for brownfield assessment and remediation, upon request.

Goal 4:

To protect environmentally sensitive or unique areas.

Policies:

1. Natural and fragile areas identified in this Plan should receive protection from harmful uses.

2. Where natural and fragile areas occur on developable private lands and where their adequate protection would preclude any other reasonable use of those properties, acquisition in fee simple or less than fee simple is recommended.

3. Where a potentially harmful development or activity is proposed in proximity to a natural or fragile area, measures should be taken to ensure adequate protection.

4. CVRPC encourages the inclusion of natural and fragile areas information and mapping in local plans. (Municipalities should not be limited by the definitions and designations included here, as it is recognized that this Plan may not include all locally significant sites.)

5. It is the policy of CVRPC to encourage the maintenance of existing wildlife habitats and habitat connectors. Municipalities are encouraged to identify those of local importance.

Strategy 5a. Work closely with partners such as The Nature Conservancy, the Staying Connected Initiative and Vermont Fish and Wildlife to identify areas within the Region that are sensitive to development, which contains the most recorded species, the most diverse communities, etc., and have this data available for incorporation in member town plans.

6. Any activity that would degrade important groundwater supplies is discouraged.

Specifically, development activities in designated WHPA's shall be carefully reviewed for groundwater impacts.

7. Hazardous wastes shall be disposed of properly to prevent any degradation of groundwater.

8. It is the policy of CVRPC to encourage the preservation of wetlands so as to protect their function and productivity. Efforts (including consideration of site design options) should be made to mitigate against the possible adverse impacts of development on the Region's wetlands.

9. Prevent the spread of terrestrial invasive species and forest pests.

Strategy 9a. Work with partners to implement coordinated invasive species and forest pest education, detection, prevention and control measures.

Strategy 9b. Encourage landscaping with native species over the use of non-native species, particularly in non-urban environments. Work with UVM Extension Master Gardeners on educating homeowners on the use of native trees and plants.

Goal 5:
To preserve the aesthetic quality of the Region

Polices:

1. Municipalities and developers are encouraged, through design and siting of structures, to make a concerted effort to preserve access to and enjoyment of scenic views for the public.

2. Unless effectively screened, or clearly in the best interest of the general public, ridge line development or conspicuous development on locally prominent landscape features is discouraged.

3. The scale and siting of new structures should be in keeping with the surrounding landscape and architecture; however, towers should utilize stealth technology.

4. Outdoor lighting should be limited to minimum levels necessary to ensure safety and

security of persons and property.

5. Light sources shall be shielded and not directly visible from public roads or adjacent residences.

6. Landscaping with native species is generally preferred over the use of nonnative species, particularly in non-urban environments. The use of non-native trees and plants for landscaping can lead to unintended introductions of species which out- compete native vegetation.

7. Where possible, parking lots and storage areas should be well landscaped and/or otherwise screened from view on public roads.

8. CVRPC encourages the State and municipalities to maintain existing roadside views by means of vegetation clearing, where appropriate.

9. CVRPC will attempt to inventory and map the Region's scenic resources, with assistance from municipalities.

10. The location of telecommunication towers is a significant aesthetic issue within the Region. Policies intended to minimize negative impact are presented in the wireless telecommunication facilities policies of this Plan.

11. CVRPC will track indicators that show impacts on aesthetic quality and natural beauty in Central Vermont.

12. New development should make all reasonable attempts to minimize noise pollution and shall not exceed accepted standards in residential areas.

Goal 6:

To ensure that new development in the vicinity of the Region's interstate interchanges is appropriate to the setting and considers the impact of such development on adjacent village and urban centers.

Policies:

1. CVRPC encourages interchange modeling and identification of preferred development scenarios.

2. CVRPC will encourage and assist municipalities in planning for land use in and around interchange areas.

3. CVRPC will continue to support the Town of Berlin's efforts to plan for and implement the creation of a new village center in the vicinity of Exit 7.

4. CVRPC will encourage the concept of management associations (similar to transportation management associations) to promote master planning for interchange zones.

5. CVRPC will exercise its status as a statutory party in Act 250 whenever new development has the potential to impact the form and function of an interchange area or adjacent communities.

6. In support of regional land use priorities that support the development of village and urban centers, CVRPC will not encourage development at interchanges where that development will result in a demonstrable negative impact on adjacent village or urban centers. CVRPC will, however, encourage development at interchanges that complements or appropriately expands existing growth centers according to a locally developed, regionally approved plan.

7. New development should employ design guidelines that foster economic vitality in growth areas and encourage the maintenance of the rural, working landscape.

Goal 7:

To manage the quality and quantity of storm water runoff in order to avoid property damage and negative impacts on surface and groundwater.

Policies:

1. New development should, through design and maintenance, attempt to minimize changes in the volume and chemical composition of runoff. Methods recommended to achieve this

objective include:

- Avoiding construction on steep or unstable slopes and in high elevations (Slopes in excess of 25% and elevations above 2,500 feet are generally thought to be prohibitive for most kinds of development.);
- Stabilizing entrances to construction areas to eliminate tracking of sediment onto paved public roads;
- Employing cluster/open space design techniques;
- Minimizing development road and sidewalk widths to those which are necessary for safety and access;
- Avoiding the use of wide radius, paved cul-de-sacs, where appropriate ("Hammerhead" turns, smaller radius turns, and landscaped cul-de-sac is- lands are some other options.);
- Minimizing the removal of native vegetation to the extent practical;
- Phasing new construction to minimize the amount of disturbed soil at any given time where practical; and
- Providing vegetated buffers between roof lines and paved areas and be- tween sidewalks and roads, where appropriate.

2. Structural Best Management Practices (BMP's) should be used, as appropriate, to control storm water on new development sites before, during and after construction (including plans for long term maintenance and operations). Objectives and applications include:

- Storm water retention: wet ponds, artificial wetlands
- Storm water detention: dry basins
- Storm water filtering: bio-retention, sand filters, compost filters
- Storm water velocity control: filter strips, grassed swales, rock swales
- Erosion control: construction schedule, seeding/mulching, check dams, run- off diversions
- Sediment control: sediment basins/traps, filter fabric/silt fences, hay bales, inlet protection
- Infiltration: infiltration basins, trenches, dry well, leaching catch basins, in- filtration islands, pervious surfaces

3. Acceptable Management Practices (AMP's, as defined by the Vermont Agency of Natural Resources) should be employed on all agricultural, silvacultural and earth extraction operations.

4. Efforts should be made to minimize the extent of impervious surfaces and surface runoff associated with parking facilities. The following methods are recommended:

- Constructing structured parking facilities (i.e. multi-level garages) where practical and appropriate in order to provide a higher ratio of parking spaces to impervious surface area;
- Using pervious materials in "spillover" parking areas;
- Integrating the use of landscaped areas as "bio-retention" filters; and
- Providing smaller spaces for compact cars.

5. Municipalities should consider adopting policies and practices to reduce the volume and impacts of storm water runoff, including:

- Encouraging storm water management through the use of BMP's (as outlined in policy 2) in local plans, zoning bylaws, and building permits;
- Minimizing zoning setbacks to allow for shorter driveways, and allowing shared driveways;
- Instituting maximum, as well as minimum, parking ratio requirements in local bylaws to prevent "overbuilt" parking lots;
- Allowing for shared parking facilities in local bylaws;
- Adopting "pooper scooper" ordinances to prevent the pollution of surface waters with pathogens and nutrients;
- Protecting high elevations and steep slopes from intensive development in local bylaws;
- Properly sizing and maintaining culverts;
- Properly maintaining ditches on dirt roads to slow runoff and filter sediments as per the "Road Design and Maintenance Handbook" published by the Vermont Local Roads Program;
- Separating combined storm water/sewer systems (CSO's) which can dis- charge raw sewage to surface waters during big storms; and
- Making sure road salt storage areas are covered.
- Consulting the "Erosion Control Prevention Manual" published by the Vermont Geological Survey.

Energy Element

3

OVERVIEW & STATUTORY REQUIREMENTS

Title 24, Chapter 117, section §4348a(a)(3) of Vermont Statutes outlines the information needed to be included in the energy element of a region's plan. Specifically it states:

"An energy element, which may include an analysis of resources, needs, scarcities, costs, and problems within the region across all energy sectors, including electric, thermal, and transportation; a statement of policy on the conservation and efficient use of energy and the development and siting of renewable energy resources; a statement of policy on patterns and densities of land use likely to result in conservation of energy; and an identification of potential areas for the development and siting of renewable energy resources and areas that are unsuitable for siting those resources or particular categories or sizes of those resources."

During the 2016 legislative session, the State of Vermont passed Act 174 which is an act related to improving the siting of energy projects. Act 174 outlines a path whereby regions and municipalities could receive "substantial deference"[1] before the Public Utility Commission (formerly the Public Service Board) if certain considerations were incorporated into a regional or municipal development plan. The standards outlined in Act 174 align with the primary goal of State of Vermont's Comprehensive Energy Plan which is to have 90% of the state's energy needs being generated from renewable sources by 2050 (90 by 50).

RELATIONSHIP TO THE CENTRAL VERMONT REGIONAL ENERGY PLAN

The Energy Element of this plan consists of the information contained herein, as well as the complete Central Vermont Regional Energy Plan that is hereby adopted by reference and included as Appendix A-7. This energy element is intended to provide an overview and highlights from the Regional Energy Plan without duplicating that information. The Regional Energy Plan includes information on:

- Current energy use by thermal, electric, and transportation sectors
- Targets for reducing energy consumption by sector
- Targets for conversion to more fuel efficient technologies
- Implementation actions to address land use, transportation, and energy needs
- Resource maps to identify potential locations for renewable energy generation

[1] According to Act 174 of 2016, "substantial deference" means that a land conservation measure or specific policy shall be applied in accordance with its terms unless there is a clear and convincing demonstration that other factors affecting the general good of the State outweigh the application of the measure or policy. The term shall not include consideration of whether the determination of energy compliance should or should not have been affirmative under 24 V.S.A. § 4352.

The Central Vermont Regional Energy Plan was developed by first examining the existing Central Vermont Regional Plan to identify existing information to satisfy the requirements of Act 174, but also to ensure consistency between the two documents. The Regional Energy Plan is intended to meet the standards outlined in Act 174, while also meeting the complete statutory requirements as noted above.

ACT 174 INFORMATION

In general, the requirements of Act 174 work in conjunction with the existing statutory information required to be included in a regional plan's energy element. Act 174 requires a more comprehensive analysis of existing conditions and requires the identification of targets for thermal, transportation, and electric sectors related to conversion or conservation of energy. Act 174 also identifies three distinct sections to identify this information including:

- Analysis & Targets
- Pathways & Implementation Actions
- Mapping

The Analysis & Targets section provides a baseline of information for where a region or municipality currently stands in terms of energy use and identifies the trajectories and pace of change needed to meet targeted reductions and conservation of energy. It includes information on current electricity use for residential and non-residential uses; existing and potential renewable resource generation; and current transportation energy use information. Additionally, targets are established to provide milestones for thermal efficiency; renewable energy use; and conversion of thermal and transportation energy from fossil fuel based to renewable resources. These milestones are intended to help the region measure progress towards the overall goals and not identified as requirements. Targets are established for the years 2025, 2035, and 2050 which coincide with the State Comprehensive Energy Plan.

The Pathways & Implementation Actions section provides the basis for how the region will meet their target year goals as noted in the Analysis & Targets. The implementation actions are categorized by:

1. Conservation & efficient use of energy
2. Reducing transportation demand and single occupancy vehicles trips, and encouraging the use of renewable sources for transportation
3. Patterns and densities of land use likely to result in conservation of energy
4. The siting of renewable energy generation

The implementation actions identified in this section focus primarily in areas where the Central Vermont Regional Planning Commission is already working to support its member municipalities through local land use, transportation, and environmental planning activities.

Finally, the Mapping section allows the region to visually identify where renewable energy generation is most suitable. This section combines resource information with specific known and possible constraints to the development of renewable energy generation. The mapping section also allows the opportunity to identify preferred locations for renewable energy development and areas that are unsuitable for development of any kind. In addition, the maps identify existing infrastructure to support renewable energy development.

In general, the mapping information looks at state-level data and breaks it down to a regional perspective. From there, an analysis was done (as noted in Section I) regarding the potential renewable energy generation that might be possible based on resource areas and constraints. This information is useful to visualize what geographies throughout Central Vermont are most ideally suited or best to avoid regarding renewable energy siting based on available resources or identified constraints. This is intended to be a starting point and not the only basis for siting.

This section also contains specific policy information regarding the development and siting of renewable energy resources that are reflected on the maps. It was determined that no specific locations would be identified at a regional level as being prohibited areas for the development of renewable energy generation. It was also determined that preferred locations identified at the regional level would be consistent with areas identified by the state including gravel pits, brownfield sites, or parking lots. This was done to allow the municipalities to decide if it was appropriate to identify these areas locally, rather than have this information dictated by the region.

The Regional Planning Commission did, however, identify additional possible constraints to be considered. These include elevations above 2,500 feet, slopes greater than 25%, municipally owned lands, and lakeshore protection buffer areas of 250 feet. The decision was made to include these resources as possible constraints to allow for further analysis by the region or the municipalities to determine if development of renewable energy generation facilities may be appropriate based on specific conditions.

In order to address the requirements of Act 174, the Vermont Department of Public Service provided a guidance document that identifies how a region can meet the requirements including model language to be considered. When possible, this guidance was used to ensure consistency with statute and its intent for energy planning.

REGIONAL ENERGY PLANNING

Beginning in 2016, the Central Vermont Regional Planning Commission began working on the development of a Regional Energy Plan that would meet or exceed the standards as identified in Act 174. To achieve this, the Board of Commissioners appointed a steering committee to help guide the process. The steering committee included representatives from various perspectives including the commission, state agencies, selectboards, planning commissions, local energy committees, utility providers, private energy developers, the business community, and transportation providers. This group provided the input and insight into the development of the

regional energy plan, which also includes the specific information to address the standards of Act 174.

Multiple sources of information were used to establish the regional overview of energy consumption and targets for reduction. These sources include the U.S. Census Bureau, the Vermont Department of Public Service, the Energy Action Network, the Vermont Energy Investment Corporation, The Vermont Department of Labor, the Vermont Agency of Transportation, and other sources.

Tables 1 through 3 identify the current energy use related to transportation, thermal, and electricity for the Central Vermont Regional Planning Commission area.

Table 1. Current Regional Transportation Energy Use

Transportation Data	Regional Data
Total # of Light Duty Vehicles	45,584
Average Miles per Vehicle	287,500 (12,500/vehicle)
Total Miles Traveled	567,650,000
Average Gallons Used per Vehicle per Year	12,239 (576/vehicle)
Total Gallons Use per Year	30,518,817
Transportation BTUs (Billion)	3,396
Average Cost per Gallon of Gasoline	$2.31
Gasoline Cost per Year	$70,488,465

Source: 2011-2015 U.S. Census Bureau - American Community Survey; Vermont Agency of Transportation

Table 2. Current Regional Residential Heating Energy Use by Fuel Source

Fuel Source	Regional Households	Regional % of Households	Regional Square Footage Heated	Regional BTU (in Billions)
Natural Gas & Propane	5,983	22.2%	9,632,438	578
Electricity	1,206	4.5%	1,494,263	90
Fuel Oil	14,238	52.9%	24,431,228	1,466
Coal	66	0.2%	132,664	8
Wood	5,031	18.7%	9,493,439	570
Other (Includes renewable sources)	392	1.5%	696,536	42
No Fuel	22	0.1%	42,680	3
Total	**26,938**	**100%**	**45,923,248**	**2755**

Source: 2011-2015 U.S. Census Bureau - American Community Survey

Table 3. Current Regional Electricity Use

Use Sector	Current Regional Electricity Use
Residential	241,268 megawatt hours
Commercial and Industrial	353,117 megawatt hours
Total	594,385 megawatt hours

Source: Efficiency Vermont

FUTURE CONSIDERATIONS

In order to better understand how the region can provide its share of renewable energy generation to meet the state goal of 90% renewable energy by 2050, the current potential for renewable energy generation needs to be quantified. Table 4 provides an overview of the current potential renewable energy generation for Central Vermont based on the prime and secondary resource areas that have been identified. Renewable generation potential is calculated from mapping completed by the Central Vermont Regional Planning Commission and is based on the Regional Determination Standards and associated guidance documents developed by the Department of Public Service. The renewable generation potential is expressed in megawatts (MW) and megawatt hours (MWh).

Table 4. Existing Potential New Regional Renewable Electric Energy Generation

Renewable Type	MW	MWh
Rooftop Solar	40	49,268
Ground-mounted Solar	15,622	19,160,098
Wind	23,050	70,671,678
Hydro	.01	28
Biomass and Methane	Unknown	Unknown
Other	0	0
Total Renewable Generation Potential	38,712.71	89,881,072

Source: Central Vermont Regional Planning Commission & Department of Public Service

Finally, Table 5 identifies the total amount of new renewable energy that would need to be generated by Central Vermont by 2050. In addition to the total renewable energy target for 2050, Table 5 includes targets for intermediate years to help track progress towards the 2050 goal.

Table 5. Regional Targets for New Renewable Electric Energy Generation

	2025	2035	2050
Total Renewable Generation Target (in MWh)	104,620	167,404	418,531

Source: Central Vermont Regional Planning Commission & Department of Public Service

KEY CHALLENGES AND TRENDS

Based on the information included in the Central Vermont Regional Energy Plan and noted above, Central Vermont has more than enough resource area available to meet its share of renewable energy generation by 2050. With that in mind, the more specific challenges that will be faced by the municipalities in Central Vermont are related to the guiding theme of the state comprehensive energy plan which assumes electricity is the primary power source to address the state's energy needs. As such, the following challenges and trends are noted for Central Vermont.

Grid Capacity/Infrastructure Needs

In order to effectively and efficiently transmit electricity throughout Central Vermont, the electric grid and other infrastructure, specifically three phase power, need to be adequate to support renewable energy development for the foreseeable future. It will be important to have accurate and up-to-date inventories of existing facilities to ensure upgrades or improvements are targeted to most effectively support additional electric loads on the grid. For example, some communities in Central Vermont do not currently have three phase power, however they do have prime resource areas to support renewable energy development. If three phase power is not in place, large scale renewable energy generation cannot currently be supported.

Livability Preferences

A major component of energy use is related to transportation. The vast majority of residents in the state, including Central Vermont, use personal vehicles for their daily travel needs. Only a fraction of the approximately 45,000 light duty vehicles in Central Vermont utilize alternative fuels. According to Drive Electric Vermont[2], as of July 2017 there were a total of 1,768 passenger electric vehicles in the State of Vermont Department of Motor Vehicles registration database. This includes 1,387 plug in hybrid and 381 all electric passenger vehicles. Replacement of vehicles that utilize fossil fuels with those that use alternative fuels is a component of the transportation policies noted in Central Vermont's strategy to help achieve the state's goal of 90 by 50.

Related to vehicle use is personal choice for where to live. During the eighties and nineties, the trend was to build larger houses on large lots further out from the center of the community. Trends are indicating a desire to live closer to amenities which are associated with cities and village centers. The ability to walk or use transit is becoming more popular. There is less interest in maintaining a large house and large property.

As residents begin to age and younger individuals and families look to set down roots, large lot housing choices may no longer be the desired scenario. However, large lot developments still need to be accommodated and planned for as a rural lifestyle is still preferred by many Central

[2] http://www.driveelectricvt.com/buying-guide/why-go-electric

Vermont residents. These factors will all contribute to changes in land use patterns that can support more energy efficient choices.

Alternative Transportation Options

As noted previously, changes in lifestyle choices for residents of Central Vermont will impact their choices for transportation methods. As trends towards more downtown style living continue, public transit, walking, and bicycling are becoming more widely seen as the primary means of transportation. This trend will influence the need for families to have multiple personal vehicles in exchange for alternative transportation options. As the primary public transit provider in Central Vermont, Green Mountain Transit (GMT) is consistently evaluating their service routes and making changes based on needs and demands for ridership. This includes extending routes, changing times, or adding more buses in certain locations to meet the demand. More specific information regarding transportation options, trends, and choices can be found in the transportation element of this plan as well as the Central Vermont Regional Energy Plan.

To help increase transportation options, municipalities are beginning to require amenities such as sidewalks, bicycle trails, or multi-use facilities to connect residential areas to activity centers with new land developments. This trend will continue to provide residents with choices for transportation options beyond the personal vehicle. Communities will need to continually evaluate their land use regulations to ensure density of development and mixing of uses will support alternative transportation options to maintain continuity and consistency into the future and to evolve as personal choices and trends change.

Development of Renewable Energy Generation

Development of renewable energy generation will be a key component to achieve 90 by 50. The Central Vermont Regional Energy Plan identifies specific areas where resource areas exist for renewable energy generation. These areas focus on wind, solar, and hydroelectric as they are locationally constrained. Other renewable energy generation such as woody biomass, biogas, and other renewable technologies do not require specific conditions for the location of the generation facility, however they do require resources such as wood or other organics to provide the needed fuel.

Siting of all renewable energy generation facilities will take careful planning to ensure infrastructure (including three phase power), land use regulations (including zoning if applicable), and community support exists before the development can occur. In this regard the Central Vermont Regional Energy Plan does not specify locations beyond what has been identified by the state as preferred locations[3] for renewable energy generation. This will provide opportunities for each municipality to identify locations that are preferred or restricted based on local insights and interests.

[3] Preferred locations are identified in the Central Vermont Regional Energy Plan and include parking lots, expired gravel pits, landfills, brownfield sites, and similar locations.

Changes in Technology

As noted previously, the state's comprehensive energy plan and subsequently the Central Vermont Regional Energy Plan are both written with electricity as the primary power source. This direction includes renewable energy technology that exists today such as wind, solar, hydroelectric, biomass, and biogas. As technologies change and advancements are made in both efficiency and sources of renewable energy generation, the region's municipalities will need to be flexible and adaptable to these changes.

With this in mind, the Central Vermont Regional Energy Plan acknowledges and recommends consideration for changes in technology that do not limit renewable energy development to known sources. This concept will need to be continually revisited to ensure current technologies are considered and outdated technologies are not recommended.

Weatherization

Weatherization of buildings is a pathway that will work towards the energy goals related to conservation of energy. A portion of Central Vermont's housing stock is older and was constructed at a time when no specific codes existed for energy efficiency. Now, with the passage of the Residential Building Energy Standards (RBES) and the Commercial Building Energy Standards (CBES), new construction is required to meet minimum thresholds for energy efficiency. This will ensure new construction addresses energy efficiency, however weatherization of existing construction will need to be addressed.

Incentives may be required to assist property owners upgrade their current homes and buildings to include more efficient windows, doors, insulation, or mechanical systems. These upgrades can be costly which is often identified as the primary barrier to completing the needed changes. If incentives are available to assist property owners with weatherization projects, this may increase the efficiency of buildings while decreasing the consumption of energy. This could prove a viable alternative to new construction thereby extending the lifecycle of existing buildings throughout the region.

System Conversions

Similar to weatherization, older existing buildings will commonly have outdated and inefficient mechanical systems. These often include oil based heating systems or wood-fired units. With advances in technology, cold weather heat pumps, high efficiency wood stoves, and other mechanical systems can provide efficiency improvements for existing buildings that will result in conservation of energy. As noted previously, new construction will generally include these high efficiency systems which will help address energy conservation. Like issues related to weatherization, however, the conversion to high efficiency systems will be a challenge as the costs for equipment and building modifications needed to install these systems may be cost prohibitive to many residents and business owners in the region. In this regard, identifying potential incentives will be beneficial to support conversions.

GOALS AND POLICIES

The following section outlines the general goals that will help shape the energy future of Central Vermont. Detailed goals and policies are included in the Central Vermont Regional Energy Plan, however the themes are included herein to provide an overall sense of the direction being provided. As noted previously, energy touches multiple sectors and elements of the 2016 Central Vermont Regional Plan therefore these tenants are woven throughout the various plan sections for consistency and integration across multiple elements.

GUIDING PRINCIPLE:

The Central Vermont Regional Planning Commission will support the state's comprehensive energy plan goal of having 90% of the state's energy needs generated from renewable sources by the year 2050.

CONSERVATION AND EFFICIENCY

GOAL: Conservation and efficiency is practiced by individuals and organizations regarding building construction, heating systems, and daily choices.

Policy: Increase conservation of energy by individuals and organizations.

Policy: Promote energy efficiency in the design, construction, renovation, operation, and retrofitting of systems for buildings and structures.

Policy: Identify ways to decrease the use of fossil fuels for heating.

REDUCING TRANSPORTATION ENERGY DEMAND, SINGLE-OCCUPANCY VEHICLE USE, AND ENCOURAGING RENEWABLE OR LOWER-EMISSION ENERGY SOURCES FOR TRANSPORTATION

GOAL: Support alternative transportation options and alternative fuel vehicles throughout the region.

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

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

Policy: 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.

Policy: Facilitate the development of walking and biking infrastructure to provide alternative transportation options for the community.

PATTERNS AND DENSITIES OF LAND USE LIKELY TO RESULT IN CONSERVATION OF ENERGY

GOAL: Land use policies support compact development in mixed-use centers

Policy: Central Vermont is committed to reducing sprawl and minimizing low-density development by encouraging density in areas where infrastructure exists or is planned to support growth.

Policy: Strongly prioritize development in compact, mixed-use centers when feasible and appropriate; and identify ways to make compact development more feasible throughout Central Vermont.

DEVELOPMENT AND SITING OF RENEWABLE RESOURCES

GOAL: Renewable energy generation is sited to maximize potential while minimizing locally identified impacts

Policy: Evaluate generation from existing renewable energy generation by municipality including the identification of constraints, resource areas, and existing infrastructure by energy type.

Policy: Evaluate generation from potential renewable energy generation by municipality including the identification of constraints, resource areas, and existing infrastructure by energy type.

Transportation Element

4

The Central Vermont Regional Planning Commission also adopted the Central Vermont Regional Transportation Plan in its entirety. That Plan addresses all the requirements of State statute and is adopted, by reference, as part of this document. The following is an overview of the Regional Transportation Plan and its major goals and policies. The complete text is available upon request

EXECUTIVE SUMMARY

The 2016 Regional Transportation Plan (RTP) was completed by staff with technical support from a consultant under the direction of the CVRPC Transportation Advisory Committee. Preparation of the 2016 RTP occurred simultaneously with the update of the CVRPC Regional Plan. The 2016 RTP has a planning horizon and is based on the same land use assumptions and economic and demographic forecasts used in the Regional Plan.

The 2016 RTP is organized into five chapters and an appendix. Chapter One presents an overview of the Plan's purpose and process. Chapter Two presents the transportation goals developed specifically for the Regional Transportation Plan. Chapter Three contains descriptive material on the Region's land use patterns, on current and forecast population and employment in the Region, and on current work trip travel patterns in the Region. Chapter Four describes the existing transportation system, its performance, and projected future performance of the highway system. Chapter Five presents Regional, and corridor level recommendations. The Appendix examines ways existing and future transportation and land use planning can be better coordinated, project prioritization methodology, and detailed safety, bridge, and survey analysis.

The 2016 RTP is too large to present in the Regional Plan. This section presents the 2016 RTP's vision statement and goals, summarizes the key findings on transportation demand and system performance, and briefly describes the types of recommendations included in the RTP. Refer to the 2016 Central Vermont Regional Transportation Plan for more detailed information.

DISCUSSION:TRENDS

Demographic and Land Use Trends Affecting Transportation Demand

If current settlement trends continue, households will disperse throughout the Central Vermont Region while employment and services concentrate in a growing cen-

tral core consisting of Montpelier, Barre City, Barre Town, and Berlin. Smaller concentrations of employment are anticipated in the Waterbury, Waitsfield/Warren, and Northfield areas.

Driving alone to work is the dominant mode choice for Central Vermont workers and will likely continue to dominate as households disperse and employment concentrates within a few areas of the Region. Ride-share also plays a significant role in the journey to work and will remain a viable option as households continue to disperse and workers are imported from outside of the Region. Driving alone and ride-share account for 87% of the work trips in the Central Vermont Region. According to Vermont Public Service, road transportation accounts for 95% of transportation energy use.[1]

Walking has a significant mode share in Montpelier and Northfield and is also an important mode for non-work trips in those communities.

Similar to national trends, the largest growing age cohort will be people over the age of 65. This age group will continue to fill jobs as noted above, and may also have special transportation needs. (See map: Transportation.)

Transportation System Performance

Highways: During the 2000's bridge conditions improved, but pavement conditions have declined. Congestion was limited to the Barre, Berlin, Montpelier, and Waterbury areas of the Region. Maintaining the condition of roads and bridges in the future will require sustained levels of funding for system preservation projects. Assuming no changes to the highway system, congestion is projected to spread to the rural areas of the Region.

Safety: Intersections are the most dangerous components of the Region's highway system. The intersections and road segments with the highest crash rates are located in the Barre City, Barre Town, Fayston and Northfield areas. Out of the twelve intersection high crash locations, seven have been studied, and four are included in projects. The Region will continue to conduct planning studies, and participate in State programs to address high crash locations.

Transit: Transit ridership increased significantly over the years due to expansion of service. Since 1995, ridership grew by 46%. The most notable recent addition was the Link Express service between Montpelier, Waterbury, and Burlington. A recent statewide assessment of all Vermont public transit providers found that Central Vermont's transit system had mostly positive use and cost performance measures for

[1] Vermont. Department of Public Service. Utility Facts. October, 2006.

its various routes. The increases in transit ridership underscore the desirability of continued transit service in the Region.

Transportation Demand Management: Transportation Demand Management (TDM) seeks to reduce the number of single occupant vehicle trips by encouraging people to share rides, shift travel to off-peak hours, tele-commute or use other modes such as walking, biking, or transit. Most of the ride-sharing in the Central Vermont Region occurs on an informal basis. The Park & Ride lots in the Region facilitate informal ride-sharing and have experienced a 79% increase in use since 1998. In the future, transportation demand management associations could help facilitate further use of TDM programs.

Bicycle & Pedestrian: There are a variety of bicycle and pedestrian facilities in the Central Vermont Region including sidewalks and cross walks in most cities and villages, paved shoulders in rural areas, and separated bike paths in various locations. Existing deficiencies include discontinuity of adequate shoulder widths in rural areas, constant need for maintenance of existing urban/village sidewalk networks, and a lack of sidewalks in the growing suburban commercial areas. Since 1995, there has been significant progress in planning and implementing bicycle and pedestrian facilities at the local and Regional level. This incremental progress, if continued over the next twenty years, will help the Region develop an interconnected network of bike and pedestrian facilities.

Freight Movement: The important products transported from the Region are specialty and dairy food products, granite, and wood. Most of these commodities are shipped by truck, with rail transporting a much smaller but significant share (7% statewide). Truck travel in the Region is constrained by highway geometry deficiencies and the hilly terrain. Arterials that carry truck traffic also pass through village centers creating safety and quality of life issues for residents. Rail plays an important role in the Region's trade with Canada. Preventive maintenance is needed to preserve the existing New England Central rail line that serves that international trade connection.

Edward F. Knapp State Airport, Berlin, Vermont.

Air Transportation: There are two airports located in the Central Vermont Region; the Edward F. Knapp State Airport in Berlin, and the privately owned Warren- Sugarbush Airport. The Region's public-use airports provide opportunities for public access to the National Airspace System, air

freight, emergency medical services, search and rescue operations, business aviation, recreational flying, and flight training. Knapp Airport is equipped for night operations and precision instrument landings. Since 1996, improvements at Knapp Airport have included runway rehabilitation, installation of navigational aids, and construction of jet fuel farm, hangars, and a taxiway. Future improvements have been identified that will preserve and enhance how the Airport functions.

REGIONAL TRANSPORTATION PLAN RECOMMENDATIONS

Specific project, program, and policy recommendations are presented on the Regional and corridor levels to address the issues identified in the performance assessment and during public meetings held in the Central Vermont Region. The recommendations also address the need for Regional planning and cooperation on transportation issues, transportation funding, and mitigation of development impacts to the transportation system, and the project development process. The Regional Transportation Plan also recommends ways to improve the transportation-land use connection based on ideas developed during a public workshop, and includes suggested changes to CVRPC policies for defining the Regional significance of transportation projects and how transportation should be considered in growth area planning.

Vision and Mission for Transportation in the Region

To emphasize the scope and scale of the Regional transportation issues facing Central Vermont and its communities, CVRPC established a vision and mission statement to guide the development of transportation goals, policies, and action items.

Vision - “To maintain and develop a transportation system that facilitates travel while preserving the Region’s character.”

Mission - "Preserve, enhance, and develop an integrated, multi modal Regional transportation system to accommodate the need for movement of people and commerce in a safe, cost-effective, environmentally responsible, and equitable manner, that conforms with other elements of the Regional Plan."

The vision and mission statements provide an overall direction that CVRPC believes should be followed. To guide these steps, CVRPC established a series of nine goals that further define this direction. These goals are described below, as well as the policies written to provide guidance of how the goals can be achieved.

TRANSPORTATION GOALS AND POLICES

GOAL 1:

To achieve a Regional transportation planning process that is comprehensive, multi-modal, and public, and is integrated with Regional and local land use planning as outlined in the Central Vermont Regional Plan.

Policies:

1. Encourage municipalities' analysis of transportation needs at the local level, including the relationships between development patterns and transportation needs, and which considers various modes of travel.

2. Encourage coordination and cooperation in comprehensive transportation planning among the various municipalities in the Region and at the Regional, State, and private levels.

3. Undertake a comprehensive Regional analysis of existing and anticipated travel behavior and multi-modal approaches to accommodating anticipated travel demand.

4. Balance Regional and local decision-making, and flexibility in transportation planning, when conflicts develop between local and State plans.

5. Promote a project prioritization process that takes the goals of the Regional Transportation Plan into consideration.

6. Promote open and inclusive public participation in the multi-modal planning and development of transportation projects.

7. Support the planning and design of the Region's transportation system to encourage development and re-development in existing villages, cities, and designated growth centers.

8. Encourage the full integration of transportation and land use planning at the Regional and local level.

GOAL 2:

To preserve and maintain the existing transportation system.

Policies:

1. Support the necessary steps for evaluating, prioritizing, and implementing preventive maintenance programs for all elements of the transportation system.

2. Promote a funding strategy that realizes maximum use of all available resources to ensure adequate maintenance of the existing transportation system.

3. Encourage development patterns that reflect the planned capacity of the transportation system. Level of Service C will be taken as the preferred condition. Level of Service D should be accepted within the more urban, built-up sectors of the Region (for example: Montpelier, Barre City, Northeast Berlin, South Barre, Waterbury Village, Northfield Village, Waitsfield Village, and Irasville).

GOAL 3:

Enable the transportation system to operate at it's highest efficiency by managing travel demand and encouraging shifts to under-utilized and more efficient travel modes.

Policies:

1. Develop a strategy that encourages maximum use of all available transportation resources and allocates those resources to the optimum functioning of the transportation system.

2. Support the education of the Region's employers in the development of Travel Demand Management Programs (e.g. tele-commuting, flextime, compressed work weeks, ride-share matching, preferential parking, commuter fringe benefit, etc.). Facilitate the establishment of Transportation Management Associations to organize and administer TDM programs.

3. Educate the public on modal choices available.

4. Encourage preservation of existing rights-of-way for future transportation purposes. In particular, work to retain abandoned railroad rights-of-way for transportation uses such as trails and bike paths.

5. Consider new or expanded public transit services that serve intra-Regional and intercity travel needs.

6. Encourage full accessibility to the Region's transportation services for the Region's residents in need.

7. Establish aggressive, but realistic, targets for modal shares along Regional trans-

portation arteries.

8. Support updating and optimization of traffic signal timings on a regular schedule and coordinate where appropriate.

9. Market public transit to new users.

GOAL 4:
To integrate modes of travel in order to allow for their most effective use and ultimately reduce dependence on single occupant vehicles.

Policies:

1. Encourage the development of park and ride lots for car and van pools, and encourage employers to provide incentives to car and van pool users.

2. Promote physical and operational connections between various modes of transportation.

3. Ensure adequate mobility for all segments of the population, including residents who cannot or do not use private automobiles.

4. Foster a sense of mutual respect among users of the various modes of transportation.

5. Encourage the availability of multiple options for the movement of people and goods.

GOAL 5:
To establish a transportation system that minimizes consumption of resources and maximizes the protection of the environment.

Policies:

1. Support efforts to minimize negative environmental impacts associated with the transportation system (including air quality, noise levels, surface water, vegetation, agricultural land, fragile areas, and historical/archaeological sites).

2. Encourage the preservation and enhancement of scenic views and corridors.

3. Support efforts to minimize energy consumption, especially nonrenewable energy resources, and explore expanded use of alternative fuels.

4. Factor direct and indirect costs and benefits into decision-making. Impacts that are not easily expressed in dollar values should also be considered.

5. Promote public awareness of the environmental impacts resulting from use of the Region's transportation system.6. Promote a transportation system that encourages concentrated development, allows greater access to residences, employment, and services, and facilitates car pooling, bus and rail service, and non-motorized travel.

GOAL 6: To make necessary improvements to achieve a transportation system appropriately structured and designed to safely, effectively, and economically move goods and people.

Policies:

1. Encourage the appropriate scale and design of streets, highways, and other transportation infrastructure to serve local traffic, destination traffic, and through traffic.

2. Foster a neighborhood street system characterized by a network of interconnected streets that minimizes through traffic in residential neighborhoods.

3. Promote safety-targeted measures at High or Potential Accident Locations, and promote traffic safety Region-wide.

4. Promote projects that limit the conflicts between the motor vehicle traffic stream, pedestrians, and the rail system.

5. Encourage access management policies that reduce traffic congestion and maintain capital investment.

6. Consider new facilities when demand warrants (e.g. when alternatives to reduce congestion and improve safety have been attempted) and/or when other strategic state, Regional, or local goals apply.

7. Foster a sense of safety and comfort for riders of public transit.

GOAL 7:
Promote a transportation system design that strives for aesthetic and functional characteristics that improve the quality of life.

Policies:

1. Support the design of visually attractive and durable infrastructure such as roadways, pathways, and bridges.

2. Support high architectural standards for terminal buildings, stations, shelters, garages, and other facilities.

3. Respect and enhance the built environment by restoration of period transportation structures where possible, and maintain the natural environment through architectural, landscaped, and engineered features.

4. Encourage traffic calming efforts to minimize conflicts between traffic and surrounding neighborhoods.

5. When feasible, encourage restoration or preservation of historic bridges.

6. Foster improvements that are contextually appropriate.

GOAL 8:
To promote a Regional transportation system that preserves and enhances residential and economic development potential in growth areas.

Policies:

1. Provide transportation system improvements at locations where they will or can serve growth areas.

2. Foster transportation and commerce links that contribute to the economic health of the Region.

3. Encourage transportation system improvements that renew and improve downtowns, growth areas, and neighborhoods.

GOAL 9:
To promote a Regional public transportation system.

Policies:

1. Provide for basic mobility for transit-dependent persons.

2. Support public transit that provides access to employment.

3. Encourage congestion mitigation to preserve air quality and the sustainability of the highway network. Support public transit that advances economic development with emphasis directed toward tourist areas.

UTILITIES, FACILITIES AND SERVICES ELEMENT

5

Public and private utilities, facilities, and services play a critical role in providing for the health, safety, and welfare of Central Vermont's citizens. All of us depend, in one way or another, upon water distribution systems, solid waste and sewage disposal, police and fire protection, health services, schools, parks, and electric power and information technology.

The location, condition and availability of services and facilities can have a profound influence on growth and development in a region. Homes, businesses, and industry tend to concentrate where utilities and facilities are readily available, while areas remote from infrastructure and services are more costly and difficult to develop (they often contain important natural resources as well). Hence, communities and regions, through the thoughtful placement of infrastructure, may direct growth to the most suitable location, or away from areas where change may have undesirable impacts.

The condition and scale of utilities also needs to be considered. Where facilities are over-sized and under-utilized they may encourage unplanned growth, or operate inefficiently and at unnecessary financial expense to residents. For systems that are at capacity and/or outdated, further development may cause environmental damage. Failure to upgrade urban systems may stall new growth or push it away from growth-designated areas. Communities and regions can avoid the above scenarios through the appropriate timing and sizing of infrastructure improvements[1].

1 This text contains selected amendments to the 2016 Central Vermont Regional Plan. Comprehensive data updates have not been conducted for the purposes of amendment. Some statistics and figures (those labeled with "2008 Data") may not represent the most current data.

UTILITIES

Electric Power

It goes without saying that electric power is a vital component of life in modern America. When our sources of power are lost, even temporarily, as a result of weather conditions or technical difficulty, the result may be chaos and hardship. Perishables perish, business and industry halts, and the rhythms of domestic life are profoundly interrupted.

As the Region grows, so does its demand for reliable and affordable electricity, but existing sources of electric power are limited and the costs of developing new ones are dear. Neither is electricity completely benign in its impacts. Its generation, transmission, and distribution raise issues of environmental protection, public health, land use and aesthetics. Fortunately, studies have shown that kilowatt-hours can be saved at an expenditure of far less than it takes to generate them; furthermore, conserving electricity creates jobs, conserves natural resources, curbs pollution, and expands opportunities for self-reliance too.

Vermont has become a leader in the move towards energy independence and is undertaking an ambitious renewable energy program that could at least put it on a path toward obtaining 90% of its energy from renewable sources by 2050.

These facts did not escape the Department of Public Service (DPS) as it prepared its Comprehensive Energy Plan as directed by Executive order # 79. A fundamental theme of the DPS plan is its promotion of "least cost integrated planning" as "a way for electric utilities to plan for a portfolio of supply resources, demand-side management programs, and transmission and distribution improvements that will enable the company to serve its customers at the lowest life-cycle cost, including environmental and economic costs."

Regional electric markets have restructured, and electricity is now sold in a regionally competitive market. Recent narrowing between Vermont retail electric rates and New England rates is due in part to low natural gas prices driving costs down elsewhere in the region. However, challenges remain to carry out transmission upgrades needed in the years ahead and to ensure that long-term electricity needs are met in a cost-effective and environmentally-sustainable manner.

CVRPC's desire to ensure that energy generation, distribution and transmission facilities are located, designed and sized to support the Region's economic and lifestyle demands with minimal adverse impact, supports, and is supported by, the concept of "least cost integrated planning" and its attendant objectives.

The activities and choices of the area's utility companies can have direct and indirect impacts on land use (both locally and elsewhere). Locally, distribution line extensions can spur residential, commercial and industrial growth. Decisions regarding future power sources will also have regional or even global impacts.

Electric Utilities

Five different utility companies provide power to Central Vermont's homes and businesses. As of 2009, the majority of the electric power they provided came from Vermont Yankee, Hydro-Quebec, and the Ryegate and McNeil wood generating systems. Residential users demand about half of this power. (Further analysis of energy uses and sources can be found in the Energy Element.)

Green Mountain Power (GMP) is the Region's largest utility, serving a population of about 26,000 in Central Vermont. GMP's customers are located primarily in the more populous valley areas such as Barre, Montpelier, and many of the Region's villages. GMP is continually expanding and upgrading their facilities to meet new growth. According to Vermont Public Service, GMP's output in 2005 was 2,007 million kWh[2].

GMP also provides electric power to about 500 customers in Roxbury and Northfield and serves 123,048 residential customers and 17,851 commercial customers in total with output in 2005 of 2,300 million Kwh[3].

The Washington Electric Cooperative Inc. (WEC) provides electricity to more rural areas throughout Central Vermont. Its service territory covers a larger area in Central Vermont than any other utility with 10,170 customers. Due to the rural nature of WEC's service area, residential users account for an unusually high percentage of total demand. In 2005, WEC's output was about 69 million kWh[2].

The Cooperative is committed to the concept of least cost integrated planning as

2 2008 Data

evidenced by its recent initiatives including programs to identify and install electrical efficiency measures in homes demonstrating high and moderate electricity use, such as: dairy farms, schools, small businesses, and new construction, as well as its recently released Interim Integrated Resource Plan. WEC is a member-owned utility run by a 9-person board elected by co-op members.

A small number of Central Vermonters residing in the Towns of Calais and Woodbury are serviced by the Hardwick Electric Department. This utility serves about 4,300 residential customers and 307 commercial customers total with a 2005 output of 32 million KWh[3]. The department is planning to expand its customer base in both of these towns.

The Northfield Electric Department serves about 1900 customers in Northfield and part of Roxbury with service to 1,646 residential customers and 254 commercial customers and a 2005 output of 27 million kWh[3].

The Vermont Electric Power Company, Inc. (VELCO) provides the bulk of electrical transmission network (voltages 115 kv and above) for the entire state of Vermont. VELCO serves 14,705 residential customers and 547 commercial customers and 50 industrial costumers throughout the state. In the Central Vermont region VELCO has a 115 kv transmission line which leads from Wilder, Vermont, connecting with substations in Williamstown, Barre, Berlin, and Middlesex before continuing on to Essex with a 1999 output of 1238 million kWh. VELCO also maintains a 230 kv line extending from its Williamstown substation to Comerford, New Hampshire[3].

To reinforce its transmission system VEC installed a static compensator in Essex. VEC in recent years has also increased the voltage the major transmission line between Cavendish and West Rutland to serve the growing electrical load. It is company policy to use existing transmission corridors to accommodate expansion "wherever possible."

Wastewater Systems

The proper treatment of wastewater is essential to a safe, healthy environment. Today, we do a better job treating waste than ever before. Treatment plants built in

3 2008 Data

the 60's and 70's reduced the impacts of effluent reaching our streams and rivers, including biological oxygen demand and microbe levels In general, our surface waters are cleaner now than they were 40 years ago. Improved on-site septic system technology, regulation, and monitoring has had a beneficial impact on our environment too.

There is, however, much room for improvement. The volume of waste treatment byproducts (effluent and sludge) grows with the population. Disposal of these substances poses its own unique set of problems and issues. Though improvements have been made, combined sewer and storm water systems are still releasing raw sewage to receiving waters during heavy rains. In addition, there remain, in spite of new laws, many unregulated or "grand-fathered" on-site systems polluting our environment.

It is important then, that we provide for the safe and efficient treatment of sewage for current and future residents. As communities in Central Vermont plan for the future, wastewater treatment and disposal will continue to be a critical factor, particularly when considering encouraging higher residential densities or in permitting commercial or industrial uses.

Public Systems

There are eight municipal wastewater treatment facilities in the Central Vermont region that serve over 10,000 households and scores of businesses and industries (see Service Area Map). They range in size from the Montpelier Wastewater Treatment Facility with a design of 4 million gallons per day (mgd), to a .045 mgd capacity facility in Marshfield. All provide secondary treatment of effluent. All discharge treated effluent is released into class C receiving waters of the Winooski River or its tributaries. Combined, they retain over 4 mgd of reserve capacity. A more detailed analysis of each of the region's sewage treatment plants and their implications for future growth and development is shown in Table 1, followed by a brief summary of the individual systems.

The Barre Wastewater Treatment Facility serves the City and parts of the Town of Barre. It serves a population base of about 16,000. As of 2011, the town had an allocation of 1.5 million gallons per day. There is remaining capacity in the system

serve more than 4,000 additional homes. Through an intermunicipal agreement, Barre Town has discretion over if and where new connections will occur within its allocation. The wastewater treatment facility is limited to a maximum discharge of 7,306 pounds of phosphorus annually based on the Lake Champlain Phosphorus TMDL (total maximum daily load) established in 2002. Recent upgrades to the treatment plant have greatly improved the plant's effectiveness at phosphorus removal. The plant currently discharges 4.5 pounds per day or 22% of the maximum allowed

The Marshfield Wastewater Treatment Facility serves 100 residences, 5 commercial establishments, and 6 "other" users in the Village of Marshfield. The majority of the system was constructed in 2003. Increasing development of the Village sewer system might allow additional development outside of the Village limits; however, this is not the intent of the Village Trustees at this time.

The Montpelier Wastewater Treatment Facility serves a population of 8,300 in the Montpelier/Berlin area. The City has partially removed combined sewer lines, which previously discharged raw sewage during times of heavy runoff or rain, into the Winooski and North Branch Rivers. Berlin and Middlesex own parts of the distribution & collection system in their respective municipalities and have responsibility for determining new con-

Table 1: Wastewater Treatment Facilities (WWTF) (Source: VT DEC, Local Operators; MGD = million gallons per day)

Municipality	Facility Design Capacity (MGD)	Average Monthly Flow (MGD)	Percent of Design Hydraulic Capacity Remaining	Sludge Treatment	Sludge Disposal Location
Barre City (also serves parts of Barre Town)	4.000	2.911	27%	Anaerobic digestion	Landfill
Cabot	0.050	0.026	48%	Thickening only	Land application on sites certified to other permittees
Marshfield Village	0.045	0.020	56%	Lagoon system - no digestion	Landfill
Montpelier (also serves parts of Berlin and Middlesex)	3.970	1.778	55%	Anaerobic digestion	Landfill
Northfield	1.000	0.563	44%	Aerated storage/ dewatering	Landfill
Plainfield (also serves parts of Marshfield)	0.125	0.058	54%	Aerated storage/ dewatering	Barre or Montpelier WWTF
Waterbury	0.510	0.181	65%	Lagoon system - no digestion	Land application on sites certified to other permittees
Williamstown	0.150	0.070	53%	Lagoon system -	Multiple WWTFs

nections to those lines.

The Plainfield Wastewater Treatment Facility serves the village area, Goddard College and some homes that extend beyond the boundaries of the village into Marshfield. It was replaced in 1999 and is approximately halfway through its expected service life. The costs for sludge hauling and disposal have been increasing rapidly, adding significantly to operating costs. The facility is not allocating any additional connections to adjacent areas in Marshfield

Waterbury Wastewater Treatment Facility serves the extent of the incorporated village, including 800 connections and an approximate population of 1,760. The plant has much excess capacity, particularly as flows are down 30-40% from pre-Tropical Storm Irene levels with the scaling back of state workers at the State Office Complex. Substantial upgrades are planned to replace aging collection lines which will coincide with an upcoming Main St. road reconstruction project. The plant has been upgraded to improve its effectiveness at phosphorous removal.

The Williamstown Wastewater Treatment Facility serves about 1200 residents in the village area and could accommodate a little under 100 additional average single family residences. Originally constructed in 1969, the facility is due for major upgrades to address aging components, energy efficiency measures and phosphorous removal. Town voters have approved borrowing $1.7 million for the refurbishment using grants and loans from USDA Rural Development.

The Northfield Wastewater Treatment Facility provides water to 4,000 residents in Northfield and has remaining capacity. A large share of the plant's current flow is dedicated to Norwich University. In 2004 the facility was upgraded, automated, and phosphorous removal incorporated in the process. The stormwater and wastewater collection system is still combined, which allows storm flows to the Wastewater Treatment Facility. The Town is planning to separate the system.

Cabot Village Wastewater Treatment Facility serves 173 connections in and adjacent to the village. Developing an allocation policy for remaining capacity, capital budget for system repairs, emergency preparedness and energy efficiency are currently local priorities for the system.

A community septic system has been developed for the village of Warren serving 65 connections, including municipal buildings and the Pitcher Inn. The construction

project financing for Warren combined EPA demonstration grant funds and traditional grant/loan funds (See Table 2).

Warren Community Septic System. The historic settlement pattern of Warren Village, with houses concentrated at high densities along the Mad River and Freeman Brook, had led to serious problems for continued on-site water and wastewater disposal. The town underwent detailed studies to identify a cost-effective combination of onsite individual and offsite cluster systems tailored to the localized need and conditions which resulted in permits for the first municipal alternative system in the state. The decentralized wastewater management program in Warren included upgrading individual, onsite systems; building an innovative system at the elementary school; and building a small cluster system and large cluster system to which residences can connect.

Most municipal systems in the region are operating under hydraulic capacity. It should not be inferred, however, that the difference between design flow and current average flow represents available capacity. Other factors, such as capacity already allocated and/or being held in reserve, the amount of phosphorous in the treated effluent, and local decisions regarding how close to the theoretical limit the plant should operate, all affect the potential to use any remaining capacity. Generally when a facility is operating at 80 percent capacity regularly, the plant may be required to upgrade.

The needs to address aging wastewater treatment systems are significant. Nearly all municipalities with aging wastewater treatment systems need assistance in managing their assets. Many systems must implement improvements to either maintain or attain compliance with state clean water standards to protect public health and the environment. While operators of the Region's larger systems report that their effluent contains well-under the current maximums for phosphorous content, some facilities may be required to meet phosphorous reductions as part of the Lake Champlain Total Maximum Daily Load currently underway. Upgrades to address this issue have increased the level of complexity and automation in some of the Region's facilities, creating considerations for staff capacity to manage these systems.

Lack of wastewater infrastructure has been cited as obstacles to promoting denser development and redevelopment in some of the Region's more rural villages. While new, centralized systems are a cost-prohibitive option, flexible or alternative wastewater solutions such as decentralized treatment systems may be a viable option for rural communities. Decentralized systems can include conventional or advanced on

-site septic tank systems with dispersal trenches that serve individual homes and businesses, larger septic systems that serve a cluster of buildings on one or more properties or a sewer system that connects to a neighborhood or community treatment unit.

The decentralized option can be used in a more targeted way so that communities are able to envision their land use and environmental protection goals first, and then develop wastewater management solutions to best serve those goals. As decision-making related to wastewater solutions can be very complex, forming an advisory body or local wastewater committee can be an important first step for a community in understanding the problem to be addressed and planning for local action.

Active public involvement in the needs assessment planning process led to the collection of better information regarding onsite systems, site conditions, and potential effects on drinking water supplies and surface waters. In the long run, this involvement led to public support for proposed solutions in Warren, including passing a local bond vote.

Sub-surface Disposal and Private Systems

Central Vermont is highly dependent upon on-site, underground septic disposal, as about half of our population lives in rural areas outside of the service territories of the above-described systems. Vermont's Indirect Discharge Permit Program regulates land-based systems with design capacities equal to or exceeding 6,500 gallons per day. There are 19 of these larger sub-surface discharge systems in the Region (see Table 2), including a municipally-owned community septic system in Warren and systems serving the Middle and High Schools in Duxbury. These systems are predominantly located in the Mad River Valley towns and are otherwise serving resort-related condominiums or facilities.

Most on-site septic systems require specific soils and site characteristics to enable the effective treatment of wastes. Where soils are impermeable, too permeable, shallow, or wet, or where slopes are steep, conventional septic systems are problematic and potentially hazardous. Accordingly, non-sewered areas displaying such site limitations have generally not been recommended for development.

Restricting such areas, however, intensifies development pressure on those soils

Table 2: Sub-surface Discharge Systems (> 6,500 gallons per day) (Source: VT DEC, MGD = million gallons per day)

Private (Design Capacity > 6,500 GPD)	Town	Design Capac-ity (MGD)	Average Monthly Flow (MGD)	Type of Connections
Harwood Union High School	Duxbury	0.02	0.004	High School
Crossett Brook Middle School	Duxbury	0.009	0.001	Middle School
Sandy Pines Mobile Home park	E. Mont-pelier	0.01	*	Mobile Home Park
Mad River Glen Ski Area	Fayston	0.012	*	Ski Area Development
Mountain Lodge at Sugarbush North	Fayston	0.018	0.004	Mountain Lodge
Mad River Green	Waitsfield	0.012	*	Shopping Center
Butternut Condominiums	Waitsfield	0.015	*	Condominums & 3-lot Subdivision
Lincoln Peak WWTF Sugarbush	Warren	0.23	0.57	Ski Area Development
Southface I Condominiums	Warren	0.015	*	Condominums
Southface II Condominiums	Warren	0.007	*	Condominums
Club Sugarbush	Warren	0.018	0.004	Condominums
Sugarbush Inn and Sugarbush One	Warren	0.0015	*	Inn, Conference Cen-ter, Condos
Sterling Ridge	Warren	0.007	*	Condominiums
South Village Condominiums	Warren	0.033	0.005	Condominums
The Bridges Resort #3-#28	Warren	0.009	*	Resort Units
The Bridges Resort #29-54	Warren	0.012	*	Resort Units
The Bridges Resort #55-#74	Warren	0.007	*	Resort Units
The Bridges Resort #75-#102	Warren	0.008	*	Resort Units
Warren Community Septic	Warren	0.020	0.009	Public buildings and Single Family Homes

that can accommodate septic systems. Unfortunately, prime agricultural land contains such soils. Clustered subdivisions with community septic systems may help overcome site limitations and simultaneously protect resource lands. Historically, many communities in Central Vermont enacted health or zoning bylaws to regulate the installment and engineering of new septic systems.

In 2002, Vermont adopted new Wastewater System and Potable Water Supply rules in order to allow for more flexibility in the design of on-site systems, assure more consistency in the standards for permitting systems.

The new rules provided that all local ordinances and/or bylaws regulating water and wastewater would be superseded as of July 1, 2007, creating "universal jurisdiction" over permits for the Vermont DEC Waste Water Management Division. However, while municipalities may no longer adopt or administer local regulations, they may prohibit construction under a zoning permit unless and until a wastewater and potable water supply permit is issued by the State.

The innovative systems allowed under the new technical standards may allow historically "un-developable" land to be developed. As such, towns should consider the impacts on land use patterns and associated uses, and plan accordingly.

WATER SUPPLY SYSTEMS

Water is among the most basic of human needs. A clean and plentiful supply of water is essential to our very survival. We need water in our homes to cook, clean, drink and flush waste. Water is critical to our ability to fight fires. Our farms, businesses and industries depend on a plentiful water supply for their operations, as well.

Public Water Systems

Most of Central Vermont's residences and businesses receive their water from public supply systems. Defined by the Department of Health as those systems that have ten or more connections and/or serve twenty or more people, public water supply systems are regulated by that same agency to ensure their compliance with state drinking water standards. In total, there are 15 community water systems (including those operated by fire districts) serving portions of 13 municipalities (some communities have more than one system) and 12 school water supply systems. Most of these systems (87%) rely on groundwater as their source, although the largest systems (Barre City and Montpelier) are supplied by surface waters.

Municipally-owned community water systems in the Region are displayed below in Table 3. These systems serve populations ranging from approximately 134

(Websterville Fire District in Barre Town) to 8,700 people (Montpelier Water System).

Table 3: Municipal Water Systems (Source: VT DEC, local operators; MGD = million gallons per day, * = data not available at this time)

Municipality/System Name	Source Name/Type	Population Served	Average Demand (MGD)	Capacity (MGD)	Percent of Capacity Used
Barre City/Barre City Water System	Dix Reservoir Upper Orange Reservoir Lower Orange Reservoir	4,150	1.6	6	27%
Barre Town/Barre Town Water System	East Barre Town Well Graniteville FD Sources Dix Reservoir (Barre City)	1,220	0.08	*	*
Barre Town/ Websterville Fire District	Barclay Quarry	134	0.029	*	*
Barre Town/Graniteville Fire District	North Reservoir (Springs & infiltration galleries) South Reservoir (Spring & well) Former Rock of Ages Reservoir (Spring) Gale Reservoir (Infiltration galleries)	700	0.072	*	*
Cabot/Cabot Town Water System	Danville Hill Well (primary), Bondville Hill well (secondary)	104	0.05	*	*
Calais/East Calais Fire District	Spring 1 Bowen Spring	200	0.012	*	*
Marshfield/Marshfield Village Water System	Well Site #7	350	0.025	0.05	50%
Montpelier/Montpelier Water System	Berlin Pond	8,700	1	2	50%
Northfield/Northfield Water Dept.	Wells #1-3	4,000	0.72	1.4	50%
Plainfield/Plainfield Water System (serves Goddard College)	Fowler Springs 1-4 Perry Spring Hood Wellfield - Points 1-5		0.04	0.16	25%
Waitsfield/Waitsfield Water Supply	Well R-1	*	*	*	*
Washington/Washington Fire District	Well	170	0.011	0.022	50%
Waterbury/Waterbury Village Water System	Tyler Brook, Merriam Brook Wells 1-4 John Gibbs Spring, Grace Spring, Gibbs Mill Spring Merriam Spring Upper, Merriam Spring Lower, C.H.Stevens Spring	2,403	0.30	0.40	75%
Williamstown/ Williamstown Water Dept	Wells B1 & B2	985	0.077	*	*
Worcester/Worcester Fire District	Well	350	0.008	0.035	23%

The newest system to come online will be the Berlin Municipal Water System, a planned $5.5 million community water system intended to supply drinking water and fire protection to the Fire Department, Elementary School and commercial and residential areas in Berlin Corners. The system will draw from wells drilled into bedrock and consist of 32,000 ft of distribution mains, 40 fire hydrants, a 400,000 gallon water storage tank and a well pumping station. The system will make municipal water connection available in previously undeveloped areas on the rural urban fringe and it will be important to orient local planning and policies for desired growth.

Currently, five of the municipally-owned water systems are structured as fire districts. Fire districts in Vermont are all political entities (municipal corporations) established by acts of their respective towns under the authority of state law. Historically, fire districts have arisen and been established to meet public needs in a part of a town that the town itself declined to assume. In the past, the need for fire-fighting services often prompted the establishment of a fire district, but more recently the needs for public drinking water or wastewater treatment have been the catalyst.

Reasons for a community to form a fire district or to take over private systems as such include eligibility for various state and federal funding programs and municipal financing rates and terms that are not available to privately owned systems. Disadvantages include the extensive time commitment required from members and the high level of technical, managerial and financial skills required by volunteers to operate a water system.

The Region's newest fire district was formed in 2010 by a small group of volunteers in East Montpelier East Montpelier Fire District #1 is exploring the possibility of taking over a private water company's operations servicing East Montpelier Village and the immediate vicinity. While a moratorium on new connections has been imposed by the State, transfer of ownership to the fire district could potentially alleviate that issue and support growth in the Village. Funding has remained a primary barrier to transfer of ownership.

Many water and wastewater systems operate under direction of the legislative body and a few communities in the Region operate their water and wastewater utilities under the authority of a separate water and wastewater commission. These include

Waterbury, Plainfield and Northfield, where powers to determine operational budgets and user fees have been delegated by the Selectboard or the voters to the commission.

In the past, conflicts have arisen between municipalities regarding the shared use of a supply owned and operated by one municipality. The City of Montpelier has advocated for tax-sharing agreements where its system is providing water (and wastewater) service to adjacent communities. Inter-municipal conflicts have also surfaced where one municipality's source of water is located in or near an adjacent municipality, and thus is potentially affected by activities beyond the control of its users.

The physical components of the municipally-owned water systems range in age from newly installed to approximately 95 years. The most common problem facing communities that have or seek to have public community water systems is obtaining funding to acquire or upgrade water supply facilities. One of the largest needs for water systems is for distribution and transmission infrastructure. This critical portion of infrastructure is often overlooked as it is mainly below ground, however this component accounts for most of a typical system's capital value. Managing hundreds, sometimes thousands, of assets with the staff capacity of most local utilities is a challenge in Vermont and the Region.

A strategy the State is employing to help address ongoing issues of system depreciation is an Asset Management approach geared towards changing the way water and wastewater utilities in Vermont think about their financial management and to aid in making decisions for how to most efficiently use limited resources. This program provides technical assistance to help local operators inventory and develop a prioritized list of water infrastructure improvement projects. A pilot Asset Management project was conducted in collaboration by the Vermont Agency of Natural Resources and the Village of Waterbury in 2012. The end result was a database of over 2,700 assets and their associated condition, lo-

What is Asset Management? The Environmental Protection Agency (EPA) defines asset management as "a process for maintaining a desired level of customer service at the best appropriate cost". It is designed to aid water and wastewater systems in making decisions for how to most efficiently use their limited resources. An asset management program is developed to minimize the total cost of asset ownership by helping to determine when to repair, rehabilitate or replace the asset.

cation and cost. This is a huge advantage to the Village of Waterbury both from a maintenance standpoint and from a financial standpoint.

The average life of the asset, along with its replacement costs are taken into account when making these choices. Managing hundreds, sometimes thousands, of assets is a daunting task. Many systems will simply wait for an asset to fail before it is replaced. This is not always the best method. Unexpected failures can lead to large debts for a small system. The development of an asset management program will inform the system when certain repairs or maintenance are needed and assist in developing a long-term funding strategy for larger assets. Issues related to aging systems combined with a loss of knowledge from personnel retirements, and public resistance to rate increases, results in a growing need to make every dollar count.

Another issue some water systems in the Region struggle with are source yield and the need to identify additional reliable sources. Some systems that provide fire protection are under strain as they weren't necessarily designed with adequate distribution systems/pipes for use in fire protection.

In addition to the municipal systems, there are another 121 systems in the Region that meet the state's definition of a public water supply system serving facilities like campgrounds, recreation areas, mobile home parks, commercial areas, general stores and private schools.. While almost every town in the Region has at least one of these systems, the highest numbers of them are found in the towns with ski-resort related development and in the Town of Berlin, which contains a large commercial and industrial center and has attracted considerable development during the past 40 years. Outside of the service territories of public and private systems, water is generally obtained from on-site wells or springs.

Drinking Water Source Protection

Each public water system has an accompanying source protection area. The Vermont Water Supply Rule defines a Source Protection Area as: *… a surface and subsurface area from or through which contaminants are reasonably likely to reach a Public water system source.*

All public community and non-transient, non-community water systems must have

approved Source Protection Plans. These Plans address the actions the public water system will perform to minimize the contaminant risks to their drinking water supply source. Threats to groundwater and wells in the region include agricultural runoff, nearby salt storage areas, road salting, underground or above-ground storage tanks, contaminated runoff from paved areas, flood events, and failing septic systems. Specifically identified threats in local operating permits for municipally-owned systems primarily include roadways and impervious surfaces within 200 feet of the water source. Two communities respectively identify a nearby sewage treatment line and an adjacent excavating operation as potential threats to drinking water sources.

Within these source protection areas, the VT Dept. of Environmental Conservation reviews Act 250 and wastewater facility applications. VT DEC also requires that towns develop a plan for protecting source areas. Towns are not required to regulate land uses within source protection areas, but some communities in the Region choose to do so.

FACILITIES & SERVICES

Solid Waste

The proper management and disposal of solid waste is an important challenge facing the region today. Everyone in Central Vermont generates waste, often without ~~its~~ thinking about its ultimate destination or impact. In 2012, the Vermont Legislature passed the Universal Recycling Law (also known as Act 148), which made significant changes to solid waste management throughout the State. The Universal Recycling Law was prompted by Vermont's stagnant diversion rate.

In 1987, Vermont's first robust Solid Waste Law (Act 78) encouraged communities to create a new hierarchy of goals for solid waste management: source and waste reduction, followed by re-use, recycling, and lastly, disposal. This law succeeded in increasing the waste diversion rate in Vermont to between 30-36%, but by the mid-2000s, that rate had stagnated. This prompted Vermont to pass the Universal Re-

cycling Law.

The Universal Recycling Law has several key components.

- Banning the disposal of certain solid waste
- Requiring parallel collection at facilities and curbside pickup
- Allowing ANR to monitor rate structures to ensure transparency
- Creating a food recovery hierarchy
- Phasing in food scrap diversion
- Incentivizing variable rate pricing ("Pay as You Throw") for municipalities
- Requiring recycling containers wherever there are trash cans in public buildings and on public land

This law will change a great deal about the treatment of solid waste in Vermont, and the Region is no exception.

Solid Waste Districts

Three Solid Waste Districts and one Alliance operate within our Region. The Central Vermont Solid Waste Management District (CVSWMD) is our primary waste entity. CVSWD serves Barre City, Barre Town, Berlin, Calais, East Montpelier, Middlesex, Montpelier, Orange, Plainfield, Washington, Williamstown, and Woodbury. Marshfield and Cabot are served by the Northeast Kingdom Waste Management District. The Town of Worcester is the sole town in our Region participating in the Lamoille Solid Waste Management District. Finally, the Mad River Resource Management Alliance (MRRMA), was formed in 1994 and operates with assistance from CVRPC. MRRMA is responsible for the solid waste planning for Duxbury, Fayston, Moretown, Roxbury, Waitsfield, Warren, and Waterbury.

In 2006, CVSWMD adopted a policy/goal of working to achieve "zero waste" in the Region. CVSWMD believed that "by setting an extreme target for waste reduction, new levels of innovation and efficiency (will be) unleashed." That goal is now supported by the Universal Recycling Law. The economic and social benefits of a zero waste goal are indisputable. The District argues that a zero waste goal can help create new businesses and jobs through waste-based economic development,

strengthen existing businesses, and protect public health and the environment. It is estimated that landfilling/incineration creates one (1) job per 10,000 lbs of material, while composting creates four (4), sorting and processing of recyclables creates 10, remanufacturing 25, and reuse business between 28 and 296)

Landfills

In Central Vermont, residents currently generate about 40,000 tons of waste per year, Only about one third of this gets diverted from the waste stream through recycling, reuse, or composting. The rest must be disposed of through land filling (or incineration).

In their 2007 Solid Waste Implementation Plan, the Central Vermont Solid Waste Management District, estimates that between two and three million dollars is spent annually on the disposal of approximately 40,000 tons of trash.

Of this, most goes to a landfill in Coventry, In the past, solid waste has been disposed of at landfills in Moretown, Williamstown and Washington, but these facilities have been closed.

Recycling and Transfer Facilities

Recycling of appropriate components of the waste stream is one method available to reduce the burdens on disposal facilities. Available data indicate that source separation of recyclables produces a more acceptable market product. In addition, source separation keeps the management of solid waste closer to the point of generation, thus encouraging consumers to participate more fully in the management of their solid waste.

Recycling of clear glass, tin and aluminum cans, newspaper, and #2 plastic jugs was made mandatory for households, businesses, schools and municipalities in the CVSWMD in 1995. The Universal Recycling Law added new items to the list of mandatory recyclables, with the law being implemented in phases. After July 1, 2015, all of the above products, as well as all clean paper and cardboard, are prohibited from landfills. Leaf and yard debris and clean wood waste are prohibited af-

ter July 1, 2016, and haulers must provide services for those materials.

Food scraps are banned from landfills as well, with the ban being implemented between 2014 (for the largest food scrap generators) and 2020. This ban is discussed further in the "Composting" section.

Private waste haulers offer curbside collection of trash to approximately 90% of the households in the region. These materials are brought to private processing facilities. There are several public and private facilities for public recycling drop-off depots. These centers run the gamut between once a week drop off sites to full time transfer stations.

All transfer facilities perform the same two functions: desired materials are separated from a mixed waste stream, and are processed for further management. Such facilities are generally more cost-effective if operated on the regional rather than local level. Recycling is currently collected at the same transfer facilities throughout the Region that process trash. The recyclables are generally sorted at the Material Recovery Facility (MRF) in Chittenden County. CVSWMD is exploring a public drop-off facility for leaf and yard waste, clean wood materials, asphalt shingles and drywall, household hazardous waste, and other materials.

There is a need for facilities for less common recyclables. The MRRMA operates a textiles recycling program at the Moretown Town Office. This program diverts clean clothing, linens, plush toys and shoes from landfills. The CVSWMD operates an Additional Recyclables Collection Center (ARCC) in Barre, which collects "hard to recycle" objects such as prescription bottles, batteries, product packaging, textiles/ clothing, electronics, books, sports equipment, and energy bar wrappers.

In our technology-based society, electronic waste is also a growing problem as various devices wear out and must be disposed of. E-waste is illegal in landfills, and the state requires that all electronics manufacturers who sell electronics in Vermont must help pay for their disposal. This makes e-waste disposal free for Vermont residents, as well as small businesses, schools and charities. Several facilities and businesses collect e-waste throughout the Region. Many towns also collect cell phones and rechargeable batteries at government buildings.

Composting

It is estimated that about 40% of the waste we generate is food and yard waste. Currently most of this is landfilled. The State of Vermont Waste Composition Study (2013) found that 28% of residential Municipal Solid Waste (MSW) disposed (after recycling and composting) and about 18% of industrial, commercial, and institutional (ICI) materials disposed were organic material.

Composting is a natural process of decomposition of organic materials. It is the biological process that allows leaves and grass clippings to degrade. Composting of the organic component of the solid waste stream could produce an end product that both saves landfill space and provides a useful soil amendment. Source separated organics can be managed locally to produce a compost that benefits local gardeners, farmers and plant nurseries.

The Universal Recycling Law made composting mandatory for all residents and businesses in Central Vermont. The law is implemented on the following timeline:

- July 1, 2014: Generators who produce 2 tons or more per week must divert their food scraps if there is a certified facility within 20 miles.
- July 1, 2015: Generators who produce 1 tons or more per week must divert their food scraps if there is a certified facility within 20 miles.
- July 1, 2016: Generators who produce 1/2 tons or more per week must divert their food scraps if there is a certified facility within 20 miles.
- July 1, 2017: Generators who produce 1/3 tons or more per week must divert their food scraps if there is a certified facility within 20 miles.
- July 1, 2017: Haulers must offer services for food scraps for all customers.
- By 2020, all food scraps must be diverted from all businesses and households, regardless of generation rate or distance to a certified facility. Haulers must also accept food scraps from customers.

Vermont Compost Company has facilities in Montpelier and East Montpelier for large-scale source-separated composting. The company receives organic materials and processes them in large quantities to make compost and potting soil, which is then sold in eight states and online. The CVSWMD anticipates the need for a new composting facility in the Region in the coming years. This facility will be needed to process the increased organic waste stream that will be created by the elimination of yard waste from landfills.

The CVSWMD is quite active in promoting composting. In addition to producing and distributing the booklet "The Dirt on Composting", the District operates a "Business Organics" and a "School Composting" program. The Business Organics Program works with restaurants and other commercial food waste generators to divert food waste from landfills to composting (as of FY14, over 1,396 tons). The CVSWMD School Composting Program works with school cafeterias and provides other resources for schools, including guidelines for setting up a "Green Team" or environmental clubs to coordinate waste reduction actions such as composting (done on-site or with local farmers or commercial composters), holding clothing or book swaps, conducting waste audits, or taking leadership roles to address environmental issues . The District also promotes household and school level composting of organic waste by providing plans for building compost bins selling pre-made compost bins and "Green Cones." Green Cones are in-ground digesters that facilitate the fast decomposition of animal byproducts such as meat and bones.

The MRRMA also encourages composting by selling compost bins and kitchen collectors for food scraps. Food scraps from the MRRMA's coverage area are collected by Grow Compost, located in Moretown. In 2014, 126.5 tons of food scraps were composted at that facility. The Highfields Center for Composting provides composting services for the Northeast Kingdom Waste Management District and the Lamoille Regional Solid Waste Management District. The Center runs a pilot project called "Close the Loop!" in both Districts. This project offers composting education and food scrap pickup to residents in both Districts.

Re-use

In current society we tend to throw away unwanted or unneeded objects. Many such objects are suitable for other uses or desired by other individuals for their original use. By matching would-be discarded products with those in need of them, we may conserve resources and save valuable landfill space and product production resources. The Re- Store in Barre provides an outlet for used office supplies, furniture, household goods and knick-knacks for art projects. The Region also has a variety of used clothing stores and a Salvation Army, which resell clothing and furniture. CVSWMD also helps facilitate several events throughout the year, such as "Drop-n-Swaps," coat drives, ski and skate sales,

assistive technology exchanges and "Wheels for Warmth," a program that sells donated snow tires for a low cost and donates the money to Capstone Community Action.

Business and Household Hazardous Waste Collection Facilities

Although most solid waste is relatively benign, a percentage is hazardous in nature. In fact about 1% of the landfilled material (or about 400 tons in Central Vermont) falls into this category. The disposal of even small quantities of certain types of solid waste, including unregulated hazardous wastes may pose a risk to both human health and the environment.

Unregulated hazardous waste is comprised of two categories; household hazardous waste (HHW) and conditionally exempt generator (CEG) hazardous waste. Even though household hazardous waste exhibits characteristics of hazardous waste, they are exempted from State hazardous waste regulations and, for management purposes, are considered a solid waste. CEG hazardous waste is exempt from most regulations, provided that less than 220 pounds of hazardous waste (or 2.2 pounds of acutely hazardous waste) are generated per month.

The Region's growing population is projected to generate quantities of household and business hazardous waste that will need proper management and disposal. With the likelihood of fewer landfills and solid waste processing and disposal facilities, it is important that both present and future generations be provided with the following: information on reducing the use of hazardous chemicals whenever possible; opportunities for diverting hazardous waste from the municipal waste stream through hazardous waste collection programs; and programs for hazardous waste screening at landfills and other solid waste facilities.

The Central Vermont Solid Waste District, the Mad River Resource Management Alliance, the Northeast Kingdom Waste Management District and the Lamoille Regional Solid Waste Management District put on a variety of special one-day events for household hazardous waste collection. Household hazardous waste includes things such as batteries and fluorescent bulbs. CVSWMD also accepts liquid latex and oil paints at the Additional Recyclables Collection Center, which is open year-round.

Product Stewardship/Extended Producer Responsibility (EPR)

Product Stewardship, also known as Extended Producer Responsibility (EPR), is a system in which producers are responsible for their products when they are no longer in use. The system attempts to encourage producers to create product disposal methods that are more environmentally friendly and easier to dispose. Common industries that use EPR are tires and paints.

In Vermont, there are five EPR programs: paint, electronics, batteries, fluorescent lamps and thermostats, and auto switches. There are several businesses that offer options for recycling paint in Central Vermont. A Montpelier paint store, True Colors, offers opportunities for latex paint recycling by reprocessing and reselling latex paint. Additionally, PaintCare, a national non-profit organization that runs paint stewardship programs, has many locations for drop-off in Central Vermont, including the CVSWMD ARCC. PaintCare collects paint and then remixes and resells the paint.

At this time, there is no EPR program for tires. There is one facility for recycling tires in the Region: Budzyn Tire in Barre, and "Wheels for Warmth" is a tire re-use program. However, CVSWMD indicates that there is a significant need for more tire stewardship programs. Wal-Mart and Shaw's grocery stores both independently recycle the packaging from their products. Additionally, they offer plastic bag recycling collection in their stores. Compact fluorescent bulbs (CFLs) are recyclable at many hardware stores throughout the Region. CFLs are also accepted at the ARCC and at HHW events held around the Region.

Communications

Our era is often referred to as "the age of communication." Innovations in the way we process and transmit information have made the world a smaller place. Communication networks are rapidly linking the Region's residents, businesses, and governments with the rest of the world. While Central Vermont's existing communication facilities seem adequate to meet current needs, the maintenance and continued development of communications systems can help keep Central Vermont informed

and competitive. Many businesses and individuals seek out areas where high speed internet connections and cellular service are available to locate their businesses and buy a house. Ultimately though, such systems may make our current working and living patterns obsolete, as they change the elements of our lifestyle, such as the distinctions between home, the work place, and the marketplace.

Radio

Central Vermont is home to seven radio stations. WNCS and WSKI broadcast out of Montpelier; Waterbury is home to WDEV and WGLY; WDEV-FM in Warren, Goddard College's WGDR, and WSNO - WORK in Barre round out the field. The Region is also served by Vermont Public radio and several commercial stations broadcasting from locations outside Central Vermont, as well as HAM operators.

Newspaper

The Barre-Montpelier Times Argus, and the Burlington Free Press are the primary daily newspapers serving the Region and its residents. These publications cover international, national, regional and local news. Weekly papers, covering local and/or sub regional events include; The Valley Reporter (Waitsfield, Warren, Moretown, Fayston and Duxbury), The Hardwick Gazette (Woodbury, Cabot, Calais and Marshfield), the Northfield News (Northfield and vicinity), and the Washington World (all of Central Vermont). In addition, several community papers exist in the region.

Television

Most residents of Central Vermont are within receiving distance of signals from affiliates of the major commercial networks (ABC and CBS stations broadcast from Burlington and Plattsburgh, New York is home to an NBC affiliate). In addition, Vermont ETV, a public station, broadcasts from Colchester. Cable television is now available to over three-quarters of the Region's population[2]. Under Public Service Board rules, cable television companies offer local access for community programs.

Vermont Interactive Television operates out of Vermont Technical College in

Randolph, feeding additional sites across the State,including Montpelier and Waterbury. This system allows people in distant locations to have visual and audio contact with each other for conferences, meetings and classes. This technology not only facilitates communication, but saves energy and reduces fossil fuel consumption as it obviates the need for long distance travel.

Voice Communication

Most of Central Vermont is served by FairPoint Telephone Company or a subsidiary of Fairpoint, the Telephone Operating Company of Vermont LLC. The Mad River Valley, where Waitsfield Telecom operates, and Northfield & Roxbury served by TDS Telecom, are outside of Fairpoint's service territory.

Vermont's telecommunications market has grown more competitive in the last ten years with the entrance of competitive local exchange carriers (CLECs), explosive growth of mobile wireless telephone service, and telephone service being offered from cable providers. In urban and suburban areas such as Chittenden County, this influx of competition has resulted in greater choice of services for businesses and residents.

Competition, however, is less abundant in rural areas. Incumbent local exchange carriers (ILECs) are very often the only wireline provider in the state's costliest to serve areas and act as the carrier of last resort. These two trends put great financial stress on ILECs, as they try to maintain an aging network for a dwindling number of customers.

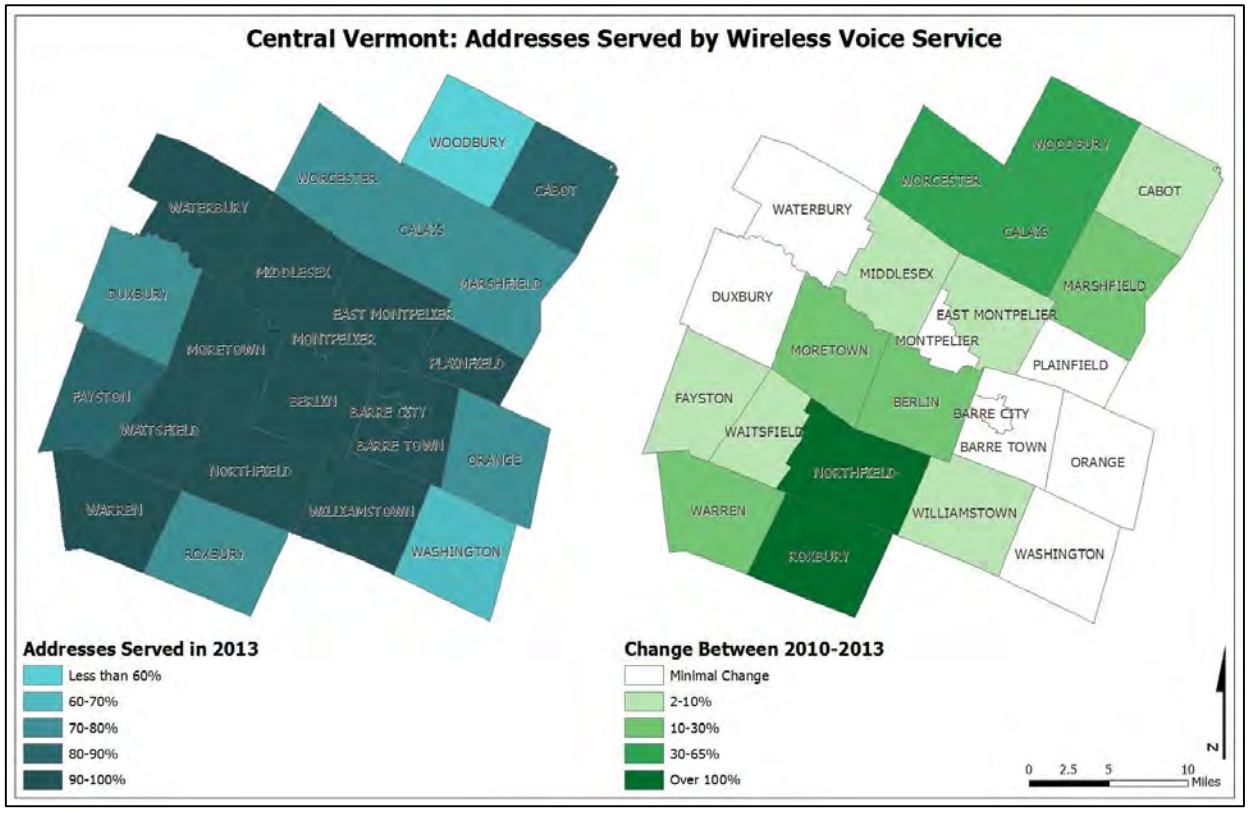
Technological changes are also affecting the voice market. Voice over Internet protocol (VoIP) is poised to replace circuit switched technology with a voice system that rides over data networks. In some rural communities, this may mean abandoning traditional wireline service altogether in favor of a wireless solution. Voice over Internet protocol (VoIP) has allowed a greater number of competitors to enter the market for voice service, such as cable and Internet content companies. More importantly VoIP has challenged the distinction between "telecommunications service" (previously referred to as a "basic service") and an "information service" (or "enhanced service").

Mobile wireless voice service is becoming more available. Vermonters' use and reliance on mobile voice technology has increased since the publication of the last telecommunications plan. Twenty nine percent of Vermont households are wireless-only households.

As of 2013, thirteen of Central Vermont's twenty-three communities have between 90-100% of addresses served by a wireless voice provider according to voice tests that were conducted throughout the state (displayed in Figure 1). Mobile data for smartphones or mobile hotspots is also typically available from these carriers in the same service areas that voice is available.

The Towns of Woodbury and Washington remain the least-served with less than 60% of Woodbury's addresses receiving coverage and between 60-70% of Washington's addresses. In recent years coverage has more than doubled in the Towns of Northfield and Roxbury and also increased significant in the Towns of Worcester, Calais and Woodbury.

Figure 1: Addresses Served by Wireless Voice Service (BroadbandVT.org)



Wireless Telecommunication Facilities

Wireless communication through broad band technologies has become a part of everyday life and a service relied upon by business, emergency services, and the public. Clearly, the ability to communicate to almost anyone, from almost anywhere, at almost anytime brings added convenience and security to our lives.

Throughout Central Vermont, we are seeing continuing applications for the installation of wireless telecommunication facilities. This is partly because the demand for wireless services is growing and partly because of changes in technology.

While Central Vermonters want and expect good cellular service, they also expect the placement and design of new facilities to be guided by a respect for the integrity of the Region's landscape and compliance with microwave emissions standards. As such, it is important to balance aesthetics, signal quality, health, business and personal needs when deciding whether and where to build new towers and other facilities.

> *The 2014 Vermont Telecommunications Plan highlights the fact that technology is evolving very fast and that changes over the last 10 years have blurred the line between what is an essential service and what is not. For example, the 2004 Telecommunications Plan survey indicated that an overwhelming majority of Vermont households (77%) had not even considered the idea of giving up their traditional landline service in favor of wireless service. Today, 29.9% of Vermont adults live in wireless-only households, and that number continues to increase as service expands and becomes more reliable.*

The Federal Telecommunications Act of 1996 does not allow local governments to prohibit the construction of wireless facilities on a town-wide (or city-wide) basis, or to make regulatory barriers so onerous as to effectively block service. However, municipalities did retain the right to place reasonable requirements and restrictions upon such facilities in order to protect community character and the environment, and encourage the efficient use of resources. In 2007, the Vermont Legislature created 30 V.S.A. § 248a. Section 248a provided telecommunications carriers seeking to construct telecommunications facilities the option of obtaining a CPG as an alternative to local zoning and Act 250 environmental review. Applicants using the Section 248a process are not obligated to adhere to zoning ordinances of the host town.

During the 2014 legislative session, the General Assembly crafted new provisions relating to town participation in 248a proceedings. Criteria is applied in the review of projects requiring the Public Service Board to give *substantial deference* to the land conservation measures in the plans of affected municipalities and the recommendations of the municipal legislative bodies and the municipal and regional planning commission regarding the municipal and regional plans, respectively, unless there is *good cause* to find otherwise.

Communities planning for the appropriate sitting of wireless facilities have to ask themselves many questions as they proceed. Would they rather have several small scale, less visible, facilities closer to the population or a few large, highly visible sites in less populated spots? Are there certain locations that are so environmentally or visually sensitive that they should be "off-limits"? What areas are providers most interested in serving? Through careful planning and clear language in the duly adopted municipal plan, cities and towns can ensure good service without compromising their character or the welfare of their residents.

Broadband and Internet Services

Internet services have become an integral part of everyday life relied upon by business, emergency services, and the public. Clearly, the ability to communicate to almost anyone, from almost anywhere, at almost any time brings added convenience and security to our lives. Broadband is an oft-referenced essential telecommunication technology that refers to high speed internet access. Central Vermont has several internet providers, and high speed connections are now available to most residents in highly populated areas. Although service has improved beyond dial-up for many Central Vermont residents and businesses, the nature of "adequate" service is an evolving concept that will continue to present challenges for the region. As the broadband networks supporting the global and national economies are improved to meet demands for greater speed, residents and businesses in Central Vermont will need service that is adequate for them to participate. Broadband was originally defined as data communications at speeds faster than a dial-up connection, which is typically 56kbps or less. The Vermont Dept. of Public Service now defines high speed internet access as 4 Mbps download and 1 Mbps upload or greater.

Regional Broadband Plan. In 2011 CVRPC established a regional technology and innovation team with representation from a variety of sectors including business, education, libraries, government, media, health care and human services. Input from this teams shaped the goals, strategies and actions found in the region-wide commonalities and sector analysis sections of a completed Regional Broadband Plan. Five themes that were present included: the availability and affordability of broadband, the role of broadband in local government, telecommuting, digital literacy, and economic impact of broadband. For more detailed information, refer to the 2012 Regional Broadband Plan.

Although the majority of the Central Vermont Region is served by Broadband in some capacity, primarily through cable and DSL (digital subscriber line via a telephone provider), the maps of cable, DSL, and fixed wireless service (WISP) provided online by BroadbandVT.org show Roxbury, Washington, and Woodbury as the most underserved towns in our region. This is a concern for residents of those locales and an impediment to economic development and energy saving activities such as telecommuting. With large portions of the towns without access to Broadband service or with access at less than 25% of residences, these areas should be targeted for increased connectivity and access. Residents of rural areas generally have less competitive choice, but new options are coming online. Those in remote parts of the Region will be best served with fixed and mobile wireless services.

Fortunately, the State has recognized the importance of this issue and continues to take steps to identify gaps and develop solutions. The Vermont Telecommunications Authority (VTA) is supported by Legislative appropriations and has been involved on an ongoing basis in three types of projects: broadband expansion, cellular service infrastructure and fiber optic infrastructure. Several commercial service providers are also investing significantly in their own broadband and/or cell service expansion projects. BroadbandVT.org, is an active cooperative effort that has developed a variety of maps that show elements of broadband and cellular coverage. BroadbandVT.org partners include the Vermont Center for Geographic Information (VCGI), VTA, Vermont Department of Public Service (DPS), and the Center for Rural Studies of the University of Vermont.

Landline High Speed Internet Access Expansion (DSL)

All incumbent local exchange carriers (phone companies) offer high speed Internet

access. FairPoint, Vermont's largest incumbent carrier, offers DSL service to an estimated 92% of the service locations in its territory. The other independent phone companies offer DSL within their entire service territories. Most offer service at speeds of 4/1 or higher. Notable is the widespread DSL availability in the Mad River Valley provided by Waitsfield Telecom.

Cable Internet Access

All cable providers in Vermont offer broadband service. All cable providers offer speeds of at least 4/1 Mbps and in most cases much faster speeds. Prices for broadband service are generally competitive with DSL, but cable offers higher speeds. In Central Vermont cable is available primarily in or in the vicinity to the Region's downtowns and larger villages.

Wireless Internet Service Providers (WISPs, or Fixed wireless)

Vermont consumers are served by several Wireless Internet Service Providers. These companies offer fixed wireless broadband service to residents within range of their facilities. Recent expansions include the development of the Cloud Alliance broadband network which, in partnership with the VTA and Central Vermont Economic Development Corporation, provided for new service to homes and businesses in Woodbury and Cabot and improved the speed of broadband service in Plainfield, Marshfield, East Montpelier and Calais. Vermont Telephone Company (VTel) also began a project in 2011 to bring wireless broadband service to Vermont using federal Rural Utilities Service (RUS) broadband stimulus grant. Wireless open world's (WOW) 4G/LTE network will reach Vermont's presently underserved and unserved areas.

Mobile Wireless Data Service

Vermonters are served by all of the major wireless network providers, but AT&T Mobility and Verizon Wireless have the deepest facilities-based penetration in Vermont. VTel recently launched a wireless service, which is anticipated to be operational

statewide. Vermonters may also choose service from a variety of pre-paid service providers and resellers of national service. As discussed more fully in the Voice portion of this chapter, mobile carriers are continuously expanding coverage and upgrading facilities to bring 4G/LTE service to existing coverage areas.

Vermont needs its wireline networks at this time. For rural residents and small businesses, wireline service is a necessity. Residents in rural areas may not have adequate cell coverage. DSL is also the best available broadband option in Vermont's most rural areas. Concerns over E-911 and the reliability of wireless service in a power outage are valid and should be carefully considered before the state accepts wireless services as a substitute for wireline services.

Fiber Optic

The VTA has developed fiber optic infrastructure to support broadband service and provide backhaul for cell sites wireline transmission from the cell site to the carrier's network. Its largest project to date is the funding of the Vermont Fiber Connect project, an initiative of the federal Broadband Technology Opportunities Program (BTOP) stimulus. The project connects over 340 community anchor institutions in the project area, encompassing seven of Vermont's fourteen counties. Vermont Fiber Connect serves Montpelier, Barre City and immediate surrounding areas in the Region. Fiber optic technology is also advancing rapidly. While older fiber in the State is becoming outdated and getting costly to maintain and run, it is still much better than any improvements in copper and wireless technology currently in place.

Emergency/Health Services

The availability of emergency services and health care facilities helps to ensure the personal safety and physical well being of Central Vermonters. As the Region grows, changes, and ages, new and increasing pressures will be brought to bear on service providers and existing facilities. While the cost of providing such services soars, public funding supplies are not keeping pace. Obviously then, it will take innovative thinking and action to address the Region's long term emergency and health care needs.

The Enhanced 911 Board operates nine 911 call answering points, known as public safety answer points or PSAP's. One of the nine PSAP's is located at the Montpelier Police Department. During 2001, 5,251 calls were answered for Central Vermont communities by the PSAP's. This represented 3% of the total calls made statewide. In 2002, the number of calls from Central Vermont increased to 9,557, or 6% of all statewide calls. It should be noted, however, that statewide calls were down by 8% in 2002[4].

Fire Protection

Central Vermont is protected by over 20 local fire departments. Most of these are based in village or urban areas and staffed by volunteer crews. In some instances, the demands on local fire departments are beginning to outstrip their capabilities. Sprawling development patterns make response more difficult and time consuming. In addition, many departments are faced with a shortage of trained volunteers and less than state-of -the-art equipment.

All of the Region's fire companies are members of mutual aid systems. These associations provide for back-up assistance from neighboring member companies, when needed.

Police Protection

Although not immune to crime, Central Vermont has historically enjoyed low crime rates. The Region's crime rate of the 1990's has declined sharply in the more serious crimes (Part I crimes such as homicide, aggravated assault, etc) and less significantly in lesser crimes (Part II crimes such as forgery, vandalism, simple assault, etc.) since the high in 1993. The Part I crime rate dropped by 23% from a region-wide rate per 1,000 population of 33.42 in 1990 to 26.01 in 2001 while the state-wide rate decreased by 35% from 45.64 to 29.90. The Part II crime rate for the Region increased from 70.46 in 1990 to a high of 85.60 in 1993. However, the 2001 rate dropped to 78.10, a decline of 9% from 1993. The statewide rate in 1990 was 83.33 and in 2001 was 82.57, a slight decrease from 1990, but a decrease of 10%

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from its peak of 91.03 in 1997. Our ability to maintain lower crime rates will depend on maintaining adequate police services at the local and regional level[4].

Barre City, Barre Town, Berlin, Montpelier, Northfield and Waterbury maintain municipal police squads. The Washington and Orange County Sheriff's Departments, located in Montpelier and Chelsea respectively, provide contractual law enforcement services to some of Central Vermont's smaller communities. The Vermont State Police (with headquarters in Waterbury and barracks in Middlesex) provides primary police service to those towns without municipal squads or contracts with County de-

Table 4: Emergency Resources by Municipality in Central Vermont (Town Plan Data[5])

Town	Police Force	Fire Protection	EMT
Barre City	Full Time	Full Time	Full Time
Barre Town	Full Time	Hourly	Full Time
Berlin	Full Time	Mutual Aid with Volunteers	Contracted from Barre
Cabot	State and Sheriff Contract	Volunteer	Volunteer
Calais	State and Sheriff Contract	Volunteer	Volunteer
Duxbury	State and Sheriff Contract	Mutual Aid	Mutual Aid
East Montpelier	State and Sheriff Contract	Full Time with Volunteers	Full Time
Fayston	State and Sheriff Contract	Mutual Aid with Volunteers	Mutual Aid, Volunteer
Marshfield	State and Sheriff Contract	Mutual Aid with Volunteers	Mutual Aid, Volunteer
Middlesex	State Contract	Mutual Aid	Contracted from Montpelier and Waterbury
Montpelier	Full Time	Full Time with Volunteers	Full Time
Moretown	State and Sheriff Contract	Mutual Aid with Volunteers	Purchased from Montpelier
Northfield	Full Time	Volunteer	Partially Volunteer
Orange	State Contract	Mutual Aid	Mutual Aid
Plainfield	State Contract	Volunteer	Volunteer
Roxbury	State Contract	Mutual Aid, Volunteer	Volunteer
Waitsfield	State and Sheriff Contract	Mutual Aid, Volunteer	Volunteer
Warren	State Contract	Volunteer	Volunteer
Washington	Sheriff Contract	Volunteer	Contracted from Barre
Waterbury	Full Time	Volunteer	Volunteer
Williamstown	State and Sheriff Contract	Volunteer	Full Time
Woodbury	State and Sheriff Contract	Volunteer	Mutual Aid
Worcester	State Contract	Mutual Aid with Volunteers	Volunteer

Data from town plans[5]

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partments, and backup assistance to all others. In addition, the State Police patrols Interstate 89.

Police departments responding to CVRPC's survey cited increasing crime and lack of manpower as the greatest problem for the foreseeable future.

Ambulance/Emergency Medical Services

Some 17 ambulance and emergency medical squads operate in and around Central Vermont, providing first aid and medical transport to injured persons. Most of these operate with volunteer crews and are funded at least in part by donations and user/ member fees. Lack of volunteers and members are cited by several squads as major concerns for the future.

Medical Facilities

The Central Vermont Medical Center (CVMC), located at Berlin Corners, is the Region's most significant medical complex. With 122 beds and a service area which includes all of Washington County and portions of neighboring counties, CVMC is truly a regional facility. A wide range of medical specialties and procedures including; emergency care, x-rays, rehabilitation, pre-natal and maternity care, pediatrics, physical therapy, mental health care, and cardiology, are available at CVMC. Some unusual and complex problems, however, may require more sophisticated treatment and/or equipment at tertiary care hospitals.

The Vermont State Complex in Waterbury, while now largely converted to state offices, still provides mental health care for some patients[6]. In addition, the Washington and Orange County Mental Health Agencies provide mental health counseling, adult day programs, and substances abuse services to those in need.

The Region's elderly population is expected to grow for at least the next several decades. Accordingly, elder care facilities and services will become increasingly important. Central Vermont hosts five nursing homes boasting more than 500 beds in total. In addition, there are several facilities which provide at home nursing and

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health care options.

Finally, Central Vermont is home to several health care clinics including Planned Parenthood of Northern New England (Barre and Waterbury), private facilities, and complexes of physicians.

Health care costs continue to rise at a rate faster than the rate of inflation. Consequently, access to adequate health care services has become an impossibility to many. It is the position of CVRPC that health care should be everyone's right.

Emergency Planning

Emergency planning is an important aspect of planning that is critical to every municipality in Central Vermont and the Region as a whole. The goal of emergency planning is to work toward the development of disaster-resistant communities; through land use planning that reduces the impacts of disasters on persons and property. Municipalities can utilize tools, such as town plans and zoning regulations, to implement sound land use practices that consider the consequences of disasters, whether they be naturally occurring or man-made. In order for a municipality or the Region to understand the types and extent of potential disasters, an assessment of all known risks from potential natural and man-made disasters needs to be completed. These identified risks can then be used to develop land use practices that will protect a community from disaster, based on mitigation, preparedness, response, and recovery.

Naturally occurring disasters, which are the most common form of disaster in Central Vermont, are those events that result from environmental conditions. These disasters vary in frequency and magnitude, but always pose a threat to the Region. In Central Vermont, the most common types of natural disasters include: floods, winter storms, hurricanes, landslides, wildfires, earthquakes, and even tornadoes. Although some of these disasters may seem unlikely in Central Vermont, it is critical to plan for them, so that the impacts from their occurrence can be mitigated if they do indeed hit the Region. However, those disaster events that occur more frequently in Central Vermont, mainly floods and storms, should be given priority in the planning process.

Between 1996 and 2006, the National Climatic Data Center reported 267 major storm events in the Central Vermont Region, all of which resulted in the loss of life or property. In total, these storm events cost Central Vermont $21.083 million in property damage and resulted in 5 deaths. Based on this data, it is evident that Central Vermont is vulnerable to major storms and the damage resulting from them.

Man-made disasters are those events that are caused by humans, usually involving accidents with hazardous materials. Man-made disasters can occur either on-site, such as factory malfunction, or in transit, such as an accident involving a truck carrying hazardous materials. Although these types of events occur less frequently in Central Vermont than natural disasters, they can be extremely dangerous and a threat to public health. Title III of the Superfund Amendment Reauthorization Act (SARA), Emergency Planning and Community Right-to-Know Act (EPCRA), 42 U.S.C. 11001 et seq. (1986) gives a municipality the legal right to know what chemicals are being used, stored, made, or transported through the community. During a community's risk assessment, this information regarding the presence of chemicals can be gathered from businesses.

Mitigation is any action that reduces or eliminates long-term risk to people and property from disasters and their impacts. It involves an ongoing effort at the individual, local, State, and Federal level and is aimed at reducing the impact of disasters on families, homes, communities, and economies. Mitigation includes compliance with the National Flood Insurance Program (NFIP). Municipalities must be in compliance with this program in order for property owners to receive flood insurance to offset some of the costs of major flood events. All 23 municipalities in Central Vermont are in compliance, however, FEMA is currently updating Flood Hazard Maps and regulatory standards – actions that will require amending local bylaws in many cases, if eligibility is to be maintained. CVRPC has been assisting out communities in responding to these new mandates.

Municipalities in Central Vermont have a variety of tools and programs to assist them with mitigation activities. The Federal Emergency Management Agency (FEMA), through Vermont Emergency Management (VEM), administers the Hazard Mitigation Grant Program (HMGP).

This program allocates funding to municipalities, following a Presidential-declared

disaster, to implement mitigation projects. In addition, the Vermont Local Roads Program, administered through St. Michael's College, assists municipalities in setting the proper standards for planning roads, culverts, bridges, and access to local roads. Finally, the Central Vermont Regional Planning Commission is currently in the process of developing a Regional Pre-Disaster Mitigation Plan which will address vulnerabilities and relevant mitigation projects throughout Central Vermont. Depending on the availability of funds, local appendices covering specific concerns and projects for each municipality will be developed in consultation with local officials.

Preparedness is the process of inventorying and organizing the people and tools available for responding to an emergency event. A municipality's Rapid Response Plan (RRP) is the first step towards emergency preparedness. An RRP, which identifies key emergency personnel, contact numbers, locations, tasks, and an evacuation plan, is a guide for use in the early stages of disaster response. Although RRP's are not required, all municipalities in Central Vermont are strongly encouraged to have one in place and to update it annually. The Local Emergency Planning Committee (LEPC) is comprised of one emergency coordinator from each municipality. The LEPC is responsible for developing a disaster response plan for the Region, including training and exercises. Currently, not every municipality in Central Vermont has a representative on the LEPC; only Barre City, Barre Town, Middlesex, and Northfield do. However, all local leaders and emergency personnel are encouraged to participate in the Committee[7].

Response is a time sensitive reaction to an emergency event designed to save lives, save property, and stabilize the situation. Response to an event includes warning, evacuating, rescuing, sheltering, informing, and providing medical care to the public.

Recovery is the effort to restore the infrastructure and the social and economic aspects of communities after a disaster occurs. In the case of severe events in which the President of the United States declares a disaster; Federal funds will become available to assist impacted communities with recovery efforts.

Emergency Management

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Emergency management in Central Vermont is handled at the local level. It is led by a municipality's emergency managers and emergency personnel who are either professional or volunteer-based depending on the community. Emergency management deals with the emergency events that occur on a regular basis, such as fire, injury, accidents, and crime. It is very important to the social and economic stability of Central Vermont and should be a high priority in the Region. Due to limited emergency resources and the geographic extent of certain towns, emergency management is sometimes coordinated among municipalities. This is especially true with ambulance and rescue services in Central Vermont.

As a result of towns lacking sufficient resources to meet FEMA requirements to prepare for disasters, VEM looked to the regional planning commissions to contribute educational information, training, and emergency expertise. In 1999, VEM contracted with the regional planning commissions to administer the Local Emergency Management Program (LEMP). This required the regional planning commissions to work with local municipalities on emergency planning, mitigation, education, exercises, and response.

CRIME AND SAFETY

Central Vermont is a relatively safe place to live where neighbors tend to look out for each other, and conflicts between members of the community are the exception rather than the rule. Vermont's crime rates are considerably below national averages and there wasn't a dramatic increase in those rates during the 1990's. It continues to be in the best interest of the Region and its residents to maintain and improve upon this enviable position.

At first glance, crime may not seem like an issue that bears much relation to land use planning. However, these issues do share many of the same peripheral concerns. Population growth tends to increase the opportunity for both interpersonal and land use conflicts. In addition, crime prevention experts and land use planners are both interested in many of the same "quality of life" issues, including: livable wage, the availability of meaningful jobs, access to education and training, access to transportation, community stability and vitality, recreational opportunities and even the aesthetic quality of the places where people live. It is widely accepted that

vibrant, pleasant, well-planned communities can avoid many of the socio-economic conditions that lead to conflict. Conversely, low crime rates are essential to the creation and maintenance of these kinds of places. To the extent that this relationship exists, it can be said that this Plan deals with the issue of crime prevention by default in the policies and programs espoused in its required elements. However, CVRPC believes the connection between land use planning and community conflict is important enough to merit direct attention.

Crime prevention is only one piece of the puzzle, however. The others may be found in the answer to the question "What happens after a crime has been committed?" The components of the answer involve the exploration of such concepts as justice, punishment, rehabilitation, restoration, and re-integration.

The traditional justice model is founded on the concept of retribution. The offender is generally punished for his or her offense by jail time, fines, or probation. The sentence is intended to be both the punishment and the rehabilitation with the prospect of returning to jail serving as the incentive to reform behavior. The offender has little or no contact with the victim of the crime and no requirements (or opportunity) to make amends directly. Some crime experts argue that this traditional justice model is responsible for over-crowded prisons, high recidivism rates, and an unsatisfactory outcome for crime victims.

Corrections agencies around the country, however, (including Vermont's Department of Corrections, DOC) are beginning to operate under a new paradigm that stresses "restorative" over "retributive" solutions for non-violent crimes. This new model (called the "Restorative Justice Program" and authorized in Vermont Statute Title 3 Section 163) is intended to make offenders answer directly to those they have wronged and begin to make amends to their victims and the community. Often this approach can maximize public resources by having offenders perform community services instead of serving costly prison sentences. In addition, it can reduce court loads and the associated expense to the taxpayers. However, there is the danger of the cost of delivering justice in this format being shifted from the State to the municipality.

Under the "restorative" model, justice for non-violent crimes may be prescribed by those closest to the offender and the victim through the establishment and operation of community reparative boards and/or restorative justice centers. Such an ap-

proach could work hand in hand with other local initiatives, such as neighborhood watch programs and "reintegration panels." While community-based justice would be in keeping with CVRPC's commitment to "bottom up" public processes, valid concerns exist over impartiality, over-zealousness, and personal vendettas whenever small town dramas play out. Consequently, the community restorative justice model demands protection against abuse. In addition, financial incentives to municipalities are an integral part of the success of the community restorative justice model. The costs usually borne by the State should not be passed on to the municipalities.

Obviously, this model is not applicable to violent or serious crime. In such instances the need to protect the public from further harm requires that offenders be incarcerated even as it is becoming increasingly difficult to house the prison population.

EDUCATIONAL FACILITIES AND SERVICES

A commitment to education is the hallmark of an enlightened society. A well-educated citizenry contributes to the societal, economic, and cultural well being of a place. Education expands the horizon of individuals, families, communities, and nations. It is the laboratory in which new ideas develop, ideas that may one day mold the future, or correct the mistakes of the past. Further, education should be a life-long process, not a luxury of youth.

While the link between education and regional planning is not particularly obvious, there are in fact connections. Planning decisions regarding the location and amount of future growth may influence the location and size of future schools or the stability of existing ones. Planning can help schools project future needs and assist municipalities in financing capital improvements. CVRPC hopes this Plan can be used to broaden access to educational and vocational training opportunities, so as to help ensure the full realization of the abilities of Central Vermonters.

Central Vermont is home to 17 public elementary/middle schools, eight middle and /or high schools, and two schools (Cabot and Twinfield) which host students K - 12. Many of these institutions are either approaching or over their capacities.

Higher education thrives in Central Vermont. Norwich University in Northfield, its affiliate, Vermont College in Montpelier, and Goddard College in Plainfield offer four-

Table 5: Public School Enrollment (Vermont Agency of Education)

School	2013-2014 School Year	10 Year Change
Union Elementary School	522	36%
Rumney School (Middlesex)	176	28%
Calais Elementary School	133	22%
Fayston Elementary School	120	20%
Washington Village School	96	17%
Warren Elementary School	184	16%
East Montpelier Elementary School	219	10%
Doty Memorial School	78	10%
Thatcher Brook Primary USD #45	444	3%
Williamstown Middle/High School	318	1%
Orange Center School	103	-1%
Barre City Elementary/Middle School	902	-2%
Woodbury Elementary School	55	-5%
Berlin Elementary School	213	-7%
Northfield Elementary School	297	-7%
Waitsfield Elementary School	155	-9%
U32 High School UHSD #32 (School)	781	-10%
Barre Town Elementary School	856	-14%
Harwood UHSD #19 (School)	544	-16%
Twinfield USD #33 (School)	406	-20%
Cabot School	182	-22%
Moretown Elementary School	117	-23%
Spaulding HSUD #41 (School)	734	-24%
Crossett Brook Middle USD #45	264	-24%
Roxbury Village School	41	-29%
Harwood Union Middle UHSD #19	135	-29%
Main Street School	192	-30%
Montpelier High School	285	-30%
Northfield Middle/High School	308	-38%
Williamstown Elementary School	23	-92%
Total	8883	-14%

year degree programs, in a variety of disciplines. Associates Degree programs and about 100 different courses are offered through the Community College of Vermont

(CCV). CCV maintains central administrative offices in Waterbury and conducts classes in Montpelier. Woodbury College, in Montpelier, offers training in mediation, Para-legal skills, counseling and human relations. Montpelier's New England Culinary Institute trains in the culinary arts and operates two restaurants where skills are honed.

Vocational training opportunities are available to Central Vermonter's primarily through the Barre Regional Vo-Tech Center which offers programs in: accounting/ bookkeepers, typing/general office skills, general marketing, allied health, food service, vocational home economics, brick/stone masonry, automotive mechanics, and drafting. Some area high schools offer courses in vocational skills as well.

Despite declining enrollment, some public schools face major expansion, renovation, or construction costs due to State public facility standards, as well as other factors.

Child Care

Overview: The availability of safe and affordable child care services is critical to the Central Vermont Region. Quality child care benefits families by preparing children for schooling and social interaction while enabling parents to work and provide income. It benefits businesses by expanding the workforce and creating more reliable, productive employees. Furthermore, child care facilities are businesses themselves and their existence expands local and regional economies directly through the hiring of workers and purchase of goods and services. Research has shown that investment in early child development programs brings a real (adjusted for inflation) public return of 12% and a real total return, public and private, of 16%.

Availability: Despite the economic and social good created by child care services, Vermont appears to have a shortage of such facilities. In fact, the Child Development Division of the Vermont Agency of Human Services estimates that the capacity in regulated facilities meets only 50-60% of the State-wide need. Consider the following statistics:

- 80% of Vermont workers with children under the age of six work outside the home.

- 87% of Vermont women with school age children work outside the home.
- There are 93,436 children ages birth through 12 in the State. An estimated 60,733 of those require child care.
- There are currently only about 36,000 children in regulated care.
- Only 35% of licensed centers serve infants and toddlers.
- On average, children under six receiving child care spend 8-9 hours per day with their care providers.
- Only 25% of the demand for infant care is being met.
- An estimated half of all Vermont businesses have employees with a child or children in child care.

Table 6: Regulated Child Care Providers in Central Vermont, Vermont Agency of Human Services

Town	Registered Home Care Providers	% Regional Total	Licensed Providers	% Regional Total
Barre City	20	22%	6	27%
Barre Town	18	21%	3	14%
Berlin	2	2%	1	5%
Cabot	1	1%	0	-
Calais	0	-	0	-
Duxbury	2	2%	0	-
East Montpelier	5	6%	2	5%
Fayston	0	-	1	5%
Marshfield	2	2%	0	-
Middlesex	1	1%	0	-
Montpelier	6	7%	3	14%
Moretown	1	1%	0	-
Northfield	5	6%	0	-
Orange	0	-	0	-
Plainfield	3	3%	0	-
Roxbury	1	1%	1	5%
Waitsfield	0	-	3	14%
Washington	0	-	0	-
Waterbury	9	10%	3	14%
Warren	1	1%	0	-
Williamstown	7	8%	0	-
Woodbury	2	2%	0	-
Worcester	1	1%	0	-
Total	87		27	
Source: Vermont Agency of Human Services.				

In Central Vermont, there are 87 registered home care providers and 22 licensed care providers (see Table 6 for breakdown). However, there are only 7 "quality" providers (licensed with 4 or 5 STARs in the Vermont Step Ahead Recognition System and/or with national accreditation). Furthermore, if we assume that each center is licensed for 50 children (some are less and some are more) then there are 350 spaces for an estimated 21,000 working population. This suggests that we have a crisis that is affecting the social and economic well-being of Central Vermonters.

Affordability: According to the Child Development Division of the Vermont Agency of Human Services, the average cost for center-based care for infants is $140.92 a week and $125.71 for pre-schoolers. This means a family with an infant and a pre-schooler in licensed care would pay $266.63 a week, or $13,865 a year, for child care. (These figures may be the average for all providers, but are low for quality ones. Costs range from $8,000 to $11,000 per year per child depending on age. State subsidies are available, but fall short of actual tuition.) This equates to 29% percent of the median household income for Central Vermont.

It is probable that the high cost of child care keeps some residents of the Region out of the workforce. Simply put, for some families the cost and inconvenience of putting children in daycare outweighs any potential income gain. Even moderate income families that do opt for a daycare solution, often pay a large portion of their total income for these services and consequently struggle to get ahead.

While the financial challenges of child care are certainly daunting, the State of Vermont DCF Subsidy Program, operated by the Agency of Human Services, does provide some financial assistance to low and moderate income families. The amount of the subsidy available is based on a formula (tied to the poverty rate) which takes into account both income and family size. Unfortunately, the formula has not been changed since 1999. Consequently, the percentage of families qualifying for subsidies has been decreasing. It would cost an estimated sustainable $18 million to bring subsidies up to date. Therefore, many working poor families are caught in a downward spiral. Both parents need to work, can't afford child care and education which then affects their ability to survive.

Resources: While child care "slots" are scarce, resources for parents, providers and would-be providers are abundant. Among the many sources of information and assistance are:

- The Family Center of Washington County/Child Support Services – Offers referral services, operates care programs. www.fcwvt.org/child care. (802)-828-8771 (referral), (802) 828-8774 (subsidy).
- Bright Futures Child Care Information System – Web based resource providing

comprehensive information on child care in Vermont, as well as municipal level data on regulated care providers. www.brightfuturesinfo.org

- Vermont Association of Child Care Resource and Referral Agencies – Works with parents, care providers, businesses and community organizations to provide quality child care services throughout the State. www.vermontchild care.org
- Vermont Child Care Consumer Line – Provides access to records of violations, counseling regarding child care concerns. www.dcf.state.vt.us/cdd/programs/ child care/cccl.html.

OUTDOOR RECREATION

Recreation is a basic psychological need; not a frivolous luxury. To recreate (literally, to "make new") is to refresh minds, bodies, and spirits. The ability to recreate enhances the quality of our lives immeasurably. Where the opportunity for recreation is denied, history and science have shown the spirit withers.

Recreation contributes not only to our individual well being, but to the health of our society as well. Throughout Vermont, recreation breeds tourism, which in turn provides an influx of imported wealth. Recreation also improves the health and productivity of our work force, thereby saving untold dollars for health care. In addition, a region that boasts recreational amenities has a competitive advantage in attracting new entrepreneurs.

One of Central Vermont's greatest recreational "facilities" is its landscape. Besides being home of Vermont's last undeveloped mountain range (the Worcester Range), a bounty of mountains, rivers, lakes, forest and fields, provide a virtual playground for residents, neighboring regions, and out-of-state visitors alike. The Region boasts some 59,194 acres of public outdoor recreation lands. These include a National Forest, eight state forests, three state parks, four wildlife management areas, and about a dozen municipal forests. In addition, there are public parks and playgrounds, as well as State surface water access points.

In addition, an impressive network of trails traverses the region. While these lands contain some of Central Vermont's finest scenery, natural resources, and recreational opportunities, such values are abundantly represented in many of the region's private holdings, as well. Accordingly, un-posted private lands are an important fabric in Central Vermont's recreational tapestry.

Given the Region's natural endowments, it is not surprising that recreational pursuits dependent upon or enhanced by natural resources and scenery flourish here. Skiing, snowmobiling, hiking, jogging, hunting, fishing, golf, cycling, boating, swim-

ming, camping, picnicking, and auto-touring are examples of some of our popular outdoor activities. So popular are they that occasionally their practitioners find themselves in conflict with each other over scarce resources. Furthermore, the Vermont State Outdoor Recreation Plan (SCORP) has predicted that water- based recreation, bicycling, day hiking, walking and X-C skiing will witness increasing popularity over the next few decades, and the public demand for a more elaborate network of trails and green-ways, for recreation and transit, will increase accordingly.

Alpine skiing has, however, shown a decline in terms of participation, although the enthusiasm of its adherents has not been tempered. Recent mild winters, the sport's expense, and the popularity of X-C skiing as an alternative are all factors in the recent decline. However, alpine skiing is a major industry in Central Vermont, and one of the economic mainstays of the region in general and the Mad River Valley in particular.

The SCORP report also identified several societal trends that may affect recreation in Central Vermont in the years to come. Among these are: decreasing leisure time/ shorter vacations; aging population/life long interest in recreation; recreation for fitness; increased privatization and commercialization; continued low levels of public funding for public recreation; resources threatened by recreation/overuse; resources/opportunities threatened by development and pollution; redistribution of population and decline in community spirit; changing households; loss of opportunities on private land due to fear of liability, property damage, and fragmentation of large land holdings; and increases in travel and tourism.

CVRPC faces the challenge of promoting and capitalizing on those trends which bode well for the region, countering those which may have negative impacts, and adapting to those which are neutral and unavoidable.

CULTURAL RESOURCES

The word "culture" refers to the development, improvement or refinement of the mind, emotions or interests, through ideas, customs, skills and arts. The opportunity for cultural experiences like recreation, theater, the arts, craft making, and public discussion is critical to our well being, happiness, and fulfillment. Culture, while universal among humans, is manifested differently, and with varying intensity, in different places. While the more urbane among us may perceive rural areas as existing in a cultural void, this is never true. Such an assumption about Central Vermont would be particularly erroneous. We are, in fact, in possession of cultural resources of unusual richness, quality and diversity for an area of our size and population.

This wealth of culture is partly responsible for Central Vermont's popularity as a tourist destination. At the same time, tourism bolsters our cultural resources. The link between culture and the economy is becoming ever clearer.

Central Vermont is home to a talented array of artists, musicians and crafts people, including many who have migrated here seeking a fertile ground and supportive environment for their endeavors. A multitude of festivals, galleries, playhouses, concert halls, and patron organizations exist in support of these talents.

The Region's public libraries (of which there are more than one dozen) conduct and sponsor readings, discussions, lectures and other literary activities. In addition, a few local literary publications provide a forum for amateur writers.

Central Vermont has several facilities capable of housing large cultural events and programs, including the Barre Opera House (seating capacity 645 and recently renovated to be handicap accessible), Montpelier's City Hall Auditorium (seating capacity 600-650), Barre City Auditorium, and Barre City Recreational facility (the BOR). The Region's colleges, and primary and secondary schools also provide space for cultural happenings.

Museums are archives of our culture. Central Vermont's cultural treasures are well protected in a diversity of small museums. Montpelier is home to the T.W. Wood Art Gallery (Vermont College), the Statehouse Museum, the Children's Museum of Central Vermont, and the Vermont Historical Society Museum. The former Kent Tavern Museum in Calais remembers 18th and 19th century agrarian life. In Northfield, the Norwich University museum displays a variety of military artifacts. Several local historical societies maintain small displays as well.

HISTORIC AND ARCHEOLOGICAL RESOURCES

Preserving an accurate and tangible record of historic and prehistoric endeavors of the people of Central Vermont helps us to develop a better understanding of the past and an awareness and appreciation of our cultural lineage. Significant properties and historic resources edify and provide important benefits to individuals, municipalities, and the Region in the forms of aesthetics enhancement, economic revitalization, tourism, job creation and investment tax credits.

Central Vermont harbors a rich historic record, in its buildings, in its soil, and in the very fabric of its landscape. It is a goal of this Region to preserve, protect, and perpetuate this record as an important part of Vermont's heritage.

FACILITIES, SERVICES AND UTILITIES GOALS, POLICIES AND STRATEGIES

WASTEWATER TREATMENT GOAL: Improvement and expansion of wastewater treatment facilities and options so as to protect public health, maximize public investment, and reinforce desired patterns of growth.

Policies:

1. This Plan supports efforts to improve existing wastewater collection and treatment systems.

2. Encourage municipalities to establish a schedule indicating when and for what uses remaining capacity should be allocated. A schedule of the number and types of hookups can serve a similar purpose.

3. Encourage continued efforts to improve water quality through the separation of combined sewers or other method to ameliorate the harmful impacts of combined sewer overflows.

4. Support efforts to upgrade components of aging wastewater systems to address depreciation, improve energy efficiency and increase flood resilience of the Region's systems.

A. Encourage coordination of upgrades to coincide with other municipal infrastructure projects (i.e. roads).

B. Perform outreach to municipalities whose systems are approaching 20-yr design life and connect local operators/commissions with available technical assistance.

5. In order to encourage municipalities to optimize the use of wastewater treatment capacities, municipalities are encouraged to participate in inter-municipal facilities or agreements. Inter-municipal facilities can prove cost effective for the communities involved. At the same time, capacity allocation agreements offer individual communities the option of encouraging or discouraging growth.

Provide model inter-municipal agreements upon request.

6. New or expanded wastewater treatment facilities should be planned where municipalities have immediate need or where additional growth is appropriate, including *Regional Centers*, *Town Centers*, *Hamlets*, *Resort Centers*, and *Mixed Use Commercial and Industrial* areas.

Explore opportunities to develop a region-wide water and wastewater study to identify priority investments to supporting desired growth patterns.

7. Encourage planning for and installation of decentralized community wastewater treatment systems in villages, hamlets, and in clustered housing developments, and ensure that agreements for those facilities adequately provide for ongoing maintenance and oversight.

A. Encourage formation of and support efforts of existing local Wastewater Advisory Committees.

B. Assist with grant writing and coordinate provision of technical assistance (i.e. soil mapping, wastewater studies, capacity-building) to local efforts to identify wastewater solutions.

C. Assist with public outreach and engagement efforts in planning for wastewater infrastructure.

8. This Plan encourages the extension of municipal sewage treatment collection systems to existing developments within currently un-sewered drinking water source protection areas in order to protect underground water supplies from harmful septic system leachate.

9. Wherever possible, extensions of municipal wastewater collection systems should occur, along or within existing public rights of way.

10. CVRPC will promote and encourage environmentally and fiscally sound solutions to the Region's sludge disposal problem.

11. Work with municipalities to improve outreach to on-site sewage disposal system owners through provision of guidance material explaining how to properly maintain their systems.

12. Support programs to assist with the replacement of failed on-site sewage disposal systems.

13. CVRPC encourages the use of shoreline zoning powers (24 V.S.A., Chapter 117, and Section 4411), in compliance with the Vermont Shoreland Protection Act, to regulate the design of sanitary facilities on lands adjacent to surface waters.

14. CVRPC urges communities to establish retrievable record keeping systems for "as built" municipal waste water system engineering plans, so as to ensure exact knowledge of the placement of underground collection lines.

WATER SYSTEM GOAL: Improvement and expansion of public water system facilities so as to protect public health, maximize public investment, and reinforce desired patterns of growth.

Policies:

1. Where existing water supply systems are functioning properly, they should be utilized. Particularly when located in combination with the region's wastewater systems, the service areas of water supply systems are recommended for high intensity development.

2. Land uses or activities that would measurably degrade the quality of water supply sources should be prohibited.

Assist communities in developing local regulations and/or incentives to protect aquifer recharge areas and source protection areas.

3. Work with the region's small water supply systems to build administrative capacity, coordinate with each other and develop capital improvement plans and budgets.

A. Encourage participation in VT DEC's Asset Management trainings.

B. Incorporate outreach and education regarding water and wastewater infrastructure planning into Municipal Transportation Capital Improvement Planning task in the Transportation Planning Initiative.

4. Inter-municipal water supply agreements are encouraged. The sharing of water resources can be a cost effective method of insuring that water supply adequately supports the municipal plan.

5. CVRPC encourages municipalities that have not already done so, to identify and protect backup or alternative sources of water.

A. Assist such efforts at the request of local officials.

B. Raise awareness of groundwater mapping resources available from the VT Agency of Natural Resources and U.S. Geological Survey.

6. Water service area expansions should be designed to encourage development in areas where growth is appropriate including Regional Centers, Town Centers, Hamlets, Resort Centers, Rural Commercial and Industrial areas and growth centers as identified by town plans.

7. Capacity expansion and water quality improvements to existing water supply systems are encouraged where such problems are impediments to concentrated growth.

8. CVRPC urges communities when designing and constructing public water systems and, to require the site engineer to provide "as-built" plans so as to ensure exact knowledge of the placement of underground collection lines. when the need for repair or replacement arises.

ELECTRIC POWER GOAL: Improvement, and expansion of electric power generation methods and infrastructure so as to provide adequate service, conserve energy, maximize benefits of public investment, minimize impacts on aesthetic, ecological and recreational resources, and protect public health.

Policies:

1. CVRPC supports the concepts of "demand side management" and "least cost integrated planning" as mechanisms to reduce electrical power consumption, and its attendant costs (both financial and environmental) through conservation and energy efficiency

2. CVRPC encourages the development and use of renewable energy sources to meet the region's electrical power needs, while minimizing impacts on aesthetic, ecological and recreational resources (see *Energy* element of this Plan).

3. CVRPC encourages diversity in the region's future power supply so as to establish

flexibility and avoid reliance on any single source.

4. CVRPC encourages utilities and the Public Service Board to give greater consideration to making service territories more flexible by allowing for inter-utility connections and deregulation where there will be beneficial impact to the consumer and the environment. Such flexibility will help promote the Region's goals regarding settlement patterns, and save money as well.

5. Proposals to introduce extra high voltage and ultra high voltage transmission lines (capacity greater than 345 KV, AC or DC) to Central Vermont should be carefully scrutinized pending satisfactory resolution to the health and safety issues concerning their operation.

6. The Commission encourages adherence to environmentally and ecologically sound utility line maintenance practices.

Plans and designs for utility infrastructure and corridors should incorporate climate projections and be reviewed for long-term reliability, safety and economic, social and aesthetic impacts.

7. The corridor concept is generally supported by this Plan. As such, the location of new transmission lines should share existing power line routes as illustrated on the Central Vermont utilities map. However, it is recognized that existing routes may not always be optimal for additional or expanded transmission lines. It is also recognized that the construction of distribution lines within, or adjacent to, public highway rights-of-way may, in some instances, have more negative aesthetic impacts than would a parallel route away from the road.

8. Utility infrastructure and corridors shall be sited so as to minimize aesthetic impacts, particularly in areas of local and regional scenic importance.

A. Wherever practicable, utility lines will be installed underground or behind structures in downtowns and village centers

B. The use of wood support structures, appropriate conductor colors for the background, and landscape compatibility techniques are encouraged.

C. Municipalities, in their plans, should consider the visual impacts of the siting of utility poles. Traffic safety and water quality issues may also be pertinent in certain locations.

9. Resource areas, as identified by this Plan, shall be avoided wherever possible, in the location or routing of new substation or transmission facilities.

10. Substation facilities should be located in industrial areas or in those planned for industrial use whenever practical. In any case, such facilities should be sited as unobtrusively as possible.

OUTDOOR RECREATION GOAL: To promote adequate access to a wide range of high quality outdoor recreation experiences to all sectors of the population.

Policies:

1. CVRPC will encourage and foster the provision of diverse outdoor recreational opportunities, with consideration given to the needs of the elderly, disabled, and economically disadvantaged.

2. CVRPC encourages, in particular, those recreation activities that focus on, respect, enhance, and educate, about the natural environment.

3. Recreation inventories and needs assessments should occur at the local and regional levels in order to determine deficiencies and conflicts, and to identify key recreational resources and opportunities on both public and private land.

4. Municipalities should develop and implement strategies to protect important recreation lands. Actions such as securing voluntary easements, fee or less than fee acquisition, subdivision or zoning regulations which contain provisions for common open space, impact fees or other contractual arrangements are encouraged as alternatives for achieving permanent or semi- permanent protection.

5. Public access to rivers, streams, lakes, ponds and recreation lands is a need in the Region. Municipalities, the State, and private groups, such as land trusts, should coordinate efforts to provide for improved access to the Region's surface waters. At the same time, significant water related natural areas should be maintained and protected.

6. Priority consideration should be given to rehabilitating and upgrading existing recreation facilities.

7. CVRPC supports the maintenance or upgrading of existing surface water classifications to reflect their actual recreational uses, except where lower classifications may be needed for municipal sewage treatment projects.

8. Landowners are encouraged to voluntarily keep their lands open for public recreation and enjoyment where possible, so as to maintain the Region's tradition of informal, resource based recreation on private lands.

9. CVRPC will support future legislation to alleviate landowners of unreasonable liability burdens.

10. New development proposals are encouraged, through design, to make an effort to preserve access to recreational uses for the general public.

11. The Commission supports and encourages the creation and existence of inter municipal recreation districts. (Inter-municipal districts are legal arrangements whereby a governmental entity joins with another to provide recreational facilities or services. Through these arrangements, increased opportunities may exist for municipalities to acquire or develop land, provide services, or manage an area).

Accordingly, we will continue to provide administrative and technical assistance to the Wrightsville Beach Recreation District Board of Directors.

12. CVRPC will work towards and support the maintenance and development of trail and greenway networks to provide for recreational diversity, tourist amenity, habitat linkage, and low impact transportation choices. Specifically, the Commission will strive to:

- work with individual municipalities, at their request, to help plan local trails and greenways;
- work with groups of municipalities and/or citizens to promote the concept and realization of a regional trail and greenway network that connects and builds upon local initiatives;
- encourage the paving of shoulder for safe bicycle and pedestrian travel on all state highways in the region;
- encourage the development of multi-purpose trail corridors along abandoned rail beds;
- encourage municipalities to retain Class IV roads and public trails for public recreational use; and
- encourage the provision of recreation along utility corridors, as appropriate.

13. Downhill ski areas provide valuable recreational and economic benefits in Central Vermont. However, certain external costs (e.g. expanded demands on facilities and service, environmental impacts, etc...) are inherent in their operational and expansion activities, too. It is CVRPC's goal to enhance the viability of existing ski areas and foster their development in a manner which will enable them to remain competitive while ensuring that they will protect and co-exist with the natural, physical, and socio-economic environment. Equitable means of sharing external costs between ski areas and their host towns are encouraged where such costs cannot be avoided. The Memorandum of Understanding between the Sugarbush Area Resort, CVRPC, and the Mad River Valley towns is a model for such positive coordination and communication.

14. Atmospheric pollution has become an increasing problem over the past few decades. It now threatens to disrupt global weather patterns and endanger public health. The impacts of air quality on recreation and tourism are also recognized. CVRPC will support measures to address air quality at the local, regional, state, federal, and global levels. Promotion of energy conservation practices will be the focus of such support (see Energy Element).

CULTURAL RESOURCES GOAL: To promote adequate access to a wide range of high quality cultural experiences for all sectors of the population.

Policies:

1. CVRPC encourages the development of new cultural facilities and services (including studio space), in Central Vermont, particularly in or near existing settlements and growth centers, as such areas are most accessible to all segments of the population, and the proliferation of culture in such areas will strengthen their vitality.

2. The protection and preservation of existing cultural resources and activities is a goal of the Commission.

3. CVRPC will continue to work with cultural organizations where appropriate, to support cultural resources in Central Vermont.

4. The Commission encourages the rehabilitation or adaptive use of sites and structures for cultural pursuits.

5. CVRPC supports strengthening the role of cultural and artistic disciplines in public education.

HISTORICAL AND ARCHEOLOGICAL RESOURCES GOAL: To promote the protection and use of the Region's historical and archeological resources.

Policies:

1. Municipalities are encouraged to provide a historic preservation section in their municipal plans. (CVRPC will assist in such an effort, if requested.)

2. CVRPC encourages development which preserves the historic and architectural character of town and village centers and the rural landscape.

3. Therefore, it is the policy of this Commission to support and encourage downtown revitalization programs and Downtown and Village Center Designation. Downtown revitalization efforts are means to create jobs and to preserve our national heritage.

4. CVRPC encourages the restoration, rehabilitation and adaptation of historic structures where feasible, as this minimizes the environmental impact of development by conserving raw materials, using land already developed, employing existing services.

5. Where economically practical, rehabilitation of a historic site or structure should be designed to minimize the architectural impact and maintain the historic character of the site or building.

6. Where an area is not designated as a historic district, but where there are buildings of local historical significance, projects should be designed to maintain and protect the historic character of the area. Municipalities are encouraged to develop criteria that would assist in protecting the character of an area considered historic, whether designated as such or not.

7. The impact upon the historic character of the area should be considered when public or private municipal improvement projects (such as sidewalks, roads and traffic improvements) are proposed.

8. Activities having substantial impact on an important historical site or structure should be planned in consultation with the Division for Historic Preservation, Agency of Commerce and Community Development.

9. Additions to a historic building should be designed to minimize the visual impact upon the site or building.

10. Land development adjacent to or on an important prehistoric or historic archeological site should be designed to minimize the impact upon the site.

11. Prehistoric and historic archeological sites are recognized as important to Vermont's history. Any activity that may have an impact on a prehistoric or archeological site should be planned in consultation with the Division for Historic Preservation, Agency of Commerce and Community Development.

12. CVRPC will provide support to local, regional, and state non-profit historic preservation trusts upon request.

13. CVRPC will promote the awareness of historic preservation through periodic publication of funding sources available to municipalities and investment tax credits available to individuals.

WIRELESS TELECOMMUNICATION FACILITIES GOAL: ~~To promote~~ Effective and efficient communication systems.

Policies:

1. Telecommunication facilities should not be sited where they may create an attractive nuisance.

2. Telecommunication facilities should be sited, designed, maintained and operated so as to minimize negative impacts on natural, cultural and scenic resources. Use of stealth design and/or use of existing structures are encouraged where appropriate. New towers should be no taller than necessary to provide coverage. The policies of this Plan addressing ridgeline and hilltop development (see Land Use Element, Goal 5) are intended to apply to telecommunication facilities.

3. Use of existing towers, communication facilities, and structures where possible, is encouraged and expected rather than development of new transmission and receiving stations. Permits for tower facilities should require permiteess to accommodate additional users, appropriate to the structure, at a fair market rate.

4. Permits for towers should require a financial mechanism to ensure their removal by service providers should they be abandoned or rendered obsolete by advances in technology. Processes for establishing bonds should take inflation into account as many years can elapse between construction and removal.

5. Applicants must demonstrate that telecommunication facilities comply with FCC emission standards in order to protect public health and safety.

6. Assist service providers and municipalities to identify appropriate locations for the construction of new tower (or other facilities) necessary to achieve adequate coverage of the Region as well as locations that are not appropriate for new towers. CVRPC will act to implement the results of this effort through its participation in the Section 248 Process.

7. CVRPC will provide its "Model Telecommunication Facility" bylaw to all member municipalities and work with towns and cities to develop bylaw, ordinance, and/or town plan language to address facility siting. The Commission encourages municipalities that adopt telecommunications regulations to provide for an expedited per-

mit process for small scale facilities.

8. New towers should be constructed in areas served by existing roads or trails.

9. Access roads should be designed to minimize their impact on scenic, agricultural, forestry, and natural resources.

EMERGENCY/HEALTH SERVICES GOAL: To promote effective, efficient and accessible emergency and health care services.

Policies:

1. Adequate health care facilities and personnel should be planned and located throughout the Region so that all residents have access to such services. It is necessary that planning for these facilities be coordinated with population distribution and existing and future transportation patterns.

2. For all aspects of emergency/health service delivery, full consideration of the costs and benefits of cooperative and regional provision of these services is encouraged.

EMERGENCY MANAGEMENT GOALS:

1. To build disaster resistant communities in Central Vermont through sound emergency planning and management.

2. To ensure that all communities in Central Vermont have the appropriate information, resources, and tools to respond to disaster events and recover from their impacts.

Policies:

1. Promote the importance of local emergency management plans to municipalities in Central Vermont.

2. Encourage municipalities to annually review and update their Rapid Response Plans for the new contact information and to identified risks.

3. Encourage municipalities to undertake and periodically review an all-hazards assessment in their community to identify potential hazards and the at-risk people and property.

4. Encourage municipalities to adopt minimum standards for public roads, bridges, and culverts (using the Vermont Local Roads Program and FEMA's standards).

5. Encourage municipalities to implement land use policies and development regulations that consider the potential impacts of disasters on people and property.

6. Discourage residential, commercial, or residential development in flood plains.

7. Maintain, wherever possible, vegetated buffer strips adjacent to all waterways to reduce the occurrence and magnitude of flooding.

8. Encourage municipalities to amend flood hazard regulations so they comply with current NFIP requirements.

9. Provide local officials with information on programs and funding available through FEMA and/or VEM for emergency management and hazard mitigation projects.

CRIME AND SAFETY:

Overall Goal: To minimize community conflicts within Central Vermont, reduce the Region's already low crime rate, and protect the community from violence and serious crimes.

Goal 1: To prevent the social and economic conditions that often lead to community conflicts.

Policies:

1. To encourage the use of early intervention and prevention strategies in schools

2. To work to implement the other goals and policies of this Plan, particularly those regarding education, housing, and employment.

Goal 2: To foster safe and supportive communities by educating municipal officials on crime issues, supporting prevention programs, encouraging rehabilitation strategies, and fostering public safety.

Policies:

1. To encourage municipalities to investigate the establishment of community based, victim focused crime prevention/justice initiatives.

2. To work with municipalities, SRS, and the Vermont criminal justice system to support the establishment of a regional restorative justice center.

3. To support the use of conflict reduction/resolution techniques and restorative processes in schools, law enforcement, and communities.

4. To gather and report information on crime and safety indicators as related to other indicators of community health to establish data on possible relationships therein.

5. To coordinate all crime/rehabilitation related efforts with municipalities and the Vermont criminal justice system.

6. To encourage State financial and technical support for community restorative justice programs.

Goal 3: To protect the community from violence and other serious crimes.

Policies:

1. To support incarceration of violent offenders.

2. CVRPC should consider the need for, costs, benefits, and detriments of construc-

tion of new prison facilities within the Region.

EDUCATION GOAL: To promote effective, efficient, accessible, and affordable educational facilities and services.

Policies:

1. New development that places a significant impact on local and regional educational systems must address and mitigate these impacts.

2. The construction of new educational facilities should occur in locally designated growth areas or in other locations that will maximize their convenience and accessibility to the population and infrastructure, and will contribute to the vitality of communities.

3. Through improved coordination among planning commissions, school boards and the State Department of Education, a regional approach to planning for the placement and timing of construction of educational facilities is encouraged.

4. Municipalities and school districts are encouraged to employ capital budgeting and programming as a means to anticipate and plan for the payment of capital improvements to public schools.

5. CVRPC supports and promotes efforts to broaden access to adult and senior educational opportunities.

6. CVRPC supports and promotes efforts to broaden access to vocational education opportunities.

CHILD CARE GOAL: To ensure the availability of safe and affordable child care and to integrate child care issues into the planning process.

Policies:

1. Continue to inform municipalities of their statutory responsibility to plan for child care and assist in this effort upon request.

2. Encourage municipalities to assess local barriers (regulatory or otherwise) to the provision of child care services and to support them in taking action to remove or reduce those barriers.

3. Consider undertaking, in partnership with local advocacy organizations, a region-wide needs assessment for child care services. As part of such a program, CVRPC could examine the relationship between the location of jobs and the location of child care facilities.

4. Encourage the location of child care facilities in growth centers and existing settlements, near residential clusters, schools, and large employers, and along public transportation routes. Such locations can help reduce traffic, energy consumption, and the overall financial cost of day care for families.

SOLID WASTE GOAL: Safe, sound, cost effective, and efficient solid waste management.

Policies:

1. For both environmental and economic reasons, support waste reduction as a top priority of the Region and support the concept of "zero waste" as outlined by Vermont's Universal Recycling Law and the policies of the Central Vermont Solid Waste Management District, Northeast Kingdom Waste Management District, Lamoille Solid Waste Management District and the Mad River Resource Management Alliance.

2. Encourage managing solid waste as close to the source as is reasonable, with a preference given to local or sub-regional solutions to waste management. Proper management of municipal solid waste should utilize environmentally sound systems and programs at the least cost possible.

3. Promote education about composting, recycling and waste reduction in the Region.

4. Encourage individuals or businesses in the Region to bear the cost of proper management of the waste generated.

Support Extended Producer Responsibility (EPR) programs and sites for industries to recycle their own byproducts in the Region.

5. Support recycling and composting facilities and programs that promote individual participation and responsibility.

Encourage the convenient and de-centralized placement of local drop-off facilities

6. Support the maintenance of collection centers for hard to recycle materials within the Region.

A. Support the siting and building of a permanent location for the Additional Recyclables Collection Center (ARCC) in a location central to the Region

B. Support the siting and building of a facility to collect and recycle asphalt shingles and drywall in a location central to the Region

7. Encourage composting of residential, commercial and institutional organic waste in order to maintain the materials' highest re-use value. Composting efforts should move toward being financially self-supporting and locally controlled.

Support the continuing presence and establishment of composting centers at appropriate sites within the Region

8. Continue to implement recycling and waste reduction measures in our internal operations, in accordance with Vermont's Universal Recycling Law.

9. Support projects that involve the distribution of Class A Biosolids from municipal wastewater treatment facilities only when only when Central Vermont Solid Waste Management District, Northeast Kingdom Waste Management District, Lamoille Solid Waste Management District or the Mad River Resource Management Alliance has worked with municipalities to ensure that said biosolids are safe and that municipal officials and other decision makers have been educated about the issue.

BROADBAND GOAL: Universal broadband availability and affordability.

Policies:

1. Encourage Municipalities to include broadband goals and strategies within local plans as tools to enhance economic development, education and overall resiliency.

2. Promote awareness of broadband informational resources, such as BroadbandVT.org, to inform residents, businesses and local planning processes.

3. Support expansion of broadband services and enhancements in underserved areas, *Regional Centers* and *Town Centers*.

A. Encourage creation of public wi-fi zones in *Regional Centers*, *Town Centers and Hamlets*.

B. Encourage expansion of wireless internet service providers in rural communities.

Housing Element

6

Housing is the foundation of our historic towns and villages. The size, location and cost of housing shape the communities in which we live. Providing a range of housing options for a variety of income levels and lifestyles contributes to the vitality of our communities. Housing impacts local economic development, school enrollment, land use, and traffic patterns, among others. Currently in Central Vermont:

- Average household sizes are decreasing; yet new construction house size is increasing;
- The population of people between ages 45 to 69 is expected to grow more rapidly than any other age group;
- Incomes are not keeping pace with dramatically increasing home costs;
- New housing creation is falling just short of the 5-year demand for housing;
- Much of the recent housing growth in the Region is happening outside of town and village centers.

This chapter reviews the number and types of housing units currently in existence, future trends in housing demand and costs, and outlines strategies to meet identified housing needs. Finally, it concludes with a list of resources that can be used by town officials and residents who are interested in this important issue.

DISCUSSION: TRENDS

Population & Households

The 2000 Census showed the population of the Central Vermont Region at 63,276 and estimates the Region's 2005 population to be at 64,842.[1] According to the EPR Forecast, the Central Vermont Region's population is expected to reach 67,297 by 2010 and 73,080 by 2020.[2] This is an increase of 6.3% between 2000-2010 and an

Central Vermont Population and Household Growth, 2000- 2020

	2000	2010	2020	% Change (2000-2010)	% Change (2010-2020)
Total Population	63,276	67,297	73,080	6.3%	8.6%
Total Households	25,675	28,708	33,534	11.8%	16.8%
Household Size	2.46	2.34	2.18	(4.8%)	(6.8%)

SOURCE: US Census 2000 and EPR Forecast (2010, 2020)

1 U.S. Census. 2000. American Factfinder www.factfinder.census.gov.

2 Economic & Policy Resources, Inc. 2001. Economic & Demographic Forecast: Central Vermont Region 2000-2020

Households, By Age of Householder, 2000-2010 (Washington County)

Age Group	2000	2005	2010	%Change (2000-2010)	Change in # Households (2000-2010)
15-24	1,040	1,116	1,158	11%	118
25-34	3,514	3,402	3,367	-4%	(147)
35-44	5,402	5,315	5,225	-3%	(177)
45-54	5,593	6,083	6,414	15%	821
55-59	1,855	2,230	2,509	35%	654
60-64	1,432	1,634	1,892	32%	460
65-69	1,286	1,348	1,501	17%	215
70-74	1,145	1,197	1,235	8%	90
75-79	1,002	943	955	-5%	(47)
80-84	751	820	870	16%	119
85+	639	683	767	20%	128
Total	23,659	24,771	25,893	9%	2,234

SOURCE: VT Dept of Housing & Community Affairs

increase of 8.6% between 2010-2020.

Between 1970 and 2000, the Region's population increased at an average rate of just 8% while the Region's number of households increased at an average rate of 20%. The reason for the significant difference between population growth and household growth is the increasing population has been distributed into a greater number of smaller households.

The average household size in 2000 was 2.47 people, down from 2.64 people in 1990. The number of households in the Central Vermont Region will increase from 25,675 in 2000 to 28,708 in 2010 and 33,534 in 2020. This is an increase of 16.8% between 2010- 2020. One reason is the average household size is projected to continue to decrease to 2.34 persons in 2010 and 2.18 persons in 2020. The increasing number of households containing a smaller number of people will have a significant effect on housing demand.

Central Vermont will experience substantial changes in the growth and decline of certain age groups between 2000-2010. Most notably, householders between the ages of 25-44 are expected to decline while most of the growth will occur in householders between ages 45-69. There will also be a fairly significant increase in the number of householders over 80 years old.

In 2000, there were 5,287 households with residents aged 65 years or older, representing 21% of all the households in the Central Vermont Region. According to the Washington County Housing Needs Assessment, between 2000-2010 these households are expected to grow by 12.25%.[3] These types of households generally require smaller units with one or two bedrooms and as they age, may need access to housekeeping, personal-care, or medical services.

According to the Vermont Department of Housing and Community Development, "In 2000, more than 1,800 Washington County elderly households had some type of mobility and/or self care limitation. The problem was noted especially for elderly or extra-elderly (age 75+) owner households. However, non-elderly households experienced even higher levels (21% of renter and 35% of owner households). The total number of households with mobility and/or self care limitations represents 17 percent of all Washington County households."

General Housing Demand by Age Group

Age Group	Characteristics	Housing Demand
20s	-lower incomes -high mobility -small households	Apartments
30s	-beginning families -small children -low savings -growing income	1st time homebuyer Mobile homes Condos
40s	-growing families -growing income	Step up to larger house Additions, home improvements
50s	-stable housing -empty nest -income peak	Live in existing homes Renovate and improve housing
60s	-end of income producing years	Begin process of "downsizing"
70s	-retirement -reduced income -risk of frailty	Smaller homes Condos Retirement developments
80's/90's	-risk of frailty or dementia -more single (widowed) households than couples	Assisted living At risk of institutional care

SOURCE: VT Dept. of Housing & Community Affairs, VT 2005 Housing Needs Assessment

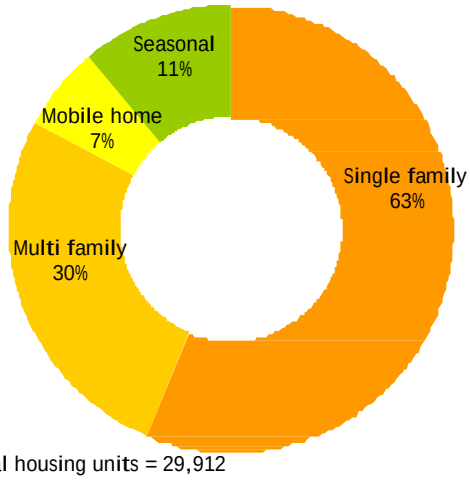
Number & Type of Housing Units

The last Census found there were 29,912 total housing units in the Central Vermont

[3] VT Department of Housing and Community Affairs. 2005. Washington County 2005 Housing Needs Assessment.

Region (2000 Census). Of this total 3,285, or 11% of the total, are seasonal units leaving 26,627 year-round units that are occupied or available for occupancy. Having 11% of the total housing stock as seasonal, recreational, or occasional use housing is well above the national average of only 3% and points to the strong vacation home market in Central Vermont.

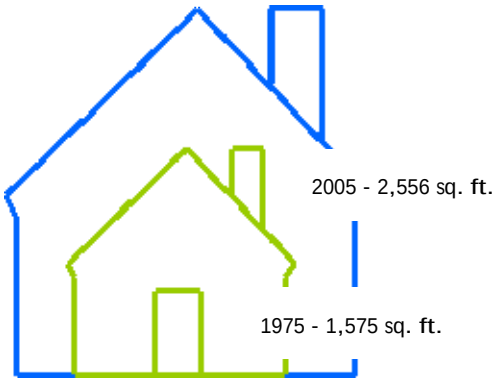
Composition of Housing Stock, 2000



Total housing units = 29,912

Single family homes make up the majority of the housing stock in the Region (63%). Thirty percent (30%) of the housing stock consists of homes that contain more than one housing unit, for example — condominiums, two-family houses, or apartment buildings, and the remaining 7% are mobile homes. If trends over the last 30 years continue, about 70% of these households will be owners and 30% will be renters. The high cost of housing could push many households out of the home buying market. (See Housing Affordability section)

Average Home Size 1975 & 2005



While the average household size is shrinking, the average single-family house size continues to increase. According to the Vermont Finance Agency "the average size of a newly-constructed home has increased dramatically over the past 30 years. According to Census data, in 1975, the average new home in the Northeast measured 1,575 square feet of living space. By 2005, that average new home had grown by 62 percent, to 2,556 square feet." [4] (For more information see: Land Use & Energy Elements)

One measure of a healthy housing market can be indicated by the vacancy rate. In general, a rental vacancy rate is considered healthy when it is approximately 5% and a healthy ownership vacancy rate is 3%. Any rate below the one considered "healthy" indicates that choices will be limited and prices generally increased. On the other hand, vacancy rates much above 5% for rental units and 3% for ownership units may signify an oversupply of that type of housing or disinvestment in a

[4] Vermont Housing Finance Agency. 2006. Housing Matters Newsletter.

Central Vermont Housing Supply- 2000

	Number	Percent of Total Units
Year-Round Housing Units	26,627	89%
Seasonal Housing Units	3,285	11%
Occupied Units	25,675	86%
Owner-Occupied Units	17,926	70%
Renter-Occupied Units	7,749	30%
Vacant Units (includes Seasonal)	4,237	14%
Vacancy Rate*		3.6%

*Vacancy Rate = (Year-Round Units- Occupied Units)/ Year-Round x 100

SOURCE: Census 2000

particular area. According to a housing needs analysis performed by the state, there is concern about the health of Washington County's housing market because at the time of the last Census, it had a rental vacancy rate of 3.3% and an ownership vacancy rate of 1.4%, well below the rates considered healthy (Vermont Dept. of Housing & Community Affairs, 2005).

Any discussion of the quantity of housing units available should also include the quality of those units. One rough measure of the quality of the housing stock is its age. In Washington County, 38.1% of the housing units were built prior to 1939 and only 6% of the units were built since 1999.

Housing Affordability

Housing costs in Vermont have increased significantly over the last ten years. It is not uncommon for housing prices to rise as wages and income rise, yet throughout Vermont housing costs are rising much faster than income. A few facts from the Vermont Housing Awareness Campaign's "Between a Rock and Hard Place" 2007 Update on housing and wages in Vermont illustrate this issue:

- A Vermont household would need an annual income of $66,000 to purchase the median-priced single family home ($197,000). Sixty-seven percent of Vermont's households have incomes below that figure.
- The average Fair Market Rent for a modest, two-bedroom apartment in Vermont reached $797 in 2006, a 10 percent increase since the year before and a 42 percent increase since 1996.
- A Vermont household would have to earn $15.34 per hour, or $31,897 annually,

Working with the Central Vermont Community Land Trust

River Station Apartment, Montpelier

Many towns and community groups in the Region have worked with the Central Vermont Community Land Trust (CVCLT) to develop affordable housing to meet the needs of their community.

River Station Apartments: CVCLT worked closely with the City to gain funding for the project. "The Central Vermont Community Land Trust has played a vital role in helping to address Montpelier's need for new affordable housing. This project was extremely challenging. It involved a difficult site, a multitude of funding sources, environmental issues, and permitting difficulties. The Central Vermont Community Land Trust's years of experience and expertise were essential to bringing this project to completion" said George Seiffert, former Community Development Specialist for Montpelier, about working with CVCLT.

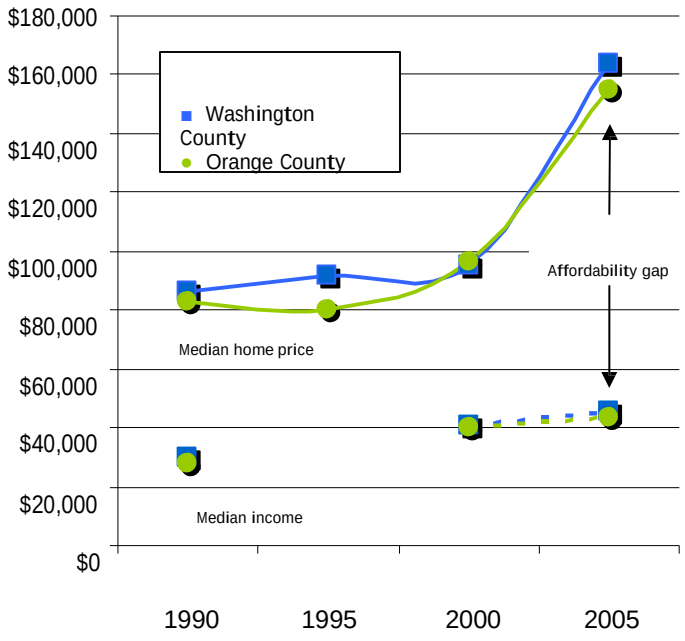
Cabot Senior Housing: Cabot Senior Housing was developed to allow area elderly residents and past residents to live in town. This project became a reality through the hard work of a community group called Cabot Commons who partnered with CVCLT to build and manage eight units of senior housing in Cabot. According to Sue Carpenter, Board President of Cabot Commons, "This project has been very successful. There is a real internal support system for the residents as well as a great deal of community involvement in providing services and activities for these residents."

Evergreen Place, Waitsfield

Evergreen Place: This project, completed in May 2006, contains 18 units of housing for elderly or disabled residents as well as the senior center and local food bank. It is located within walking distance to the cafés & stores in Waitsfield. All of the units in this project will be affordable to low income households.

For more information on these projects or on how your community can partner with the CVCLT, call (802) 476-4493

Median Home Price vs.
Median Household Income



to afford that Fair Market Rent. At least 59 percent of Vermont's non-farm employees – more than 163,000 people – work in occupations with median wages below that level.[5]

Housing costs are identified as a "burden" by State planning statue (Ch. 117) if they consume more than 30% of the household's income. In the Central Vermont Region, at the last Census in 2000, 23% of all homeowner households and 36% of all renter households lived in homes that cost more than 30% of the household income. Many of these residents are earning less than the area median income. These residents include families, schoolteachers, child care workers, and service workers.

In Washington County, the median home price increased by just 10% between 1990 and 2000, but by as much as 73% in the five years between 2000- 2005. In order to afford a median home in Washington County in 2005 a household would need to earn a yearly salary of $59,169.

According to a Housing Needs Assessment undertaken by the Vermont Department of Housing and Community Affairs in 2005, the gap between the income needed to buy the median priced home and the actual median income of residents in Washing-

Comparison of Affordable Home Prices and Incomes, Washington County

	Median Income	Median Home Price	Affordable home based on median income	Income needed to afford median home	Gap between affordable home and median home price	Gap between income needed and median income
2000	$41,387	$95,000	$110,719	$43,235	$15,719	$1,848
2005	$47,857	$158,562	$139,187	$59,169	($19,375)	($11,312)
2010	$54,089	$192,809	$115,987	$88,752	($76,822)	($34,663)

SOURCE: Vermont Department of Housing and Community Affairs, Washington Co. Housing Needs Assessment

5 Vermont Housing Council. Between a Rock and a Hard Place. 2006.

CV Region Housing Cost Burden 1989 & 1999*

Tenure	Number of burdened households	Percent of total households
Owners		
1989	1878	20%
1999	2459	23%
Renters		
1989	2360	36%
1999	2657	36%

*Selected monthly owner costs (or gross rent) as a percentage of household income

SOURCE: Housingdata.org (from Census)

ton County is $11,312 and expected to increase by 306% (to $34,663) by the year 2010. It should be noted that according to the Washington County Needs Assessment "the estimated 'affordable homes based on median income' decreases in 2010 because the calculation includes expenses beyond the mortgage, such as taxes and insurance which are based on the increasing median home price. This leaves less income available for mortgage payments."

The number of burdened households will rise given the significant increase in median house prices over the last five years. This increasing gap between what families are forced to pay for housing costs and what their incomes afford has several negative side effects on quality of life and the local economy. Burdened households may not be able to afford medical or educational costs. These households also have less disposable income to spend in local stores, restaurants and entertainment venues.

CV Region Number of Subsidized Rental Units, 2006

Number of Bedrooms	Total
SRO	39
0	142
1	651
2	254
3	114
4	13
TOTAL	1,213
Elderly or disabled only	(750)
Total unrestricted	584

SOURCE: Vermont Directory of Affordable Housing

For many low income residents of the Region, homeownership is not an option. In 2005 a household in Washington County would need to earn $13.15 or $27,360 annually in order to afford a two-bedroom apartment. In Orange County the 2005 housing wage was $12.54 or $26,080 for the same size apartment.

According to Between a Rock and Hard Place, out of the ten occupations employing the most Vermonters only two of them paid median wages above both the Washington and Orange County housing wage. (For more information about jobs in Central Vermont see: Economic Element). The Vermont Department of Housing & Community Affairs estimates that households earning $38,286 per year (80% of the county median household income) can afford to pay about $957 monthly for rent (including utilities). There are 5,111 households with incomes below 80% of the county median.

In 2005, an estimated 7,058 affordable rental units were available in Washington County with rents below $978. However, more than half of these units are estimated to be occupied by upper income households (i.e., not low or moderate income) and an additional 5% are assumed to be vacant at any given point in time, leaving only 2,978 available for low-income renters. In 2005, there were an estimated 3,053 very low-income households (those making less than 30% of the county median income, see Table A above) and only 1,213 subsidized rental units in the Central Vermont Region. Seven hundred and fifty of them are restricted to elderly or disabled residents only. According to the Washington County 2005 Housing Needs Assessment this creates an estimated shortage of 2,134 affordable rental units in Washington County.

Many households find more affordable housing farther away from employment centers causing long commutes and reduces the amount of time to spend with family. The cost savings on a home farther from town centers may be deceptive. Commuting costs increase substantially as families move farther away from jobs. These households also have less disposable income to spend in local stores, restaurants, and entertainment venues. (Also see Location of Housing section.)

Costs of Commuting*

	40 mile round trip commute	15 mile round trip commute
Monthly Costs	$404	$151.5
Yearly Costs	$4,848	$1,818

*Assumptions: commuting 5 days per week x 2008 IRS rate ($0.505 per mile).

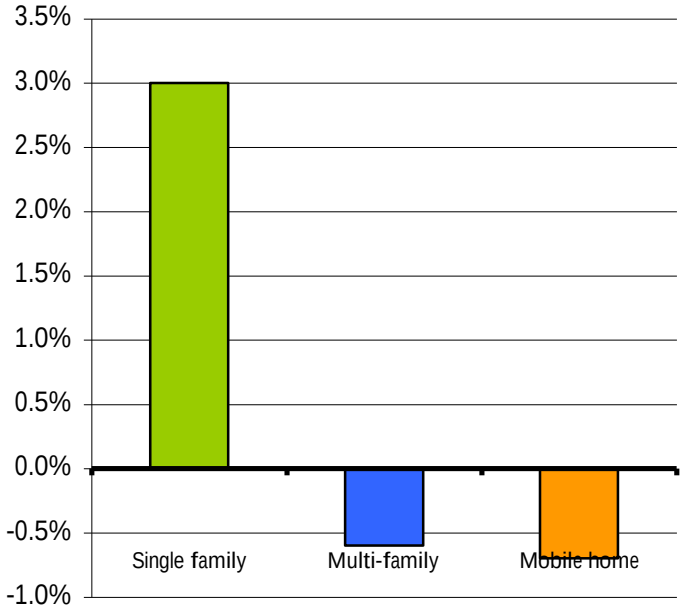
Long commuting times have an impact on more than just quality of life, traffic, air pollution levels, natural resources. (For more information see: Land Use & Transportation Elements) These long commutes also cost residents a significant amount of money. According to the Internal Revenue Service's 2008 standard mileage rate a resident who drives 40 miles round trip per day to work will spend about $404 per month ($4,848 per year)[6] on commuting expenses alone, a 15 mile round trip commute would cost significantly less. Current development patterns which locate housing far from jobs and services are costing residents both time and money.

In any market area there is a percentage of the units which are rented or sold at affordable rates, yet they may be in older buildings or in less desirable locations.

6 Internal Revenue Service. 2008 Standard Mileage Rate. The standard mileage rate for business is based on an annual study of the fixed and variable costs of operating an automobile.

However, in Central Vermont public housing authorities and the community land trust are working to provide our Region with perpetually affordable rental and homeownership units. Affordable housing developers can use Federal and State funding resources in order to subsidize units that will be maintained at affordable rates for income eligible tenants. Affordability covenants or deed restrictions can be added to homeownership units to ensure homes remain affordable for a set period of time, even during re-sale, a mechanism used by community land trust model. (For more information see section: Working with the Central Vermont Community Land Trust.)

Growth Rate by Housing Type 1990-2000



Housing Growth

During the ten-year period between the last two Censuses, 2,141 homeowner units and 915 rental units were created, representing a growth rate of 13.5% for all occupied housing units. Over this same time period, the total number of single-family units grew while the number of multi-family and mobile home units declined. If this trend continues it could/will present a problem as multi-family and mobile home housing is a necessary option for households that require more affordable forms of housing.

The CVRPC Regional forecast states that "as the Region's population has grown, population densities in the less dense areas tend to show a pattern of dramatic increase" indicating the more rural towns are experiencing the greatest housing growth. According to data collected by CVRPC, 1,709 building permits for housing have been issued in the Region between 2001 and 2005. Of these permits, only 138 have been for multi-family units, the rest for single-family units. While building permits issued cannot be considered the same as the number of housing units that have actually been constructed, it does give us some idea of the number and type of units that are being produced between Censuses.

Central Vermont is falling just short of the 5-year demand for housing—forecasted at 1,755 housing units. It will be important to at least keep this pace, if not increase it, over the next 15 years to meet projected demand for housing. According to the CVRPC Economic & Policy Resources forecast, 3,890 new housing units will

need to be created between 2005 - 2015.

It should be noted that all projections of future trends are the best guesses of experts and computer models. Anything as complex and dynamic as the Region's housing market must be constantly monitored to identify any changes in supply or demand and respond to them. It is therefore recommended that housing needs analyses be updated at least every five years.

Care should be taken to create the type of units, in both size and price that are needed by the Region's current and future residents. Keeping prices from soaring higher will require not just a raw increase in the number of housing units but the production of specific types of housing units, in the locations that are needed in the Region. The sections above show a growing demand for housing that fits the needs of people ages 45-69 as well as householders over 80 years old.

Location of Housing/Density

In the early twentieth century towns and villages were characterized by compact neighborhoods; yet today much of the housing growth in the Region is happening outside of town and village centers. According to the 2007 CVRPC Northwest Build-Out Study, most municipalities within the study area support 'smart growth' principles as a matter of policy , but have not been able to put them into practice.[7] (For more information about the Northwest Study visit www.centralvtplanning.com)

Low-density scattered development has been a significant concern to many towns in the Region as reflected in their town plans. Most towns now have land use and housing goals that include some version of the following statement: "Goal: The preservation of the Town's historic settlement pattern, defined by compact villages surrounded by rural countryside." (Warren Town Plan 2005) The benefits of developing more dense, compact housing within or close to village and town centers at historic settlement densities are numerous and include:

- decreased land costs due to smaller lot sizes
- decreased development costs due to proximity to existing infrastructure
- increased opportunities to develop a variety of housing options for different lifestyles
- decreased automobile dependency due to proximity to amenities such as schools, shops, services and jobs
- increased viability of mass transportation
- preservation of natural resources such as agricultural land and water resources.[8]

[7] Central Vermont Regional Planning Commission. 2007. CVRPC Northwest Build-out Study Summary Report.

[8] Local Government Commission and U.S. EPA. 2003. Creating Great Neighborhoods: Density in Your Community.

In spite of these benefits, rural municipalities continue to see higher housing growth than larger communities with the infrastructure available to support more dense growth. While it is widely believed that this is driven by market forces/consumer preference, that perception may not be the entire story. In fact, a 2005 survey by the Vermont Forum on Sprawl concluded that 80% of Vermont residents believe that "action should prevent sprawl," and, more surprisingly, that 33% of Vermonters would choose to live in an urban/village setting over a rural one if such a choice was available. This latter figure represents a 65% increase over the number making this choice in a 1998 poll.

Local regulations and attitudes may be compounding the problem as well. GIS "Density Sampling", conducted as part of the Northwest Build-out Project indicated that, in many traditional village and urban areas, allowable densities are often considerably less than that displayed by existing neighborhoods. NIMBY-ism (not-in-my-back-yard) has also been cited as a factor occasionally inhibiting denser new-development.

Rural communities can also do more to promote compact housing by providing density bonuses and other incentives for "clustered" development, or finding suitable locations for village expansion or the development of new villages and "rural hamlets." (For more information on residential development patterns see Land Use Element)

In addition to the cost of land, there are other factors that affect the real cost of housing. The fact that housing development is occurring farther away from village and town centers also generally means that people are located farther from the sources of employment. Over the ten years between 1990 and 2000, the percentage of Central Vermont Region residents who drive 60 minutes or more roundtrip to work each day increased from 22% of working residents in 1990 to 27% of working residents in 2000. (See Housing Affordability section.)

In May 2006 the Growth Centers bill (S.142) was approved by the State legislature. CVRPC has endorsed the growth centers concept for over a decade and this legislation has created a new process for the designation of growth centers. According to the Vermont Growth Center Planning Manual, a growth center is "a compact area planned for concentrated, mixed-use development." Like the Village, Downtown and New Town Center designation programs, the Growth Center program offers financial and regulatory incentives to promote planned growth, including housing.

Homelessness & Transitional Housing

Homelessness in Central Vermont is growing yet it is a problem which is not easily tracked. Homeless persons are not counted in the Census and many times they do not seek assistance or shelter at local facilities. Some 'couch surf' at homes of friends and family, some seek shelter in tents or in their cars. Others may find shelter in abandoned lots or buildings.

Currently there is one overnight shelter in Central Vermont, the Good Samaritan Haven in Barre. It operates on a first-come-first-serve basis and is open from 6 p.m. to 7 a.m. in the winter and from 7 p.m. to 7 a.m. in the summer. In addition to the overnight shelter there is one transitional housing site. Transitional housing provides the bridge between homelessness and permanent housing. Good Neighbors offers both short term housing and case management to assist families transitioning from homelessness into permanent housing.

According to the Washington County Needs Assessment average stays at the Good Samaritan Shelter have dramatically increased in the last 10 years. In 1998 the average stay was between eight days to two weeks, in 2004 the average stay was two months. More people who are seeking shelter are not transient but are local Vermonters who are working multiple jobs and can not afford rent.

Fair Housing Laws & Municipal Responsibility

State and Federal housing laws help protect against housing discrimination. Under the Federal Fair Housing Act and its 1988 amendments, individuals may file complaints alleging housing discrimination on the basis of race, color, national origin, religion, gender, handicap, or familial status. Individuals may also allege related acts of discrimination that are governed by other federal laws such as the Civil Rights Act of 1964. Vermont law (9 VCS 4503) prohibits any person from engaging in unfair housing practices such as the refusal to sell or rent, as well as many other actions involved in the advertisement, financing, and brokering of a dwelling.

A municipality has fair housing responsibilities regardless of whether or not the Federal government has funded the activity that is the basis for the complaint. A fair housing violation does not require a discriminatory intent; a violation can be found simply because municipal officials carried out regular activities in a routine way and failed to recognize their special fair housing responsibilities. In addition Chapter 117 section 4412 outlines required provisions and prohibited effects by which municipalities must abide.

Municipalities carry out four broad categories of activities that affect housing. Each can trigger municipal fair housing responsibilities:

- Regulatory activities – When a municipality enacts and administers regulations (e.g. zoning or building codes) that affect existing or potential residential properties;
- Provision of services – When a municipality provides routine services in residential areas or to residents;
- Provision of subsidies – When a municipality offers financial incentives (e.g. grants, loans, or loan guarantees) or special services (e.g. infrastructure projects or housing rehabilitation services) to residential property owners or to residents; and
- Proprietary activities – When a municipality buys or sells real property, particularly if the property was used or will be used as a residence.

Under the Fair Housing Act, a person who believes that he or she is a victim of housing discrimination may file either a complaint with the Department of Housing and Urban Development (HUD) or a lawsuit in federal or state court. If a municipality must defend itself against a complaint based on the Fair Housing Act, or if it is found to have violated the Act, the costs can be considerable. For more information on Fair Housing laws, visit the HUD website at http://hud.gov.

MEETING CURRENT & FUTURE NEEDS

Advocacy & Housing Committees

In February 2006, the Central Vermont Economic Collaborative, of which CVRPC is a member, initiated a Regional summit called "Housing Strategies 2006". Seventy-five Central Vermont residents attended this meeting and many of them volunteered to be on one of three task forces in order to work on the following issues:

- Planning / Zoning / Permitting
- Incentives to create or purchase housing
- Public Awareness / Education / Involvement

Each task force has developed strategies for implementation that could foster increased housing. The Planning/Zoning/Permitting Committee (of which CVRPC is a member) created a GIS model to identify land available for housing development within towns with municipal sewer and water systems. The Incentives group identified five financial incentives which currently do not exist in Central Vermont which would benefit the creation, rehabilitation and purchase of homes. They are: 1) development of low-interest loans for landlords to renovate existing apartments, 2) develop more incentives/tax breaks/abatements/credits and assistance to attract the private sector to develop housing within existing infrastructure, 3) expand assistance for accessory apartment conversion, 4) develop community support for

creating mixed uses and mixed housing types, and 5) develop employee pre-tax house savings accounts. The Public Awareness/Education/Involvement committee developed an educational flyer and compiled a comprehensive list of media contacts and other forms of information outlets. Currently, the Collaborative is working on a housing guidebook (entitled "The Central Vermont Housing Menu") combining the efforts of all committees.

The Mad River Valley Housing Coalition (MRVHC) is organized as a not-for-profit housing group and continues to work on the following projects in the Fayston, Waitsfield and Warren area:
research and develop an accessory apartment program,
implement the recommendations of the Mad River Housing Study;
support local housing projects;
educate the public on local housing needs.

The Montpelier Housing Task Force (MHTF) was organized in 1999 to assist with the preservation and enhancement of residential opportunities in Montpelier for households of all income levels. Working with community residents, City staff and elected officials, landlords and financial institutions, and community organizations, recent accomplishment of the task force include:

- creation of a City housing trust fund,
- implementation of an accessory apartment program,
- recommended changes to municipal ordinances
- conducted public outreach and education,
- continuation of tracking City housing data.

Local housing groups have proven effective at addressing local housing needs and can be a valuable resource in assisting town select boards and planning commissions in decision making. Yet no single municipality acting alone can address the Region's housing needs. All 23 cities and towns can work together in advocacy and partnership with other housing organizations (see CVCLT feature on p. 5) in order to meet current and future housing needs in sustainable ways. The Regional Housing Distribution Plan, as detailed below, is one way the Region's municipalities can continue to work cooperatively towards this important goal.

Regional Housing Distribution Plan

The Regional Housing Distribution Plan is a pro-active Regional approach developed by CVRPC and designed to assist local towns in their planning for housing. It is a critical step in the Region's on-going effort to address the housing needs of Central Vermont residents. Given the interdependent economy and society of the Region,

the housing needs of the Region affect every community. The purpose of the Housing Distribution Plan is to establish a long-term vision for Central Vermont and is to be used to measure progress.

The number of housing units for which each town is expected to plan was derived from the report titled Economic and Demographic Forecast: Central Vermont Planning Region 2000-2020 prepared by Economic and Policy Research, Inc (EPR) for CVRPC. In the year 2000 each town contributed a certain percentage of housing units to the Regional total. The EPR forecast indicated that the larger towns in our Region, with infrastructure capacity, are projected to contribute lower percentages to the Regional housing total as the year 2020 approaches. (This is in part due to a combination of factors including land costs are cheaper in more rural areas, causing an increase in scattered residential development outside of town and village centers. This pattern of decreasing population in our larger towns has been the basis for future forecasts.) Therefore, the Housing Distribution Plan was formulated with the aim to ensure that all towns continue to contribute similar percentages of the Regional total, or more, as they were in the year 2000 to fulfill the needs of the future. The Regional Housing Distribution Plan results in planning for a total of 8,835 new housing units in Central Vermont between 2000 and 2020. (See Appendix)

Under § 4347 of Chapter 117, the State mandates CVRPC to plan for anticipated growth and promote the development of housing suitable to the needs of the Region. In § 4348a, the State also mandates that the Regional plan housing element "identifies the need for housing for all economic groups in the Region and communities." Therefore the Regional Housing Distribution Plan is a method to be used by municipalities, in conjunction with information contained within this Housing Element, to help meet the future housing demand.

- The Regional Housing Distribution Plan is intended to be used by municipalities when updating their land use plans and regulations.

- Town Plans adopted after January 1, 2009 are expected to incorporate this Housing Distribution Plan into their town plan housing element.

- The Regional Planning Commission has established a town-by-town housing distribution plan at least 15 years into the future. The formula and allocation will be reviewed and updated with each Regional Plan's five year update.

- Town plans shall contain a detailed map or maps of the town showing the town's preferred locations for future housing units – consistent with current or proposed zoning* – for 80 percent of the anticipated 10 to 15

Regional Housing Distribution Plan
Number of net, year-round, housing units to be planned for per municipality

Municipality	2000-2004	2005-2009	2010-2014	2015-2020	TOTAL
Barre City	110	163	199	295	767
Barre Town	107	199	268	382	956
Berlin	112	139	125	116	492
Cabot	37	43	23	57	160
Calais	40	100	88	118	346
Duxbury	54	82	90	106	332
E. Montpelier	74	94	87	206	461
Fayston	48	55	89	134	326
Marshfield	44	55	46	72	217
Middlesex	76	68	84	151	379
Montpelier	97	206	177	299	779
Moretown	60	86	98	129	373
Northfield	62	138	113	197	510
Orange	31	37	40	53	161
Plainfield	18	28	22	42	110
Roxbury	13	15	25	36	89
Waitsfield	73	75	76	88	312
Warren	85	87	69	143	384
Washington	24	37	38	51	150
Waterbury	109	138	148	269	664
Williamstown	84	131	140	184	539
Woodbury	37	33	57	63	190
Worcester	35	26	24	53	138
TOTAL	1,430	2,035	2,126	3,244	8,835

year housing demand. ("Demand" is the difference between the number of units at the time of town plan approval and the Housing Distribution number at least 10 years thereafter.)

- Town plans shall also provide mapping updates that identify the locations and number of housing units created in the town since the previous town plan adoption.

- Towns and cities are required to demonstrate the community's intent to meet the proposed housing unit numbers laid out in the Housing Distribution Plan or to describe in detail the obstacles that make attainment impossible. CVRPC will consider the planning effort to encourage housing development in relation to the Housing Distribution Plan when approving a municipal plan.

- CVRPC can and will work with municipalities to overcome any local barriers to housing production that prevent attainment of the housing unit numbers, and suggest programs of local actions to address those barriers. Towns unwilling to implement programs to address barriers to housing may have their plans denied Regional approval.

- The Regional Housing Distribution Plan is not proposing quotas that municipalities must achieve within the time frame of their next municipal plan update; rather it is to identify the locations where the Region welcomes and encourages the housing residents need.

*For towns without zoning bylaws: Town plans shall contain a detailed map or maps of the town showing the town's preferred locations for future housing units consistent with the town plan's housing goals and policies and be compatible with other plan elements as outlined in § 4382 "the plan for a municipality." (See Appendix.)

Note: The Distribution Plan total numbers are somewhat higher than the actual projected unit totals for the Region, as well as for some individual municipalities. The Distribution Plan numbers are not meant to replace the projections that appear elsewhere in this Plan, but rather are intended to ensure that communities plan for potential demand.

HOUSING RESOURCES

Advocacy

- Vermont Affordable Housing Coalition. www.vtaffordablehousing.org. Organization working to promote awareness and policies for affordable housing.

- Vermont Coalition to End Homelessness. www.helpingtohouse.org. Organization working to monitor the needs and stream line the services and housing.

Data Sources

- American Factfinder. www.factfinder.census.gov. Data base of Regional and national statistics.
- Vermont Housing Data. www.housingdata.org. Data base of Vermont including a directory of affordable housing, housing profiles and policy resources.

Guides

- Affordable Housing Design Advisor. www.designadvisor.org.. U.S. Department of Housing and Urban Development website which includes tools, resources, ideas and a guide to affordable housing design.
- Central Vermont Housing Resource Guide. www.centralvtplanning.org. A guide to renters and homeowners looking for information about subsidized housing; mobile homes; and mortgage and home improvement financing. Hard copies are available at CVRPC Offices, 29 Main Street, Montpelier.
- Housing and Vermont's School Enrollment, VHFA Issues Paper. www.vhfa.org. Explores the relationship between home building and school enrollment levels. Includes a guide to help communities make decisions about the impact of housing development on school enrollment.
- HUD's Regulatory Barriers Clearinghouse. www.huduser.org/rbc/. U.S. Department of Housing and Urban Development's guide to solutions to state and local regulatory barriers to affordable housing.
- Vermont Housing Needs Assessment Guide. www.housingdata.org. Guide to help community groups determine the need for affordable housing within their cities or towns.

Organizations

- Central Vermont Community Land Trust. www.cvclt.org. Organization working to develop and manage affordable rental and homeownership housing opportunities in Central Vermont.
- Vermont Forum on Sprawl. www.vtsprawl.org. Organization dedicated to promoting research-based smart growth. Includes resources to assist towns with including density and affordable housing.

HOUSING GOALS, POLICES & ACTIONS

Goals:

1. To promote the development of housing opportunities for all residents of the Region, including and especially, affordable, elderly, and special needs housing.

2. To encourage innovative planning, design, and development of housing which minimizes its costs, energy consumption, and environmental impacts.

3. To promote preservation of the existing housing stock and the development of future housing in the village/town and employment centers of the Region, or those areas designated as Growth Centers.

4. To support the coordination between public, private, and non-profit agencies involved with planning, financing, and developing affordable housing.

5. Encourage large employers to explore and implement employer assisted housing.

Policies:

1. The Region's towns, non-profits, and state agencies should work collaboratively to address the Region's housing needs.

2. Municipal plans should assess the community's ability to meet the goals set out in the Regional Housing Distribution Plan.

3. Municipalities should encourage housing at the maximum densities allowed by local plans and regulations and at densities at or above those of their traditional/existing neighborhoods.

4. Municipalities should seek to ensure at least 20 percent of the housing stock is affordable, as defined by 24 VSA, Chapter 117, Section 4303.

5. The majority of new housing should be constructed in town centers and designated growth centers.

6. The Region's existing housing stock should be preserved and renovated. Adaptive re-use of older and historic buildings should be encouraged especially in town centers.

7. Housing units that are affordable to households below the area median income

and housing near employment centers should be encouraged.

Actions

- Assist towns in finding the resources needed to carry out housing needs analyses to identify the specific types of housing most needed by the community.

- Provide communities with the tools and resources needed to implement the Regional Housing Distribution Plan.

- Encourage the adoption of local land use regulations and bylaws that allow concentrated development where appropriate infrastructure can be made or is available.

- Review town plans to assure that all towns in the Region have a housing element that identifies housing issues and outlines steps through which housing needs will be addressed.

- Assist towns with the process of designating growth centers

- Help towns to identify potential partners for affordable housing development.

- Continue advocating for state policies and funding initiatives that increase housing opportunities for the Region's residents.

- Make Geographic Information System technology and other tools available to communities so they may analyze the impact of existing and/or proposed zoning policy on the potential for housing development.

- Continue support of local housing groups.

- Promote the density building land use strategies discussed in this Chapter and in the Land Use Element as a matter of course through our technical assistance programs.

- Provide municipalities with copies of "The Central Vermont Housing Menu" when completed.

- Actively participate in the Act 250 process to support appropriate housing development.

- Actively support the economic incentives identified by the Central Vermont Eco-

nomic Collaborative (see page Advocacy & Housing Committees section.)

- Continue to assist any municipalities which have not yet adopted the 2004 housing-related changes to 24 VSA, Chapter 117.

- Encourage towns to develop a streamlined permitting process for housing along with density bonuses and lowering of impact fees in growth centers, village centers and downtowns, and other areas where housing growth is desired.

ECONOMIC ELEMENT

7

A healthy economy is essential to maintaining Vermont's quality of life. A diversified and dynamic economy provides employment, stimulates social and cultural interaction, and provides the resources for the provision of a wide variety of community services, including education, health care and a well maintained physical infrastructure. On the individual level, a diversified economy offers greater opportunities for individuals to engage in satisfying and meaningful occupations and pursuits.

Economic vitality is a balance between human, natural and capital resources. The interaction of these factors determines the scale and intensity of growth and development. The Economic Element of the Central Vermont Regional Plan focuses on making effective use of the wide range of resources available in the region, while maintaining the balance of these resources.

DISCUSSION: GENERAL ECONOMIC PROFILE

Like the rest of Vermont, the Central Vermont economy has evolved from an agricultural/ manufacturing emphasis to a more complex mixture of economic activity. The growth of the travel/ hospitality/recreation industry, for instance, has contributed to the expansion of the retail and wholesale trades, and other services like construction and mortgage banking. Manufacturing, which has expanded to include food processing, plays a significant role in the attraction of tourists and the diversification of agriculture. No one sector can stand alone; changes in one will have an effect on all the others.

Total employment in Central Vermont is expected to increase by approximately 14,000 over the 2000-2020 period at an average rate of 1.4% per year. However, given a sharp drop in employment in 2008 and 2009, the Region exhibited only 1.3% growth between 2003 and 2013. While Washington County is expected to see

an increase in employment over the forecast horizon, it is expected to decrease its share of the total northwest region's (including Chittenden, Franklin, and Lamoille Counties) employment.[1]

The region's diverse economy is divided among a variety of activities. This industry distribution is supported by an equally diverse educational and occupational profile of the work force. Of the adult population in Central Vermont, 92.6% have a high school diploma or better. 44.7% have either an Associate's degree, Bachelor's degree or graduate-professional degree. Central Vermont has a higher relative number of collegiate degrees, including Associates, Bachelors and Graduate/ Professional, compared to Vermont (42.3%) and the United States (35.8%). Within the Region there is significant variation in educational attainment with levels of adults with a high school diploma or less at 48.5% in Barre. These percentages have increased significantly since the 1990 census. The occupational profile of the work force indicates that the largest category falls into public administration, health care and social assistance or retail trade.

Cabot Creamery, Cabot, Vermont.

Approximately 60% of the region's employment is concentrated in the urban core, which is made up of Montpelier, Berlin, Barre City and Barre Town, with most of the balance of employment opportunities found in Waterbury, Northfield and the Mad River Valley towns. Together the region's employment centers account for about 89% of the region's employment and approximately 73% of its population.

Just as the region's economy has evolved from locally focused agriculture and manufacturing to its current place in the more complex New England and national marketplace, it will continue to evolve as markets change and competition in all sectors becomes more global.

1 United States. Census Bureau. Population and Housing Census. 2000
2 Vermont. Department of Labor. Vermont Employment Projections. 2000.

Projections developed by the Office of Policy and Information of the Vermont Department of Employment and Training help to identify the shifts that are occurring in the state and regional economies. National and international forces have a tendency to have greater influence on manufacturing, while state and regional market forces combine to influence the non-manufacturing side.

The growth of the state economy is closely linked to the expansion of trade and service industries which meet the demands of residents and tourists. Our proximity to the urban centers of the Northeast plays a major role as a market in our recreation/ tourist activities. The growth in resident income also contributes to the importance of the trade and service industries.

While the next two decades are expected to produce employment growth at a rate of about 1.4% per year, approximately 84% of this growth is expected to be in the non-manufacturing sector with the addition of approximately 11,000 jobs over the forecast period (1.6% annual growth). Most of this increase (62%) will be in service industries that will grow faster than the rest of the non- manufacturing sector.

Employment in the manufacturing sector is forecast to grow 1.1% per year or by 1200 jobs by 2020. The government sector is expected to add the same number of new jobs while growing at an annual rate of only 7%.

The granite industry has long been at the heart of the Central Vermont Region's manufacturing sector. The region is a melting pot of ethnic heritage brought about by the influx of immigrants drawn to the region's granite quarries and manufacturing plants. The industry continues to be a major employer, with over 1,000 jobs and in excess of $100 million in sales. In recent years, the industry has emphasized diversification of its product line and improvement of its fabrication processes. Innovation has led to reductions in such health and environmental hazards as dust and sludge, and has led to greater utilization of processing wastes.

Ski areas are viewed as one of the Region's resources, combining economic benefits and recreational opportunities. Ski area growth has direct implications for the natural, physical and socio-economic environments. The ski industry also presents the potential for secondary impacts through associated employment in the service and

construction sectors, as well as the expansion of seasonal and permanent housing. A challenge exists to balance the competing demands of accommodating growth while preserving resources.

By its nature, the ski industry operates within some of the more environmentally sensitive areas of the Region. The ski areas, themselves, have often recognized the strong relationship between the health of the environment and the health of the ski industry and have demonstrated a desire to ensure that ski-related development respects the natural environment.

Central Vermont continues to have significant ties to the agricultural and forest-based economies. In addition to direct economic contribution, farms and forests helps to define the Region's cultural identity and provides Central Vermont residents with open space, recreational opportunities, aesthetic pleasure, and a sense of place. The continued economic viability of these highly valued working landscapes will be a key factor in preventing the conversion of these lands to other uses.

Though a variety of economic and social factors continue to threaten the local sourcing that was common in the past, new economic and social forces make this a good time to look anew at local food and wood product manufacturing. Many farmers are growing for local markets, local processors are feeling pressure for growth, the majority of maple producers have diversified their operations, and public interest in maintaining our agricultural economy is clearly on the rise.

ECONOMIC DEVELOPMENT

Self Sufficiency

Research has shown that community and economic development are best supported when local solutions and resources are brought to bear on local problems.

Small, new businesses are the backbone of economic development and job creation. In Washington County, enterprises with less than 20 employees comprise 90% of total private businesses while providing for 38% of total private employment.

(National figures are 87% and 26%, respectively.) Even though initial employment gains may be small, start-up businesses have immediate impacts on the local economy. Small companies tend to hire locally, buy locally and put more money into the local economy than they take out.

Over the past decade Vermont has become a leader in small business formation, with the Central Vermont region adding its share of new, small, innovative businesses to the list. In Central Vermont the vast majority of the more than 2000 employers fit the definition of small business.

Business development is influenced by a number of factors, as is the ability of the Central Vermont region to nurture, attract, and retain the businesses that are crucial to the economy. The Central Vermont Regional Plan attempts to capitalize on the region's positive factors, and also identify problems along with potential solutions.

Education

The quality of the work force and quality of life are directly related to community emphasis on education. Elementary and high school education are the basis of the human infrastructure. They provide the skills necessary for individuals to interact with one another in civil and meaningful ways. They are also the source of basic vocational skills in communications, mathematics, and problem solving.

As our society becomes more technologically advanced, these elementary skills take on even greater importance. Complex manufacturing techniques require workers who can process information and manipulate advanced machinery. Information management requires the ability to identify, isolate and utilize a wide variety of data.

The Central Vermont region is served by a high quality public and private school system. The region's seven high schools provide curricula ranging from college preparatory to vocational education. Several high schools have received state recognition for excellence in education. The region's elementary schools are in the forefront of the educational reform movement, making great strides in performance based

programs, several of which have been recognized at the national level, and curriculum integration.

Institutions of higher education play an important role both as major employers and as support institutions for technology based industry. The Central Vermont region hosts six colleges and post-secondary schools. Spin off institutes and for-profit ventures undertaken by the higher education community have added substantially to the economic and cultural wellbeing of the region. Advanced educational institutions also play a major role through the provision of programs that advance technical and problem solving skills.

While an elementary and high school education can provide the building blocks for an educated work force, individual advancement and technological improvement will depend on the development of life-long learning habits and opportunities for all workers. The public education system must expand to meet the vocational needs of adults. Public and private institutions and employers must take a proactive role in identifying the skills necessary for economic vitality in the future, and take the steps necessary to prepare and retain the work force.

Transportation and Communication

A number of factors contribute to the appeal of Central Vermont to businesses. The transportation system in Central Vermont provides ready access to markets for goods produced here, as well as facilitating the flow of tourists into the region from the major northeast metropolitan areas. The region is served by the interstate highway system and national freight and passenger rail service. Private business and general aviation are served by the all-weather Edward F. Knapp State Airport, and passenger air service is readily accessible through the Burlington International Airport.

The State's communications policy and planning have benefited Central Vermont in the form of a network of telecommunications infrastructure that enables information-based industries to link into a worldwide telecommunications network. There remain challenges to both take advantage of this advanced technology, and to keep pace with the developments of this quickly changing industry. The increasing region

-wide availability of the state-of-the-art telecommunications/information technology infrastructure (including high speed internet access and wireless communications) is increasing work options for Central Vermonters.

Quality of Life as an Economic Consideration

Quality of life is a difficult concept to define, yet many would agree that it stems from the sense of security and well-being that comes from being part of a community. Central Vermont's small town character, with its opportunities for participatory government, diverse social interaction, and human scale commerce plays a major role in maintaining an excellent quality of life.

Essential to a high quality of life is a dynamic and varied cultural experience. The village as the center of social activity provides the critical mass necessary for a flourishing interchange of ideas, art and culture. The traditional New England village is a virtual textbook of human history. The variety of architectural styles reveal the economic and social fortunes of its inhabitants, past and present.

The New England village is considered by many to be the pinnacle in land use design. In scale and function, it satisfies our needs for privacy, community and livelihood. Maintaining historic development patterns of village centers surrounded by resource based agricultural, mineral, forest and recreational activities balances economic and environmental interests. Concentrating growth and development within the confines of a village or "growth center" allows the community to implement infrastructure improvements in an efficient and effective manner that will improve the quality of life while limiting the degradation of the environment.

Central to the preservation and development of village patterns and commerce are affordable public utilities and services that allow increases in residential and commercial densities. While the costs of water and sewer for dispersed development can be borne by individual owners and users, public systems that benefit the entire community are frequently beyond the capacity of individual users to support. Equitable methods of financing that recognize the social, economic and environmental

3 Vermont has the highest tuition costs in the nation for state universities and colleges while ranking 47th out of 50

benefits of public infrastructure must be developed.

The availability of safe and affordable child care services is critical to the Central Vermont Region. Quality child care benefits families by preparing children for schooling and social interaction while enabling parents to work and provide income. It benefits businesses by expanding the workforce and creating more reliable, productive employees. Furthermore, child care facilities are businesses themselves and their existence expands local and Regional economies directly through the hiring of workers and purchase of goods and services. The need for childcare is prevalent across the state: 71% of Vermont children under 5-years old are in the care of someone other than their parents for at least part of the day.

CHALLENGES

A number of obstacles have been identified as impediments to economic development. The limited number of clearly identified, well-serviced, commercial/industrial sites hampers the ability of local businesses to expand and new ventures to develop. Some sites are identified as commercial or industrial in town zoning ordinances, but lack the needed sewer, water, electrical services or transportation infrastructure, while other areas have services available, but are not zoned for commercial/industrial use.

Similarly, the capacity of some of the region's existing public infrastructure is being severely strained by age, quality and the demands being placed on it from all sectors. The costs of upgrading and expanding public facilities often out pace the ability of users to pay.

The lack of venture and expansion capital is a serious obstacle to business development, especially for smaller enterprises. In Vermont's small business climate, where loans have traditionally been made as much on the credibility of the individual as on the assets of the company, the effect has been profound.

Utility costs represent a substantial portion of the operating costs of many businesses, primarily in the manufacturing sector. Vermont's climate and location alone mean increased energy use and cost compared to other areas. Conflicting and

sometimes lengthy permit decisions have also complicated the development process. Development proposals are reviewed by numerous state agencies, local boards and regional planning and environmental commissions, each adding its own perspective and requirements. The myriad of permits that are sometimes required can tend to discourage the inexperienced business-person.

There has been much discussion in recent years regarding salaries in Vermont and the desirability of compensating workers with a "livable wage" (defined as the hourly wage/annual income necessary to cover all basic needs plus all relevant local, Federal, and State taxes. Basic needs include: food, housing, child care, transportation, health care, clothing, household and personal expenses, and insurance). It is an often heard refrain that our young people often leave the State to find higher paying jobs elsewhere. The fact that Vermont placed in the top five states in multiple job-holders in 2000 may provide further evidence that low wages may be a problem here. Unfortunately, this trend is actually accelerating.

The Region's downtowns and villages were primarily established along the Winooski River and its major tributaries. This development pattern leaves our communities very susceptible to flood damages amongst other natural hazards and weather events that can affect community vitality and economic activity. This vulnerability became extremely evident during 2011 flood events, including Tropical Storm Irene, during which a great number of businesses were directly impacted by flood damage or indirectly impacted due to road closures, tourism impacts or dips in local spending. There is a need to incorporate an economic component into future analyses related to our communities' flood vulnerabilities and to include actions to better prepare businesses for future flood events.

The Demographic Challenge

Continued economic vitality depends on the existence of a skilled, knowledgeable and innovative "next generation" workforce. With an older than average and rapidly aging population, along with the lowest percentage of people in the 25 to 29 age group in the nation, Vermont faces some serious challenges in this regard.

Recent studies in the State suggest two different points of view on, and approaches

to, solving the State's demographic problem. The 2006 report of the Governor's Next Generation Commission espouses the belief that many young people are "forced" out of the State by the high cost of post secondary education, lack of available training, and lack of early awareness regarding career/educational choices. Its recommendations focus primarily on retaining young people already in the State by providing them with financial and other incentives for them to stay, helping them develop skills to offer employers, and providing them the information to make better decisions about their futures.

Another point of view, delivered in a 2007 report commissioned by the Vermont Department of Economic Development, argues that the so called "youth flight" or "brain drain" is a natural, perhaps even healthy phenomenon common to all rural areas. This document (Growing Vermont's Next Generation Workforce) suggests that instead of trying to prevent out-migration, the State should instead focus on "brain circulation" – "The capture of new talent and the recapture of native talent after they have experienced other places." CVRPC believes both approaches have validity and merit and that the data they present and recommendations they offer are not mutually exclusive, and are probably complementary.

The later study included sizable surveys of recent alumni of Vermont colleges. Among the positive revelations of these surveys was that a high percentage of the respondents had an interest in moving back to, or remaining in, Vermont. Notable among the reasons offered was an affinity for the State's environment and culture. Chief among the barriers were our relatively low wages and high cost of living – a daunting financial "double whammy." While stating that 80% of the State's college students move out of Vermont within one year after graduation, the report did cite a number of unique opportunities for Vermont and makes a case for optimism. Among the encouraging factors are:

- Colleges and universities are already actively engaged in attracting young people to Vermont – over 50% of those enrolled are from out of State.
- Vermont's tourism/recreation industry is a "natural draw" for young people to experience Vermont's quality of life.
- The younger generation is less bound to the notion of corporate employment and

more inclined to make "value-based" career choices than previous ones. Both of these factors bode well for entrepreneurial, innovative, "socially responsible," small business development.

- Information technology has widened the horizons for recruitment and marketing.
- According to survey results, "Students who become interns at area companies are up to 75% more likely to stay in Vermont."

CVRPC must recognize these trends and strive to support and cultivate opportunities for young people to stay in, return to, or discover our Region as an exciting and affordable place to work and live.

SUMMARY

Vermont's "quality of life," its work force, the environment, and Vermont's positive marketing image are assets to doing business in Central Vermont.

Central Vermont has the underpinnings of a strong economy. The diversity of its larger employers, the number of small employers, the variety and level of skills found in its labor force, and the quality of life are its prime assets. In conjunction with local governments, businesses and other regional development groups, the Central Vermont Regional Planning Commission will participate in economic development efforts by helping communities capitalize on their assets and helping the region and state to overcome economic obstacles.

The purpose of this element is to guide and plan for economic development that will create employment in Central Vermont which keeps pace with the region's labor force, provides an adequate flow of taxable economic activity to fund State programs, and increases the wealth and economic well being of residents.

ECONOMIC GOALS, POLICIES AND STRATEGIES

Goal 1: Full employment[4] and the creation and preservation of high quality jobs in a diverse range of occupations.

Goal 2: Business retention, growth and development that anticipate and meet market opportunities.

Policy 1: Promote career exploration and education planning for all young people and reduce barriers to participation in some form of post-secondary education or training.

A. Promote sharing of best practices within the Region's supervisory unions with regards to dual-enrollment, work-based learning internship and apprenticeship programs and assist with identifying resources and incentives for these efforts.

B. Promote an annual regional Student Career Day/Job Fair event targeted to High School students for summer employment, job shadow opportunities and internships.

C. Facilitate effort to identify partners and formalize network of STEM-related (science, technology, engineering and math) companies, high schools, educational institutions, Tech Centers, and Community College of Vermont (akin to Vermont Youth Conservation Corps. concept, applied to STEM sectors) to provide hands-on training and internships.

D. Identify, inventory and support resources programs that place emphasis on sound management and mentorship for young workers, particularly at-risk youth, in partnership with service providers such as Washington County Youth Services Bureau and ReSource/ReBuild.

4 The level of employment, or unemployment rate, which provides the maximum sustainable rate of economic growth and Gross Domestic Product without resulting in accelerating inflation. A Full Employment rate that is also just above the rate which will cause inflationary pressure, is called the Non-Accelerating Inflation Rate of Unemployment (VT Dept. of Labor).

E. Support and engage with Young Professionals organizations to better understand professional development needs and barriers to workforce stability in younger workers.

Policy 2: Deliver training and life-long learning to retain and expand a robust workforce with skills to match needs for current and future available jobs.

A. Support availability and awareness of training programs for underutilized workforce populations (e.g. dislocated, special needs and older workers) to attain skills to transition to new careers.

B. Increase local delivery of information regarding regional workforce training resources (e.g. Front Porch Forum, employer groups/trade associations, municipal web sites).

C. Promote partnerships with digital workforce training programs such as those piloted by the Vermont Digital Economy Project to increase access to workforce training opportunities, including those in more rural communities.

D. Encourage and collaborate with the State to conduct or reference existing labor skills gap analyses, where available, to: i) improve workforce data availability, ii) identify the types of jobs that businesses need to fill, and iii) document anticipated skills shortages.

Policy 3: Focus retention, growth and development efforts on industries and businesses that are a good fit with the Region's existing economic base and support sustainable economic development.

A. Increase collaboration between regional planning and economic development organizations, such as Central Vermont Economic Development Corporation, Capstone Community Action and Central Vermont Chamber of Commerce, in order to accomplish strategies identified in Policy 3.

B. Support and encourage expansion in sectors that are poised for growth, such as: health care, high tech manufacturing, software development and information technology, value added agriculture, higher education and recreation and tourism.

C. Support education on sustainable business best practices, on topics such as recycling, use of environmentally friendly materials and processes, and implementing energy efficiency improvements.

D. Explore opportunities to expand value added manufacturing networks (i.e. processing, storage, distribution, wholesale, retail, direct-to-consumer) and information exchanges.

E. Develop and disseminate information on development incentives, techniques and resources for towns and local development groups.

F. Provide a range of information regarding regulatory processes and available financial and technical resources and, where feasible, facilitate trainings for developers, entrepreneurs and business owners.

G. Research cooperative development models (e.g. Evergreen Cooperatives in Cleveland, Cooperative Development Institute in Massachusetts, Cooperative Vermont in Burlington) and identify potential partnerships between the Region's cooperatives (the credit unions, food coops, and few worker-owned cooperatives) and other major "anchor" institutions (the State, educational institutions, etc.) to encourage more cooperative development in the Region.

Policy 4: Promote entrepreneurship and innovation in all business sectors and encourage small and micro business development.

A. Assess zoning and other regulatory barriers to entrepreneurship and small and micro business development, including home-based businesses and diversified agricultural enterprises.

B. Continue to expand availability and improve the quality of broadband to enable telecommuting and home-based work opportunities, particularly in more rural areas of the Region.

C. Identify policy and programmatic gaps and opportunities to expand access to capital for businesses, particularly knowledge-based.

D. Work with Capstone Community Action partners to explore opportunities to develop a network (e.g. "Community Capital Exchange") where local businesses and investors come together to identify capital needs, investment, and opportunities to apply commercial strategies to maximize improvements in social and environmental well-being, such as Capstone Community Action's Community Capital Exchange initiative.

E. Encourage organizations or professional associations to provide networking and a unified voice to creative economy sectors (writers, web designers, etc.).

F. Explore opportunities for regional innovation partnerships and/or technology transfer with employers, educational and research institutions and other public partners.

G. Encourage online marketing training and technology use for small and micro businesses, including participation in Vermont Digital Economy Project trainings and use of aggregated web platforms such as the Vermont Food System Atlas or Made in Vermont.

H. Increase collaboration with business development organizations to enhance delivery of technical assistance to the wide range of small and micro businesses and entrepreneurial enterprises serving the Region.

Policy 5: Implement the goals and policies presented in the Utilities, Facilities and Services and Land Use elements of this Plan that enhance and optimize quality of place to attract and retain employers and residents.

These efforts to enhance and optimize quality of place include preservation of historic and cultural assets; maintaining the scenic qualities of our agricultural and forest lands, protection of natural resources and environmental quality, expansion of local food systems and healthy lifestyles, and increased access to recreational opportunities and amenities

POLICY 6: Ensure availability of commercial and industrial space to meet employment and business expansion needs.

A. Assess capacity of commercial and industrial space using available data, including existing GIS information, and identify the various types of commercial and industrial space needs.

B. Assist municipalities in promoting marketable sites and identifying assets, deficits and options available to meet industrial and commercial site development needs; for example, the potential for use of small wastewater treatment systems.

C. Maintain inventory and support the reclamation and redevelopment of blighted, contaminated or potentially contaminated sites (i.e. "brownfields"). Continue to actively seek funds to facilitate this effort.

D. For uses that do not require a rural location, guide and assist commercial, industrial and institutional uses to locate in downtowns, villages and adjacent industrial areas, or at those locations in the fringe areas that have been significantly developed and are zoned for such purposes.

Policy 7: Implement the goals and policies presented in the Energy, Utilities, Facilities and Services and Transportation elements of this Plan to maintain and plan for adequate infrastructure, energy, telecommunications, and transportation systems to accommodate and support business growth and expansion.

These efforts to maintain and plan for adequate systems to support business growth and expansion include support of:
A transportation system that efficiently transports goods and services and employees to their place of work;

An efficient and stable energy system that provides for reduced costs, consumption and reliance on nonrenewable energy sources;
State-of-the-art telecommunications/broadband infrastructure that would increase work options and reduce commuting and its impacts on the transportation infrastructure and the environment; and
Water, wastewater and storm water management systems in locations that allow for appropriately-scaled commercial and industrial expansion, higher densities and co-location of jobs, housing and services.

Policy 8: Support the continued use and sustainability of our natural resources and associated industries.

A. Encourage the continued productivity of viable mineral resources.

B. Facilitate the use of locally obtained materials for building and highway construction and maintenance. Assist municipalities in mapping the important, accessible resources.

C. Ensure that resource extraction operations follow best management practices to minimize impacts to the local and surrounding environment and other land uses, and to allow for site restoration.

D. Implement the goals and policies presented in the Land Use element of this Plan related to continued use, sustainability and protection of productive forests and prime agricultural soils.

Goal 3: Incomes sufficient to meet or exceed basic needs with opportunities to advance and to achieve financial security.

Policy 9: Support and encourage the business community and policy makers in developing strategies for the retention and creation of jobs that pay a livable wage.[5]

5 Defined in statute as the hourly wage required for a full-time worker to pay for one-half of the basic needs budget for a 2-person household, with no children, and employer-assisted health insurance, averaged for both urban and rural areas (VT Legis. Joint Fiscal Office).

A. Research and develop case studies of businesses that are pursuing or have achieved a livable wage for employees as a goal, research and identify primary barriers to businesses being able to pay livable wages, and research impacts of livable wage policies and incentives on the economies of other places.

Policy 10: Implement the goals and policies presented in the Housing, Transportation and Utilities, Facilities and Services elements to expand access to resources that promote stability in the workforce, including workforce housing, transportation solutions, affordable child care, and medical and mental health care.

Policy 11: Support efforts to develop and disseminate information on career pathways and advancement opportunities for industry sectors poised for growth.

A. Encourage employers to provide for training and education opportunities for employees of all ages to acquire, maintain, and improve the skills and knowledge necessary to advance.

B. Support statewide initiatives such as the STEM (science, technology, engineering and mathematics) Equity Pipeline and other Statewide Consortia developing career pathways in priority sectors identified in the 2020 Statewide CEDS, such as health care and value-added agriculture.

Policy 12: Support projects identified in the 2020 Statewide Comprehensive Economic Development Strategy.

Goal 4: Dynamic and resilient downtowns, villages and commercial districts.

Policy 13: Find new uses and opportunities for vacant and under-utilized sites and buildings.

A. Encourage and assist applications for Village Center designations in existing compact settlements not yet designated by the Agency of Commerce and Community Development.

B. Assist participating municipalities in designation renewals and in utilizing technical assistance and incentives offered by State designation programs to preserve and reuse significant, economically viable, and historic structures.

C. Support rezoning of village centers for mixed-use development, encompassing commercial, light manufacturing, artisan and residential uses at traditional village density.

D. Assist municipalities in: planning for capital investments, identifying barriers to redevelopment or reuse, and planning for adaptive reuse of buildings.

E. Support and prioritize assistance with community-identified priority/anchor revitalization projects in our downtowns, village centers and growth centers as they are identified.

Policy 14: Focus infrastructure investments in downtowns, village centers and growth centers and promote use of healthy community design principles in public investments and land use regulations.

A. Promote incorporation of Healthy Community Design[6] and Complete Streets[7] principles into public infrastructure, redevelopment projects, land use regulations and community engagement efforts.

B. Assist municipalities in pursuing resources to upgrade infrastructure, including roads, sidewalks, bike paths, multi-use paths, bridges, rail, water, wastewater, and stormwater. Promoted shared services via inter-municipal agreements where appropriate.

6 Healthy Community Design links traditional concepts of planning (land use, transportation, community facilities, parks and open spaces) with health themes (physical activity, public safety, access to nutritious food, air and water quality, mental health and social equity) (Vermont Dept. of Health).
7 Complete Streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities (Smart Growth America).

Policy 15: Increase economic resilience by mitigation of and adaptation to extreme weather events and flooding.

A. Encourage and assist employment centers with participation in FEMA's Community Rating System to enhance community-wide floodplain management efforts and reduce flood insurance premiums.

B. Develop and implement outreach strategies targeted to business and residential property owners to raise awareness of flood risk and promote strategies and resources to reduce vulnerabilities.

C. Work with communities to upgrade flood hazard bylaws and improve storm water mitigation strategies in order to minimize risks to homes, businesses and public infrastructure.

D. Encourage communities to direct new commercial or industrial development to areas not at risk from erosion and inundation flood hazards, where feasible.

E. Consider the benefit to local and regional economic resilience when prioritizing assistance with Hazard Mitigation Assistance grants.

Policy 16: Support coordinated and complementary efforts to market the Region's unique, yet-connected downtowns and villages.

A. Utilize results from Vermont Downtown Action Team retail market analyses to assist with marketing available commercial space, business recruitment and start-up support.

B. Promote collaborative marketing with common themes among regional downtowns and villages, chambers of commerce, scenic byway committees and Vermont Tourism via region-wide events and tours (e.g. cycling; hiking; food, farm and brewery; covered bridges; stone arts; and fall foliage) targeted to both visitors and residents.

C. Support formation and expand capacity of community-based or business associations focused on village vitality, marketing and enhancements.

Goal 5: Sustainable and viable agricultural and forest lands.

Policy 17: Promote and expand asset-based recreation and tourism with an emphasis on year-round offerings.

A. Support efforts to develop and update local and region-wide inventories of natural, historic, scenic, agricultural and recreational assets at the local level to support tourism and quality of life promotion.

B. Investigate feasibility of a region-wide promotion effort similar to Newport's "Fresh by Nature."

C. Identify gaps in offerings and support expansion of facilities to develop off-season activities, host multi-day events, conferences and weddings and various related support services.

D. Work with municipalities to identify viable options for expanded commercial and public outdoor recreational facilities, including trail development and related infrastructure that are environmentally and culturally sustainable.

E. Explore options and pursue resources to update VT TrailFinder web site.

Policy 18: Foster collaborative partnerships among regional food system stakeholders.

A. Assist with identifying sustainable collaborative frameworks and funding sources to continue the work of the Central Vermont Food Systems Council.

B. Collaboratively host an annual meeting focused on best-practice-partnerships among economic development, land use planning and conservation stakeholders to support local food systems.

C. Promote representation of the agricultural and/or forestry sector on town and regional economic development committees/boards.

D. Promote Handbook for Local Action in Sustainable Agriculture developed by the State and targeted to municipal officials, boards and staff and local volunteers.

Appendices

A-1 REGIONAL HOUSING DISTRIBUTION PLAN METHODOLOGY

In August 2006, the Central Vermont Regional Planning Commission formed a Housing Committee to discuss a pro-active approach to planning for housing in Central Vermont. Commissioners representing the Towns of Calais, East Montpelier, Middlesex, Plainfield, Orange, Waitsfield, and Williamstown met monthly for seven months. The result of the Committee's work is the Regional Housing Distribution Plan.

The Housing Distribution Plan is based upon the "Economic and Demographic Forecast: Central Vermont Planning Region 2000-2020" prepared for the Central Vermont Economic Development Corporation, Central Vermont Chamber of Commerce and Central Vermont Regional Planning Commission in November 2001 by Economic & Policy Resources, Inc. (EPR). The formula for the housing plan is based upon historical patterns and trends in population and employment change.

The following steps outline how the number of net, year-round, housing units to be planned for per municipality was formulated:

1. The EPR forecast projects the Region's need to develop approximately 7,800 new housing units between 2000 and 2020, bringing the total from 25,675 to 33,534.

2. In 2000 each town was contributing the following percentage of housing units to the regional total:

Town	Housing units in 2000	Percent (%) of region	Town	Housing units in 2000	Percent (%) of region
Barre City	4220	16.44%	Orange	362	1.41%
Barre Town	2951	11.49%	Northfield	1819	7.08%
Berlin	1109	4.32%	Plainfield	487	1.90%
Cabot	452	1.76%	Roxbury	227	0.88%
Calais	616	2.40%	Waitsfield	734	2.86%
Duxbury	498	1.94%	Warren	742	2.89%
E. Montpelier	1007	3.92%	Waterbury	2011	7.83%
Fayston	484	1.89%	Washington	406	1.58%
Marshfield	575	2.24%	Williamstown	1248	4.86%
Middlesex	663	2.58%	Woodbury	329	1.28%
Montpelier	3739	14.56%	Worcester	346	1.35%
Moretown	650	2.53%	Total	25,675	100.00%

3. Each town's 'percent (%) of region' was calculated for the years 2005, 2010, 2015, and 2020 housing forecast.

4. Each town's 'percent (%) of region' in the year 2000 was applied to the 2005, 2010, 2015, and 2020 forecast.

5. If each town's 'percent of region' for the years 2005, 2010, 2015, and 2020 was higher than the 'percent of region' in the year 2000 then the EPR forecasted housing projections were used as is (which was the case for the majority of towns in the region.) If the town's 'percent of region' for the years 2005, 2010, 2015 and 2020 was less then the 'percent of region' in the year 2000, then the mid point between the projection and the 'percent of region' in the year 2000 total was applied. This was the case for Barre City, Montpelier, Northfield and Plainfield.

The Housing Distribution Plan results in planning for a total of 8,835 housing units in Central Vermont between 2000 and 2020, ensuring the region is prepared for future housing growth and encourages towns to continue to contribute similar percentage levels of housing units into the future.

It should be noted that all projections of future trends are the best guesses of experts and computer models. Anything as complex and dynamic as the Region's housing market must be constantly monitored to identify any changes in supply or demand and respond to them.

It is, therefore, recommended that local and regional housing needs analyses, economic and demographic forecasts, and the Regional Housing Distribution Plan be updated every five years.

A-2 24 V.S.A. § 4382. THE PLAN FOR THE MUNICIPALITY

Title 24: Municipal and County Government
Chapter 117: MUNICIPAL AND REGIONAL PLANNING AND DEVELOPMENT
24 V.S.A. § 4382. The plan for a municipality

§ 4382. The plan for a municipality

(a) A plan for a municipality may be consistent with the goals established in section 4302 of this title and compatible with approved plans of other municipalities in the region and with the regional plan and shall include the following:

(1) A statement of objectives, policies and programs of the municipality to guide the future growth and development of land, public services and facilities, and to protect the environment;

(2) A land use plan, consisting of a map and statement of present and prospective land uses, indicating those areas proposed for forests, recreation, agriculture (using the agricultural lands identification process established in 6 V.S.A. § 8), residence, commerce, industry, public and semi-public uses and open spaces reserved for flood plain, wetland protection, or other conservation purposes; and setting forth the present and prospective location, amount, intensity and character of such land uses and the appropriate timing or sequence of land development activities in relation to the provision of necessary community facilities and service;

(3) A transportation plan, consisting of a map and statement of present and prospective transportation and circulation facilities showing existing and proposed highways and streets by type and character of improvement, and where pertinent, parking facilities, transit routes, terminals, bicycle paths and trails, scenic roads, airports, railroads and port facilities, and other similar facilities or uses, with indications of priority of need;

(4) A utility and facility plan, consisting of a map and statement of present and prospective community facilities and public utilities showing existing and proposed educational, recreational and other public sites, buildings and facilities, including hospitals, libraries, power generating plants and transmission lines, water supply, sewage disposal, refuse disposal, storm drainage and other similar facilities and activities, and recommendations to meet future needs for community facilities and services, with indications of priority of need, costs and method of financing;

(5) A statement of policies on the preservation of rare and irreplaceable natural areas, scenic and historic features and resources;

(6) An educational facilities plan consisting of a map and statement of present and projected uses and the local public school system;

(7) A recommended program for the implementation of the objectives of the development plan;

(8) A statement indicating how the plan relates to development trends and plans for adjacent municipalities, areas and the region developed under this title;

(9) An energy plan, including an analysis of energy resources, needs, scarcities, costs and problems within the municipality, a statement of policy on the conservation of energy, including programs, such as thermal integrity standards for buildings, to implement that policy, a statement of policy on the development of renewable energy resources, a statement of policy on patterns and densities of land use likely to result in conservation of energy;

(10) A housing element that shall include a recommended program for addressing low and moderate income persons' housing needs as identified by the regional planning commission pursuant to section 4348a(a)(9) of this title. The program may include provisions for conditionally permitted accessory apartments within or attached to single family residences which provide affordable housing in close proximity to cost-effective care and supervision for relatives or disabled or elderly persons.

(b) The maps called for by this section may be incorporated on one or more maps, and may be referred to in each separate statement called for by this section.

(c) Where appropriate, and to further the purposes of section 4302(b) of this title, a municipal plan shall be based upon inventories, studies, and analyses of current trends and shall consider the probable social and economic consequences of the proposed plan. Such studies may consider or contain, but not be limited to:

(1) population characteristics and distribution, including income and employment;

(2) the existing and projected housing needs by amount, type, and location for all economic groups within the municipality and the region;

(3) existing and estimated patterns and rates of growth in the various land use classifications, and desired patterns and rates of growth in terms of the community's ability to finance and provide public facilities and services.

(d) Where appropriate, a municipal plan may provide for the use of "transit passes" or other evidence of reduced demand for parking spaces in lieu of parking spaces. (Added 1967, No. 334 (Adj. Sess.), § 1, eff. March 23, 1968; amended 1971, No. 257 (Adj. Sess.), § 7, eff. April 11, 1972; 1975, No. 236 (Adj. Sess.), § 2; 1979, No. 174 (Adj. Sess.), § 8; 1985, No. 188 (Adj. Sess.), § 10; 1987, No. 200 (Adj. Sess.),§§ 8, 10, eff. July 1, 1989; 1989, No. 280 (Adj. Sess.), § 7; 1991, No. 130 (Adj. Sess.), § 2; 1995, No. 122 (Adj. Sess.), § 2, eff. Apr. 25, 1996

A-3 "ECONOMIC AND DEMOGRAPHIC FORECAST, CENTRAL VERMONT PLANNING REGION, 2000 TO 2020" —POPULATION BY TOWN

FINAL3_20203

POPULATION BY TOWN

Washington County Town	'50 Census	'70 Census	'80 Census	'90 Census	'00 Census	2005 EPR	2010 EPR	2015 EPR	2020 EPR	
Barre City	10,387	10,209	9,824	9,482	9,291	9,186	8,911	8,763	8,625	
Barre Town	4,580	6,509	7,090	7,411	7,602	7,802	8,177	8,451	8,747	
Berlin	1,306	2,050	2,454	2,561	2,884	3,010	3,164	3,325	3,515	
Cabot	763	663	958	1,043	1,213	1,271	1,323	1,373	1,453	
Calais	694	749	1,207	1,521	1,529	1,615	1,730	1,874	2,052	
Duxbury	546	621	877	976	1,289	1,379	1,475	1,621	1,820	
E. Montpelier	1,200	1,597	2,205	2,239	2,578	2,691	2,836	2,989	3,154	
Fayston	158	292	657	846	1,141	1,252	1,375	1,536	1,766	
Marshfield	891	1,033	1,287	1,381	1,496	1,531	1,619	1,703	1,821	
Middlesex	770	857	1,235	1,614	1,729	1,874	2,026	2,230	2,460	
Montpelier	8,782	8,609	8,241	8,247	8,035	7,982	7,899	7,832	7,780	
Moretown	788	904	1,221	1,415	1,653	1,768	1,892	2,047	2,301	
Northfield	4,511	4,870	5,435	5,610	5,791	5,899	6,012	6,162	6,311	
Plainfield	966	1,399	1,249	1,302	1,296	1,292	1,285	1,300	1,306	
Roxbury	364	354	452	575	576	606	636	669	703	
Waitsfield	788	837	1,300	1,422	1,659	1,777	1,914	2,071	2,230	
Warren	469	588	956	1,172	1,681	1,832	1,998	2,135	2,421	
Waterbury	4,303	4,614	4,465	4,589	4,915	5,041	5,172	5,350	5,579	
Woodbury	317	399	573	766	909	891	957	1,036	1,093	
Worcester	417	505	727	906	902	951	999	1,049	1,109	
County Total	**42,860**	**47,659**	**52,393**	**54,928**	**58,039**	**59,671**	**61,408**	**63,506**	**66,269**	
Orange County Towns										
Orange	430	540	752	915	965	1,030	1,101	1,181	1,276	
Washington	565	667	855	937	1,047	1,095	1,156	1,226	1,311	
Williamstown	1,553	1,922	2,284	2,839	3,225	3,393	3,631	3,901	4,224	
Subtotal:	2,548	3,029	3,891	4,691	5,237	5,518	5,888	6,308	6,811	
CV REGION	**45,408**	**50,688**	**56,284**	**59,619**	**63,276**	**65,189**	**67,297**	**69,814**	**73,080**	

As modified by Economic & Policy Resources, Inc. November 2002

A-4 "ECONOMIC AND DEMOGRAPHIC FORECAST, CENTRAL VERMONT PLANNING REGION, 2000 TO 2020" —HOUSING UNITS BY TOWN

FINAL3_2020G

HOUSING UNITS BY TOWN

Washington County Town	'60 Census	'70 Census	'80 Census	'90 Census	'00 Census	2005 EPR-CVRPC	2010 EPR-CVRPC	2015 EPR-CVRPC	2020 EPR-CVRPC
Barre City	3,523	4,003	4,048	4,220	4,242	4,267	4,350	4,462	
Barre Town	1,788	2,256	2,632	2,951	3,026	3,215	3,525	3,907	
Berlin	642	858	938	1,109	1,221	1,360	1,485	1,607	
Cabot	195	323	365	452	489	532	555	622	
Calais	213	422	567	616	656	756	844	962	
Duxbury	176	308	353	498	552	634	724	830	
E. Montpelier	455	638	827	1,007	1,081	1,175	1,262	1,468	
Fayston	88	252	327	484	532	587	678	810	
Marshfield	307	414	430	575	619	674	720	792	
Middlesex	240	417	547	663	739	807	891	1,042	
Montpelier	2,851	3,254	3,546	3,739	3,757	3,904	3,979	4,153	
Moretown	294	458	540	650	710	796	894	1,023	
Northfield	1,164	1,497	1,682	1,819	1,858	2,005	2,095	2,282	
Plainfield	295	421	460	487	501	521	530	568	
Roxbury	109	162	207	227	240	255	280	316	
Waitsfield	264	521	574	734	807	882	959	1,046	
Warren	178	374	512	742	827	914	983	1,126	
Waterbury	1,099	1,504	1,754	2,011	2,120	2,258	2,406	2,675	
Woodbury	130	221	275	329	366	399	456	519	
Worcester	145	250	324	346	381	407	431	484	
County Total:	**14,146**	**18,613**	**20,948**	**23,659**	**24,724**	**26,348**	**28,044**	**30,668**	
Orange County Towns									
Orange	139	241	312	362	393	430	470	523	
Washington	176	267	329	406	430	467	505	556	
Williamstown	499	751	1,036	1,248	1,332	1,463	1,603	1,787	
Subtotal:	**814**	**1,259**	**1,677**	**2,016**	**2,155**	**2,360**	**2,578**	**2,866**	
CV REGION	**14,960**	**19,872**	**22,625**	**25,675**	**26,879**	**28,708**	**30,622**	**33,534**	

As modified November 2002 by Economic & Policy Resources, Inc.

A-5 "ECONOMIC AND DEMOGRAPHIC FORECAST, CENTRAL VERMONT PLANNING REGION, 2000 TO 2020" —HOUSEHOLD SIZE BY TOWN

FINAL3_2020G

Household Size by Town

Washington County Town:	'60 Census	'70 Census	'80 Census	'90 Census	'00 Census	2005 EPR-CVRPC	2010 EPR-CVRPC	2015 EPR-CVRPC	2020 EPR-CVRPC
Barre City		2.90	2.45	2.34	2.20	2.17	2.09	2.01	1.93
Barre Town		3.64	3.14	2.82	2.58	2.58	2.54	2.40	2.24
Berlin		3.19	2.86	2.73	2.58	2.47	2.33	2.24	2.20
Cabot		3.40	2.97	2.86	2.68	2.60	2.49	2.47	2.37
Calais		3.52	2.86	2.78	2.48	2.46	2.29	2.22	2.13
Duxbury		3.53	2.85	2.69	2.59	2.50	2.33	2.24	2.19
E. Montpelier		3.51	3.16	2.71	2.56	2.49	2.41	2.37	2.15
Fayston		3.32	2.61	2.59	2.36	2.35	2.34	2.27	2.18
Marshfield		3.36	3.06	2.77	2.60	2.51	2.40	2.37	2.30
Middlesex		3.57	2.96	2.77	2.61	2.54	2.51	2.50	2.36
Montpelier		3.03	2.53	2.33	2.15	2.12	2.02	1.97	1.87
Moretown		3.07	2.67	2.62	2.54	2.49	2.38	2.29	2.25
Northfield		4.18	3.63	3.34	3.18	3.17	3.00	2.94	2.77
Plainfield		4.74	2.97	2.83	2.64	2.38	2.49	2.46	2.34
Roxbury		3.25	2.79	2.78	2.54	2.53	2.19	2.39	2.23
Waitsfield		3.17	2.50	2.43	2.26	2.20	2.17	2.16	2.15
Warren		3.30	2.56	2.29	2.27	2.21	2.18	2.17	2.15
Waterbury		4.20	2.97	2.62	2.44	2.38	2.29	2.22	2.09
Woodbury		3.07	2.59	2.79	2.46	2.43	2.40	2.27	2.12
Worcester		3.48	2.91	2.80	2.61	2.50	2.45	2.43	2.29
County:		3.37	2.81	2.62	2.45	2.41	2.33	2.26	2.16
Orange County Towns									
Orange		3.88	3.12	2.93	2.67	2.62	2.56	2.51	2.44
Washington		3.79	3.20	2.85	2.58	2.55	2.48	2.43	2.36
Williamstown		3.65	3.04	2.77	2.58	2.55	2.48	2.43	2.36
Subtotal:		3.72	3.09	2.80	2.60	2.56	2.50	2.45	2.38
CV REGION		3.39	2.83	2.64	2.46	2.43	**2.34**	2.28	2.18

2.34 in 2010

As modified by Economics & Policy Resources, Inc November 2002

A-6 REGIONAL PLAN IMPLEMENTATION PROGRAM

Progress Measures:

- Regional Plan actions are accomplished.
- Municipal plans continue to make progress towards achieving state planning goals, thereby receiving regional approval.
- State agency plans and programs are consistent with the Regional Plan.
- Municipalities achieve efficient local governance by working together on shared goals through intermunicipal districts or by using other tools.

Action / Strategy	Area	Recommended Lead / Partner	Estimated Cost	Timing	Priority	Financing
CVRPC will review this Plan in preparing its annual work program, and in all of its internal decision making, to ensure that our actions are consistent, defendable, and purposeful.	Region	RPC	Low	Annually in April and on-going	High	CVRPC
A Regional Plan implementation schedule which will establish priorities of key Plan goals for implementation followed by an annual review to evaluate progress, analyze current data, re-assess priorities, and consider possible amendments to the Regional Plan.	Region	RPC	Medium	5 years with subsequent annual reviews	High	CVRPC and State agreements
CVRPC will continue to provide technical assistance to member municipalities in the areas of community planning, bylaw development and administration, capital budgeting, community development, and GIS in accordance with our membership services policies.	Region	RPC / Municipalities	$600,000 - 800,000 annually	Annually	High	CVRPC, Towns, State and Federal grants and agreements
CVRPC will continue to provide local officials and interested citizens with information and training on the complete range of topics and issues presented in this Plan. We will do so through periodic workshops, newsletters, public forums, and the provision of	Region	RPC	$20,000 annually	Annually at various times through the year	Medium	CVRPC and project-based grants

Action / Strategy	Area	Recommended Lead / Partner	Estimated Cost	Timing	Priority	Financing
materials and information upon request.						
CVRPC will review State agency plans and programs to assure that they are consistent with the goals and policies of this Plan and those of member towns.	Region	RPC / Municipalities	$3,000 annually	Annually as needed	Medium	CVRPC, State grants and agreements
When requested, CVRPC will review municipal plans for consistency with this Plan.	Region	Municipalities / RPC	$2,500 per plan	Within 60 days of request	High	State agreements
CVRPC will maintain and strengthen its commitment to regional and intermunicipal issues and programs in accordance with, and in support of, this Plan. Specifically, we will continue our technical support services for the Mad River Valley Planning District, the Wrightsville Beach Recreation District, and the Mad River Solid Waste Alliance.	Region	RPC /Municipalities & Intermunicipal Districts	$20,000 annually	On-going	High	Districts, CVRPC, State agreements
CVRPC will continue to provide region-wide transportation planning services.	Region	RPC / VTrans	$250,000 annually	On-going	High	State agreement, Towns
CVRPC will respond to inter-town conflicts or opportunities with mediation or technical assistance services, where appropriate.	Region	RPC / Municipalities	Low	As requested	Medium	CVRPC, Towns
CVRPC will continue to participate in Act 250 proceedings in accordance with our adopted guidelines to advance the goals of this Plan.	Region	RPC	$10,000 annually	As needed	Medium	State agreements

CENTRAL VERMONT REGIONAL PLANNING COMMISSION

REGIONAL ENERGY PLAN

Central Vermont Regional Planning Commission
29 Main Street, Suite #4
Montpelier, Vermont 05602
802.229.0389
www.centralvtplanning.org

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ACKNOWLEDGEMENTS

The development of this plan would not have been possible without the assistance of the dedicated individuals that volunteered their time to participate on the Regional Energy Committee. This committee was established by the CVRPC Board of Commissioners to provide recommendations regarding energy planning and lead to action by the full Commission. The committee represented a diverse cross section of the region and interests to provide multiple perspectives that were critical to the development of this plan. The members that served on this committee include:

Steve Fitzhugh, Chair, Town of Northfield Planning Commission
Bram Towbin, Vice-Chair, Town of Plainfield Selectboard
Alex Bravakis, Novus Energy Development
Jackie Cassino, Vermont Agency of Transportation
Barbara Conrey, Montpelier Energy Committee
Robert Dostis, Green Mountain Power
Brian Fitzgerald, CVRPC (Town of Duxbury)
Karen Horn, Vermont League of Cities & Towns
Ron Krauth, CVRPC (Town of Middlesex)
Don La Haye, CVRPC (Town of Waitsfield)
Karin McNeill, Vermont Agency of Natural Resources
Julie Potter, CVRPC (Town of East Montpelier)
Patty Richards, Washington Electric Cooperative
Janet Shatney, CVRPC (Barre City)
Mark Sousa, Green Mountain Transit
Jamie Stewart, Central Vermont Economic Development Corporation
Paul Zabriskie, Capstone Community Action

How This Plan Will Be Used

The Central Vermont Regional Energy Plan will establish the policies that will help the Regional Planning Commission achieve its share of the state's goal of 90% of the state's energy coming from renewable sources by 2050, as outlined in the 2016 State Comprehensive Energy Plan. In order for this document to have standing, it will need to receive a Determination of Energy Compliance (DOEC) from the Vermont Public Utility Commission (PUC). This determination will give the Central Vermont Regional Plan "substantial deference" before the PUC during their review of applications for Certificates of Public Good related to renewable energy generation facilities.

Once a DOEC has been issued, the Central Vermont Regional Plan will be used to establish a position in proceedings before the PUC if warranted Additionally, where applicable, the plan will be used during Act 250 proceedings before the District 5 Environmental Commission. Finally, once a DOEC has been issued to the region, municipal plans will be reviewed against the Regional Energy Plan and against the standards of Act 174 for municipal planning. If all the requirements for municipal planning are successfully met, the Region will issue a DOEC for the municipal plan. This determination will provide the municipal plan with "substantial deference" before the PUC as applicable.

Additional Energy Generation Technology

The general premise of the Central Vermont Regional Energy Plan is based on the idea that generation of energy will be achieved using more renewable sources and less fossil fuel based resources. To this end, the focus for generation of energy is primarily based on existing technologies such as solar, wind, and hydroelectric. Additionally, the plan notes woody biomass and biogas as renewable forms of energy generation when developed in a sustainable manner. This direction is taken from the State's Comprehensive Energy Plan which focuses on electrification of the grid in order to meet their goals of 90% of the state's energy use coming from renewable sources by 2050.

The sources of renewable energy generation that are identified in this plan include current technologies that are known and supported in Vermont. Advances in the development of renewable energy technologies may result in generation measures or techniques that are not currently considered in this plan but may be more efficient or effective. As such, this plan will consider renewable generation technologies that do not have an adverse impact on the region, its municipalities, or the policies that guide the Regional Planning Commission and not be limited exclusively to the generation techniques and technologies noted herein.

EXECUTIVE SUMMARY & INTRODUCTION

The 2017 Central Vermont Regional Energy Plan represents the efforts of the Central Vermont Regional Planning Commission, through it's Regional Energy Committee to develop a plan that will receive a Determination of Energy Compliance (DOEC) through the Vermont Public Utilities Commission (PUC). A DOEC will give the Central Vermont Regional Plan "substantial deference" before the PUC for applications that seek to receive a Certificate of Public Good.

The 2016 State Comprehensive Energy Plan identified a goal to have 90% of the state's energy needs derived from renewable sources by 2050. As part of this goal, the Vermont State Legislature passed Act 174 in 2016. Act 174 provides an avenue for regions and municipalities to have increased input in PUC determinations for Certificates of Public Good regarding renewable energy generation facilities. As such, Act 174 identified standards that need to be met in support of the state's goal of 90% renewable energy by 2050 in order to have a plan receive a DOEC and have "substantial deference". Otherwise, a plan will receive "due consideration" in the Section 248 review process. Act 174 is categorized as enhanced energy planning and goes beyond what is outlined in 24 VSA 117 Section §4348a and §4382 respectively.

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 energy sectors that include thermal (heating), electrical, and transportation.

Section I: Analysis & Targets

This section provides a baseline of information for where a region or municipality currently stand in terms of energy and identifies the trajectories and pace of change needed to meet targeted reductions and conservation of energy. It incudes information on current electricity use for residential and non-residential uses; existing

and potential renewable resource generation; and current transportation energy use information. Additionally, targets are established to provide milestones for thermal efficiency, renewable energy use, and conversion of thermal and transportation energy from fossil fuels to renewable resources. These milestones are intended to help the region measure progress towards the overall goals and are not identified as requirements. Targets are established for the years 2025, 2035, and 2050 which coincide with the State Comprehensive Energy Plan.

Specific information in this section notes the region currently uses approximately 600,000 megawatt hours of electricity on an annual basis across the identified sectors. By comparison, the regional share of new renewable energy generation needed to meet the state's goal is approximately 420,000 megawatt hours. Based on the mapping and resource data (Section III), the region has resources available to generate approximately 90,000,000 megawatt hours of energy.

Other analysis includes 2050 targets for fuel switching of vehicles from fossil based to alternative power, and conversion or installation of high efficiency heating systems for residential and commercial structures. Specific targets for Central Vermont include approximately 75,000 alternative powered vehicles and approximately 14,500 heating systems. These targets may be ambitious for Central Vermont based on the number of existing vehicles and structures which are listed at approximately 45,500 and 30,000 respectively. Also, specific implementation actions in this plan call for increased transit use which could reduce the overall need for vehicles region-wide. The specific 2050 targets for transportation and heating renewable use in Central Vermont are 90.2% and 92.5% respectively.

Section II: Pathways & Implementation Actions

Section II provides the basis for how the region will meet their target year goals as noted in Section I. The implementation actions are categorized by:

1. Conservation & efficient use of energy
2. Reducing transportation demand and single occupancy vehicles trips, and encouraging the use of renewable sources for transportation
3. Patterns and densities of land use likely to result in conservation of energy
4. The siting of renewable energy generation

The implementation actions that are identified in this section focus primarily in areas where the Central Vermont Regional Planning Commission is already working to support its member municipalities through local land use, transportation, and environmental planning activities.

To this end, the 2016 Central Vermont Regional Plan was first reviewed and implementation actions that pertained to any of the above mentioned sections were noted. These implementation items were carried forward for inclusion in the Regional Energy Plan to establish consistency with the two documents. To ensure all the categories for implementation as noted above were adequately addressed, guidance from the Department of Public Service related to implementation was utilized.

The implementation actions identify who will be responsible for completing each action, the timeframe for when it should be completed, and an anticipated outcome that will help provide a measure of success. This section will serve as the basis for how energy planning will be incorporated into regional activities. The implementation actions that were included are based on the CVRPC's ability to lead the action. This will

create consistency with regard to implementation and put the responsibility for action on the CVRPC. Other partners are listed when appropriate to indicate which groups will be engaged support the successful completion of the identified actions.

Section III: Mapping

The mapping section allows the region to visually identify where renewable energy generation is most suitable. This section combines resource information with specific known and possible constraints to the development of renewable energy generation. The mapping section also allows the opportunity to identify preferred locations for renewable energy development and areas that are unsuitable for development of any kind. In addition, the maps identify existing infrastructure to support renewable energy development.

In general, the mapping information looks at state-level data and breaks it down to a regional perspective. From there, an analysis was done (as noted in Section I) regarding the potential renewable energy generation that might be possible based on resource areas and constraints. This information is useful to visualize what geographies throughout Central Vermont are most ideally suited or best to avoid regarding renewable energy siting.

This section also contains specific policy information regarding the development and siting of renewable energy resources that are reflected on the maps. It was determined that no specific locations would be identified at a regional level as being preferred or prohibited areas for the development of renewable energy generation. This was done to allow the municipalities to decide if it was appropriate to identify these areas locally, rather then have this information dictated by the region. The Regional Planning Commission did, however, identify additional possible constraints to be considered. These include elevations above 2,500 feet, slopes greater than 25%, municipally owned lands, and lakeshore protection buffer areas of 250 feet. The decision was made to include these resources as possible constraints to allow for further analysis by the region or the municipalities to determine if development of renewable energy generation facilities may be appropriate based on specific conditions.

Appendices

There are three appendices included with this plan. Appendix A provides definitions for the known, possible, and regional constraints that are included on the maps and discussed in Section III. These definitions include source information and in several instances provide insight as to why the particular resource is listed as a known, possible, or regional constraint. Appendix B includes the specific regional resource and constraint maps. Included in the resource mapping is data specific to wind, solar, hydrological, and woody biomass. All of these maps also include information regarding three-phase power and transmission lines; roads; and other relevant data used to assist with siting of renewable energy development. Finally, Appendix C includes information related to Long-Range Energy Alternatives Planning (LEAP) modeling. The LEAP model is what established the baseline information for the entire state regarding current energy use and necessary reductions in energy use in order to achieve the state's goals of 90% renewable energy use by 2050. This information serves as the primary data source for the information in Section I. The methodology for how the modeling was conducted is also included in Appendix C.

CONFLICT RESOLUTION

The following information is being provided to help guide the process and ensure conflicts that may arise through regional or local energy planning are identified and addressed as early in the process as possible. Municipalities are encouraged to work with the Regional Planning Commission and their neighbors when developing an energy plan to identify any potential conflicts. Early discussions during the planning process may help alleviate the need to engage in the conflict resolution process as noted below.

Three conflict types are identified. These include:

1. Conflicts between a municipal energy plan and the regional energy plan
2. Conflicts between two municipal energy plans
3. Conflicts between the regional energy plan and the Central Vermont Regional Plan.

Conflicts between a municipal energy plan and the regional energy plan

The regional energy plan has been purposefully written to limit the region from dictating how the municipalities need to address renewable energy development and the standards of Act 174. The regional plan focuses on impacts at the regional scale and provides general guidance to municipalities regarding siting, renewable energy generation technology, and specific implementation actions. This was done to allow municipal energy plans to include specific detail related to these aspects while limiting conflicts with the regional energy plan.

If a municipal energy plan is in conflict with the regional energy plan regarding siting, the type of renewable energy generation, or implementation actions that will only impact the host municipality, the municipal energy plan will take precedent. If, however, the municipality proposes an action that will adversely impact a regionally significant resource (such as critical habitat) that is specifically identified in the Central Vermont Regional Plan, then the regional energy plan would take precedent and provide guidance to the Public Utility Commission or the District 5 Environmental Commission. Consistency with the Central Vermont Regional Plan and regional energy plan is necessary for municipalities requesting regional approval of their municipal development plan or municipal energy plan.

Conflicts between municipal energy plans

Requirements for a municipal development plan are outlined in statute. Specifically, 24 VSA 117 §4382(a)(8) requires, "A statement indicating how the plan relates to development trends and plans for adjacent municipalities, areas and the region developed under this title." To this end, municipalities are required to consider the development trends and plans in adjacent municipalities during the drafting of their municipal development plans. As such, the following process will be considered to assist in the resolution of potential conflicts between municipalities during the development of municipal energy plans.

This process only applies to the development of municipal energy plans. Notifications for specific projects seeking a Certificate of Public Good from the Public Utility Commission will follow the process outlined in 30 VSA 5 §248 for notification of municipal planning commissions, regional planning commissions, and interested parties.

1. If the policy or action being proposed by the host municipality will adversely impact a resource within the adjacent municipality (or municipalities) that has been identified in a municipal development plan, the host municipality must provide justification in writing as to why the policy or action is necessary. This notice must be sent to all effected adjacent municipalities and the Regional Planning Commission. If the adjacent municipality is outside of the Central Vermont RPC's jurisdiction, the adjacent municipality's RPC will also be notified.

2. If the adjacent municipality or regional planning commission objects to the justification as presented, a written response will be provided to the host municipality citing any studies or empirical data to support their objection. If the host municipality is not persuaded by any objections to change its position, the statement addressing 24 VSA 117 §4382(a)(8) will include information noting the inconsistency with the adjacent municipality. This notation may impact a municipality's ability to receive regional approval of a municipal plan.

An affected municipality may request assistance in mediating the conflict from the Regional Planning Commission. The Regional Planning Commission will consider the impacts on available resources when evaluating these requests.

Conflicts between the regional energy plan and the regional development plan

The Central Vermont Regional Energy Plan is intended to be a complimentary document and to inform land use decisions of the region related to energy. While efforts have been taken to ensure consistency with the regional energy plan and the rest of the Central Vermont Regional Plan, conflicts may exist. In the instance a conflict exists between policies or actions of the Central Vermont Regional Plan and the Central Vermont Regional Energy Plan, the more restrictive interpretation will be used to evaluate a proposal of regional significance. Additionally, the inconsistency will be noted and discussed by the Regional Plan Committee who will provide a recommendation to the full Commission on how to rectify the inconsistency.

PUBLIC PROCESS

The Regional Energy Committee held public meetings each month from December through May to develop a draft regional energy plan that could be reviewed against the specific standards outlined in Act 174. This draft was presented to the Regional Commission for consideration at their regular meeting on June 13, 2017. At that meeting, the three primary sections of the plan were presented for consideration. Several minor comments were discussed and changes were made as appropriate. On June 19, 2017, the Draft Central Vermont Regional Energy Plan was submitted to the Department of Public Service for review and comments against the standards of Act 174.

On October 30, 2017, the Department of Public Service returned comments on the Draft Central Vermont Regional Energy Plan. In the same transmittal, comments from the Agency of Natural Resources and the Agency of Agriculture, Food, & Markets were provided. Comments were also received from the public and staff at the Agency of Transportation who participated as members of the Regional Energy Committee. All of these comments were evaluated and incorporated as appropriate. On November 29, 2017 and December 7, 2017, the Central Vermont Regional Energy Committee met to discuss the updates to the draft regional energy

plan and recommend additional changes based on the comments received. At the meeting on December 7th, the Regional Energy Committee made a recommendation to the Central Vermont Regional Planning Commission's Board of Commissioners regarding approval of the draft.

In addition to the regular public meetings of the Regional Energy Committee, The CVRPC engaged in a robust public outreach effort to solicit feedback on the Draft Central Vermont Regional Energy Plan. This included:

- Tabling at the Waterbury LEAP Energy Fair
- Informational handouts distributed at 2017 Town Meeting Day
- Addition of a section of the CVRPC webpage dedicated to energy
- Presentations to the Barre Area Development Corporation on 12/12/2016 & 11/13/2017
- Open public comment period on the draft plan from 09/22/2017 through 10/31/2017
- Presentation to the Barre City Energy Committee on 10/23/2017
- Memo and discussion with the Central Vermont Transportation Advisory Committee on 10/24/2017
- Presentation to Downstreet Housing & Community Development on 11/15/2017
- Presentation to the Montpelier Energy Advisory Committee on 11/21/2017
- Two training sessions on Act 174 requirements and standards throughout the region
- Development of analysis & targets and mapping data for each CVRPC municipality

Additionally, the CVRPC will continue to evaluate and update the Central Vermont Regional Energy Plan as needed to ensure actions and information remains current and consistent with statewide planning goals.

ANALYSIS & TARGETS

In order to adequately determine if the Central Vermont Region is on the right path to meeting it's share of the state's goal of 90% of the energy used being produced by renewable sources, an identification and analysis of current energy use is necessary. To this end, the following questions have been identified to help determine current energy use and targets for moving forward.

I. *Does the plan estimate current energy use across transportation, heating, and electric sectors?*

II. *Does the plan establish 2025, 2035, and 2050 targets for thermal and electric efficiency improvements, and use of renewable energy for transportation, heating, and electricity?*

III. *Does the plan evaluate the amount of thermal-sector conservation, efficiency, and conversion to alternative heating fuels needed to achieve these targets?*

IV. *Does the plan evaluate transportation system changes and land use strategies needed to achieve these targets?*

V. *Does the plan evaluate electric-sector conservation and efficiency needed to achieve these targets?*

These five questions and their respective responses serve as the basis for identifying where the region is now, where the region needs to go, and how it will get there in terms of its energy future.

The information needed to answer the five questions listed above was procured from various sources. This includes information from the American Community Survey (as part of the U.S. Census), The Vermont Agency of Transportation, the Vermont Department of Labor, the Vermont Department of Public Service, Efficiency Vermont, the Vermont Energy Investment Corporation (VEIC), and the Central Vermont Regional Planning Commission. A significant portion of the data related to targets was provided by the VEIC through a process known as Long-Range Energy Alternatives Planning or LEAP. This modeling factors in a significant number of data points and has been used extensively throughout the world for energy planning such as this.

The majority of the data in this section was developed with a "bottom up" approach. That is to say, the data was developed at a municipal scale to complete the requirements of Standard 5 of the Energy Planning Standards for Regional Plans. The municipal data was then aggregated to establish a regional total. The one primary exception to that is the LEAP data, which was modeled at a regional scale. The LEAP data serves as the basis for the conservation and efficiency targets that are included in this plan. To that end, it is important to note that the data provided herein is only a starting point and should be used to establish a general direction, not a required outcome. This data is presented as a way to gauge the region's overall progress towards achieving 90% of its regional energy used produced from renewable sources. As new or better data is provided or developed, these tables will be updated to reflect the changes.

I. Estimates of current energy use across transportation, heating, and electric sectors

In order to determine where we need to go with our energy future, it is important to know where we currently are. Included in this is an identification of the existing sources of energy generation. In general, energy can be divided into four basic categories where discussions can be focused. These include resource type, land use, transportation, and siting. While all four are related and interconnected, they all serve separate components that need to be addressed individually as well as collectively.

Resource Type

The 2016 State Comprehensive Energy Plan notes four primary resource types for energy that are used throughout the state. These include non-combustion based renewables (including wind, hydroelectric, and solar), combustion based renewables (including biomass), nuclear energy, and fossil fuels. Fossil fuels account for a majority of the energy used in the state with natural gas and petroleum products accounting for 62% of Vermont's total energy use[1].

Non-Combustion Based Renewables

Non-combustion based renewables includes all the typical sources of energy generation such as wind, solar, and hydroelectric. Based on information from the Vermont Department of Public Service and the Energy Action Network's Community Energy Dashboard, there are approximately 1,300 sites in Central Vermont that are producing renewable energy across the three resource types. This accounts for approximately 130,000 megawatt hours of energy produced annually within Central Vermont. This amounts to approximately 3.5% of the annual energy consumption in Central Vermont.

Combustion Based Renewables

A second category of renewable energy generation is combustion based. Combustion based renewables include methane gas, anaerobic digesters, biodiesel, combined heat and power, compost heat, and woody biomass. Combustion based renewables are used for both electricity generation and thermal heating.

When looking at combustion based renewables for thermal heating, woody biomass is the most common form in Central Vermont. Wood products or byproducts such as wood pellets or wood chips are the most popular form of biomass heating. According to data from the U.S. Energy Information Administration, in 2015 one in six Vermont households used some form of biomass as their primary home heating source.

Currently, the primary electricity generator of combustion based renewables is methane gas. In Central Vermont, the Moretown Landfill provides the primary source of electrical generation from biomass in the form of methane gas. According to the 2014 Green Mountain Power (GMP) Integrated Resource Plan, GMP has an agreement with Moretown Landfill to purchase 100% of their energy generation capacity totaling approximately three megawatts, through 2023. Additionally, the Washington Electric Cooperative receives a majority of its energy generation from the Coventry Landfill in Coventry, Vermont. According to the Washington Electric Cooperative's data, in 2014 over 53% of their power came from the Coventry facility. Table One indicates the existing renewable electricity generation for the Central Vermont region.

1. 2016 Comprehensive Energy Plan – p.389.

TABLE ONE EXISTING REGIONAL RENEWABLE ELECTRICITY GENERATION		
RESOURCE TYPE	**MEGAWATTS**	**MEGAWATT HOURS**
Solar	24	29,919
Wind	.14	486
Hydroelectric	25	88,467
Biomass (including wood, methane, and farm biogas)	3	13,091
Other	0	0
Total Existing Regional Renewable Electricity Generation	52.14	131,963

Notes:
1. Information provided by the Department of Public Service, 2015
2. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
3. Municipal data can be found at http://centralvtplanning.org/programs/energy/municipal-energy-planning/

Nuclear Energy

The Central Vermont Region's energy portfolio has been significantly impacted by the decommissioning of the Vermont Yankee Nuclear Facility in Vernon, Vermont. This facility, which was shut down at the end of 2014, provided approximately 55% of the electrical generation capacity for the State of Vermont. To make up for the loss of generation from Vermont Yankee, utility companies throughout the state have filled this gap through a variety of ways and established long-term contracts with other market power providers. Sources for this electricity generator consist of both renewable and non-renewable sources including wind, solar, hydroelectric, natural gas or other in-state utility owned renewable generation contracts.

Based on data from the Vermont Public Service Department, in 2011 the majority of energy being provided to Central Vermont from Green Mountain Power, Hardwick Electric Department, Northfield Electric Department, and Washington Electric Cooperative was from hydroelectric sources including Hydro Quebec. In fact nuclear energy as a source accounted for only about 10% of the energy generation for the service providers in Central Vermont.

Fossil Fuels

Fossil fuels are all non-renewable sources of energy that are generally carbon based and formed over millions of years from organic matter (including plants and animals) that were gradually buried under layers of rock. These fuels include natural gas, coal, and oil. Fossil fuels are typically refined for use as gasoline or other distillate fuels such as diesel fuel; home heating oil; or transported as natural gas.

In general, the majority of fossil fuel usage is attributed to home heating (including water) in the form of natural gas or home heating oil, or for transportation to fuel vehicles. According to information from the U.S. Energy Information Administration, natural gas fired power plants are providing energy to Vermonters, however these plants are generally located outside of the state. Additional information regarding fossil fuels will be included in the discussion on transportation later in this document.

In order to further refine the existing energy picture within Central Vermont, the CVRPC calculated its current energy consumption for transportation, heating, and electric use. This included both commercial and residential heating information. This information is listed in Tables Two through Six.

TABLE TWO CURRENT REGIONAL TRANSPORTATION ENERGY USE	
DATA CATEGORY	**INFORMATION**
Total number of vehicles	45,584 vehicles
Average miles traveled per vehicle	12,500 miles
Total regional miles traveled	567,650,000 miles
Average gallons of fuel used per vehicle per year	576 gallons
Total regional gallons of fuel used per year	30,518,817
Transportation energy used per year (in Billions)	3,396 BTUs
Average regional cost per gallon of fuel	$2.31
Regional fuel costs per year	$70,488,465.00

Notes:
1. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
2. Total vehicles provided by the American Community Survey.
3. Average miles traveled & Average gallons of fuel used per vehicle provided by VTrans.
4. Average cost per gallon of fuel provided by the CVRPC.
5. Information related to public transit is not included in this table.

TABLE THREE CURRENT REGIONAL RESIDENTIAL HEATING ENERGY USE BY FUEL SOURCE				
FUEL SOURCE	**NUMBER OF HOUSEHOLDS**	**PERCENT OF HOUSEHOLDS**	**REGIONAL HEATED SQUARE FOOTAGE**	**REGIONAL BTUs (in Billions)**
Natural Gas & Propane	5,983	22.2%	9,632,438	578
Electricity	1,206	4.5%	1,494,263	90
Fuel Oil	14,238	52.9%	24,431,228	1,466
Coal	66	.2%	132,664	8
Wood	5,031	18.7%	9,493,439	570
Other (includes solar)	392	1.5%	696,536	42
No Fuel	22	.1%	42,680	3
TOTAL	**26,938**	**100%**	**45,923,248**	**2,755**

Notes:
1. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
2. Data provided by the American Community Survey.

TABLE FOUR CURRENT REGIONAL COMMERCIAL THERMAL (HEATING) ENERGY USE		
COMMERCIAL ESTABLISHMENTS	**AVERAGE THERMAL ENERGY USED PER ESTABLISHMENT**	**COMMERCIAL THERMAL ENERGY USED REGIONALLY**
2,647	699	1,847,355

Notes:
1. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
2. Thermal energy use is expressed in Millions of BTUs.
3. Information provided by the Vermont Department of Labor and the Department of Public Service.

While Table Four identifies the amount of energy used regionally for commercial thermal (heating) purposes, Table Five provides a list of the sources of fuel being used by the commercial establishments in the region for thermal purposes. Even though a large percent of commercial establishments currently use electricity for their heating needs, non-renewable fuels such as propane and fuel oils are almost as common.

TABLE FIVE CURRENT REGIONAL COMMERCIAL HEATING USE BY FUEL SOURCE		
FUEL SOURCE	**NUMBER OF ESTABLISHMENTS**	**PERCENT OF ESTABLISHMENTS**
Biofuel	0	0.0%
Distillate Fuel Oil	505	19.1%
Electric Use	922	34.8%
LPG	381	14.4%
Natural Gas	0	0.0%
Residual Fuel Oil	51	2.0%
Wood & Wood Waste	165	6.2%
Other	623	23.5%
Total Commercial Establishments	**2,647**	**100%**

Notes:
1. Information derived from VEIC LEAP Modeling.
2. Data based on 2015 information

TABLE SIX CURRENT REGIONAL ELECTRICITY USE	
USE SECTOR	**CURRENT ELECTRICITY USE**
Residential	241,268 megawatt hours
Commercial & Industrial	353,117 megawatt hours
TOTAL	**594,385 megawatt hours**

Notes:
1. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
2. Information provided by Efficiency Vermont.

II. 2025, 2035, and 2050 targets for thermal and electric efficiency improvements, and use of renewable energy for transportation, heating, and electricity

With the baseline information established for the region, the next step is to identify what targets need to be met in order for the region to achieve its share of the state's renewable energy goals. The 2016 State Comprehensive Energy Plan identifies target years of 2025, 2035, and 2050 as specific points to help measure progress. Using these same target years, the Central Vermont RPC has identified percentage targets for efficiency improvements regarding transportation, heating, and electricity.

The targets indicated in Tables Seven, Eight, and Nine are cumulative totals and account for the previous target year's percentages. For example, the residential thermal efficiency target for 2035 in Table Seven indicates that 42% of the residential units should be weatherized and efficient. This could be done through a combination of new construction or weatherization of existing structures. These are targets for the region to try and achieve and not a mandate on what they must accommodate.

The information in Tables Seven, Eight, and Nine were developed using the Long-Range Energy Alternatives Planning (LEAP) Model as provided by the Vermont Energy Investment Corporation (VEIC). VEIC was contracted to provide modeling support for this project and developed the LEAP model for each Regional Planning Commission to reflect their share of the state totals. The percentages are weighted heavier in the later years which assumes increases in efficiencies and technological improvements that will establish these targets.

TABLE SEVEN
REGIONAL TARGETS FOR THERMAL EFFICIENCY IMPROVEMENTS OF EXISTING STRUCTURES

SECTOR TYPE	2025	2035	2050
Residential Thermal Efficiency	20%	42%	92%
Commercial Thermal Efficiency	22%	33%	61%

Notes:
1. Information derived from VEIC LEAP Modeling.
2. Assumes a base year of 2015.
3. Percentages are cumulative for each target year.

Table Seven identifies the percentage of existing residential and commercial structures in Central Vermont that would need to be weatherized in each of the target years to meet the State's energy goals. These targets also assume that new structures will be built based on existing state energy codes and therefore meet or exceed the needed efficiency standards.

In addition to the thermal efficiency improvements of existing buildings outlined in Table Seven, Table Eight identifies the electric efficiency improvements needed for each target year to meet the renewable energy goals in the State's Comprehensive Energy Plan. The electric efficiency is an indication of how much efficiency is needed across all sectors. It is a comparison between anticipated electricity use for each target year versus the electricity use in the base year, which in this case, is 2010.

TABLE EIGHT REGIONAL TARGETS FOR ELECTRIC EFFICIENCY IMPROVEMENTS ACROSS ALL SECTORS			
SECTOR TYPE	**2025**	**2035**	**2050**
Electric Efficiency	1.5%	7.3%	15.2%

Notes:
1. Information derived from VEIC LEAP Modeling.
2. Assumes a base year of 2015.
3. Percentages are cumulative for each target year.

Table Eight outlines the electric efficiency improvements needed for each of the three target years. These targets would cover all sectors including electric, thermal (heating), and transportation. Many of these efficiencies will be met through technological changes and improvements that will occur over time, however conversions to more efficient technologies will need to be supported. Specific policies and actions to encourage conversions for efficiencies are outlined in the Pathways & Implementation Actions section.

Similar to Tables Seven and Eight, Table Nine identifies the percent of energy use to be derived from renewable sources for energy related to transportation and thermal needs. While energy needs for transportation and thermal uses are different, Table Nine is intended to identify percentage of renewable energy use for these two sectors and not intended to provide a parallel association between these two sectors.

TABLE NINE REGIONAL TARGETS FOR RENEWABLE ENERGY USE BY SECTOR			
SECTOR TYPE	**2025**	**2035**	**2050**
Transportation Use	9.6%	31.3%	90.2%
Thermal Use	52.3%	66.6%	92.5%

Notes:
1. Information derived from VEIC LEAP Modeling.
2. Assumes a base year of 2015.
3. Percentages are cumulative for each target year.

A major factor that will impact these targets are market forces which are beyond the control of an individual municipality or region. With that in mind, the region (and therefore the municipalities) should work to ensure barriers don't exist that would adversely impact the ability to reach these targets. The Pathways & Implementation Actions identified in this plan will discuss this in more detail.

TABLE TEN REGIONAL TARGETS FOR NEW RENEWABLE ELECTRIC ENERGY GENERATION			
SECTOR TYPE	**2025**	**2035**	**2050**
New Renewable Electric Energy Generation	104,620	167,404	418,531

Notes:
1. Information provided by The Department of Public Service.
2. Values are in megawatt hours.
3. Assumes a base year of 2015.

Table Ten notes the renewable electricity generation for each of the target years and is expressed in megawatt hours. The identification of these targets by megawatt hour is a significant factor because it represents energy (megawatt hours) as opposed to power (megawatt). In this case, the megawatt hours identified denote the amount of renewable energy that should be consumed as part of the total energy being consumed by the target years. This information was generated base on data provided by the Department of Public Service and information developed by the Regional Planning Commission.

III. Evaluation of the amount of thermal-sector conservation, efficiency, and conversion to alternative heating fuels needed to achieve these targets

One important way for each region to support and work collectively to achieve the state's goal of 90% renewable energy generation by 2050 is through conversion and development of alternative fuels. Conversions to more efficient technologies such as cold climate heat pumps for residential heating or switching to electric vehicles will mean that less energy needs to be generated as efficiencies in technologies increase. If less energy needs to be generated, the energy being generated from renewable sources will provide more of the demand over time.

Table Eleven outlines the thermal sector conversions to wood heat and heat pumps. For these tables residential and commercial uses are combined to indicate the total fuel switching needed.

TABLE ELEVEN
REGIONAL THERMAL SECTOR CONVERSIONS
(RESIDENTIAL & COMMERCIAL)

SYSTEM TYPE	2025	2035	2050
New Efficient Wood Heat Systems	117	108	966
New Heat Pumps	2,792	7,198	13,630

Notes:
1. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
2. Information derived from VEIC LEAP Modeling.
3. Heat pumps includes both space heating and hot water heating.

The information in Table Eleven is derived from calculations based on information provided in the LEAP modeling data. As with other targets, the numbers identified for each target year represent the number of new systems needed to achieve the overall efficiency goals. It should be noted that Table Eleven only highlights efficient wood burning systems and heat pumps. This is an indication that using these two technologies could account for all the changes needed in Central Vermont regarding conversions from fossil fuel based heating systems such as fuel oil or natural gas.

Other options for conversion of residential and commercial heating systems may be available that would satisfy the goals of the state's comprehensive energy plan. Wood systems are being highlighted due to their renewable fuel. Heat pumps are being highlighted because the 2016 State Comprehensive Energy Plan focuses on electrification. Therefore a high efficiency electric heat pump would address the efficiency goals while the electricity to power the system being generated from renewable sources.

Another system type that should be encouraged is geothermal heating and cooling. Geothermal systems use the consistent temperature of the earth to either provide heat or cooling to homes and businesses. Geothermal systems generally require an electric fan to force air through the system, however like with other systems, the increase in efficiency through technology and the electrification of the grid make systems like this a viable option to address conservation and conversion of systems.

One challenge that will need to be addressed regarding conversions and conservation efforts will be the tracking and monitoring of system upgrades or improvements that address efficiency to increase weatherization of residential and commercial properties. While specific programs are set up to help track and score these changes, many homeowners and business owners make changes and upgrades as part of the normal lifecycle of a property. These systems are often upgraded without any formal acknowledgement of the possible efficiency improvements being made. In order to measure how the targets in Table Eleven are being met (or not being met), a methodology should be developed to ensure the necessary information is gathered when changes occur. This will be addressed in the Pathways and Implementation Actions section.

IV. Evaluation of transportation system changes and land use strategies needed to achieve these targets

Transportation

As noted in Table Two, the average vehicle miles traveled for residents in Central Vermont is approximately 12,500 miles per year. At an average cost of approximately $2.31 per gallon of fuel and an efficiency factor of approximately 22 miles per gallon of fuel, the average person living in Central Vermont is spending approximately $1,300 dollars on fuel each year. According to information from the American Automobile Association, the average cost of owning a vehicle can range from approximately $6,500 for a small sedan to $10,400 for an SUV[2]. By creating development patterns whereby uses are in closer proximity to where people live, work, or recreate, trips can be combined or alternative modes of transportation can be employed. This will reduce the vehicle miles traveled and therefore reduce the transportation costs to individuals.

Another option to consider when evaluating system changes is the conversion to electric or alternative fuel vehicles. Vehicles that are powered by renewable energy sources increase efficiency, reduce greenhouse gas emissions, and can reduce the need for fossil fuels. While switching to alternative fuel vehicles does not reduce the vehicle miles traveled, it does reduce the dependence on fossil fuels. These changes also require improvements to infrastructure such as grid capacity to transmit the electricity as well as an increase in the volume of charging stations to provide additional opportunities and locations for vehicle charging thus increasing the range of electric vehicles.

An evaluation of LEAP data and information from the American Community Survey identifies the number of vehicles needed to be switched from fossil fuels to renewable fuels. Specifically, conversion to electric vehicles and biodiesel vehicles was noted in the LEAP analysis in order to meet the needed reductions in energy related to transportation. Table Twelve identifies the number of electric and biodiesel vehicles needed for each of the three target years in order to meet the energy reduction goals related to transportation as identified in the LEAP analysis.

2. 2016 article from the American Automobile Association (AAA) http://newsroom.aaa.com/auto/your-driving-costs/. Costs include fuel, insurance, maintenance, registration, depreciation, and similar expenses associated with owning a vehicle and is based on driving 15,000 miles per year.

TABLE TWELVE REGIONAL TRANSPORTATION FUEL SWITCHING TARGETS			
FUEL TYPE	**2025**	**2035**	**2050**
Electric Vehicles	3,902	26,954	53,809
Biodiesel Vehicles	6,801	12,603	20,438

Notes:
1. Information derived from VEIC LEAP Modeling.
2. Assumes the replacement of existing vehicles with new alternative fuel vehicles.

It is important to note that Table Twelve indicates the number of fossil fuel based vehicles that would need to be replaced with alternative fuel vehicles to meet the reduction goals for transportation energy by each target year. That is to say that of all the new vehicles on the road in 2025, approximately 10,700 of those vehicles would need to use alternative fuels as the primary fuel type. For reference, electric vehicles would be similar to a standard passenger vehicle currently using gasoline and biodiesel vehicles would be consistent with light or heavy duty trucks that currently run on standard diesel fuels.

In addition to the information regarding transportation that is noted in this plan, the Central Vermont Regional Planning Commission maintains a regional transportation plan. Under the direction of a Transportation Advisory Committee (TAC), the CVRPC identifies annual transportation priorities to be considered by the Agency of Transportation. These priorities will help determine not only the direction of future transportation projects within the region, but may also impact land use decisions a the regional or local level. This underscores the importance to coordinate transportation objectives with land use priorities to ensure a coordinated approach to land development is pursued. The confluence of land use and transportation will impact future needs and impacts to energy use including conservation, conversions, infrastructure needs, and siting. The Regional Transportation Plan provides more significant detail on specific projects that may impact the Region's energy planning future and should be considered part of the Region's energy planning priorities.

Land Use

One key factor that impacts the amount of energy being used is land use. Land use directly impacts and influences our choices, especially as they relate to transportation. When land use patterns focus on density, compact development, or mixing of uses, the result can be an area that is walkable, bicycle friendly, or promote public transit use.

Land use planning and management can have a direct impact on how much energy is used and consumed in regard to transportation. As development density decreases (creating fewer lots or uses per acre), the impacts associated with that decrease in density will rise. This includes both costs and consumption of resources including energy to move people from place to place. As land uses are spread further from one another, more resources are required to link those uses together. This includes infrastructure such as roads or utilities; needs for emergency services such as police, fire, and ambulance, and increases in municipal service needs such as road maintenance.

In order to reduce the costs and needs for energy related to transportation and land uses, changes in land development will need to occur. One significant way that this can be addressed is through amendments to land development regulations such as zoning or subdivision. Changes to land development regulations that require

pedestrian facilities such as sidewalks or multi-use paths to connect uses or activity centers is one technique that can be used to help create alternative transportation options in a community. Additionally, smaller changes could be implemented that can have larger impacts. Examples of this include reducing lot sizes, reducing parking requirements, adjusting setbacks, implementing traffic calming measures, or increasing building heights are all ways to maximize development potential within the framework of existing land development regulations.

If a municipality does not have land development regulations, there are still avenues that can be explored from the non-regulatory side that would impact land development practices. For example, developing a capital plan for public utilities and services that is consistent with a municipal plan can identify and prioritize where public funds should be spent. This could include sidewalk connections, park & ride facilities, or water and wastewater services. Expansions to emergency services or road maintenance equipment can also be a way to signal intended growth. Receiving a state designation for a Downtown, Village Center, Growth Center, New Town Center, or New Neighborhood Development Area can provide the basis for non-regulatory growth management and the tools necessary to regulate development without a formally adopted set of regulations. Finally, having clear goals, policies, and action items identified in municipal plans will impact how a community grows and therefore how the connection between land use and transportation is addressed on a municipal basis.

Currently, 19 of the 23 municipalities in the Central Vermont Region have some form of development regulation. Six of the 19 only have zoning regulations in place while the other 13 have zoning and subdivision regulations. Additionally, 12 of the municipalities have an active state designation and several municipalities have multiple designations. For example, the City of Montpelier has both a Downtown and a Growth Center designation, while the Town of Calais has three village centers that are designated including Adamant, East Calais, and Maple Corners.

While the techniques noted herein can help provide avenues for changes to support development density and create compact development patterns, a primary factor that will influence development density is adequate infrastructure to accommodate water and wastewater. Water and wastewater infrastructure is critical to provide a development pattern that includes density, mixed uses, and alternative transportation options. This is done by moving the supply and treatment of water and wastewater off-site therefore, reducing the need for land to accommodate these facilities on-site. Doing so creates opportunities for smaller lots, denser development, increased building heights, and mixed uses. All of these are positive steps to reducing the need for infrastructure to accommodate single-occupancy vehicles such as parking areas, but also begin to support the critical mass that is necessary to support public transit.

As noted previously, regulatory and non-regulatory approaches can have an impact on energy use due to the future development patterns in a community. While there isn't a single approach that will address all of the Region's energy needs, municipalities are encouraged to identify what programs or actions will work best to implement their community's future transportation and land use planning. Specific actions from the Region that can assist with municipal transportation and land use priorities can be found in the next section of this plan regarding Pathways & Implementation Actions. Ultimately, positioning the municipalities to take control of their energy futures while working collectively as a region could be a successful outcome for all.

V. Evaluate electric-sector conservation and efficiency needed to achieve these targets

Conservation and efficiency of electricity is a key component to achieving the state's comprehensive energy planning goals. Over time, advancements in technology will provide a degree of the needed efficiency and conservation measures to achieve these goals, but also, efforts can be taken now to ensure that Central Vermont is on track to meet their conservation and efficiency targets. Targets for electric efficiency improvements for Central Vermont were previously noted in Table Eight. Information related to renewable energy generation, which is a necessary component in achieving these targets, is noted below.

Siting

A discussion of electric sector conversions and efficiencies should include information related to the ability to generate electricity through renewable means, but also to have a grid that can support the distribution of that electricity. An analysis of existing land and renewable resource potential will help determine what the capacity of the region is to generate and distribute local renewable energy. As noted previously, Table One identifies the current renewable generation for the region, while Table Thirteen identifies the potential generation for the region.

TABLE THIRTEEN
EXISTING POTENTIAL NEW REGIONAL RENEWABLE ELECTRIC ENERGY GENERATION

RESOURCE TYPE	MEGAWATTS	MEGAWATT HOURS
Rooftop Solar	40	49,268
Ground-mounted Solar	15,622	19,160,098
Wind	23,050	70,671,678
Hydroelectric	.01	28
Biomass & Methane[3]	Unknown	Unknown
Other	0	0
Total Potential Regional Renewable Energy Generation	38,713	89,881,072

Notes:
1. Regional totals were aggregated from each municipal total therefore not all calculations will be consistent.
2. Information calculated by the CVRPC based on data provided by the Vermont Center for Geographic Information and efficiency factors provided by the Department of Public Service.
3. Municipal data can be found at http://centralvtplanning.org/programs/energy/municipal-energy-planning/

Based on the information included in Table Thirteen, the municipalities in Central Vermont have enough potential resource area (both prime and secondary) that is not impacted by known or possible constraints (as defined in Appendix A) to sufficiently accommodate the megawatt hour allocation and meet their share of the state's renewable energy goal as noted previously in Table Ten. This means that the municipalities can reasonably identify additional constraints or preferred locations to align with their own land use planning goals if they so choose.

3. Biomass and methane are not restricted by resource locations and should be sited accordingly to provide maximum benefit to the greatest number of end users or to meet municipal needs. Siting will be more dependent on local regulatory controls and should be planned for accordingly.

To better understand the relationship between megawatts and megawatt hours, the following conversions are used. It should be noted that some renewable generation types are more efficient at producing energy when they are actively in production. For example, the wind does not always blow and the sun is not always shining, therefore a constant production of these resources may not be possible. On the other hand, methane generated from a landfill will be producing consistently for a finite number of years therefore, its efficiency factor will be greater for the useful life of the facility. Table Fourteen outlines the various renewable technologies including their capacity factor and annual megawatt hour output per installed megawatt of capacity.

Table Fourteen reinforces the fact that multiple options of renewable energy generation exist and can be utilized at a regional and municipal level. For all of these generation types, understanding where the resources that support these sources are the best or preferred is critical. This information will be further discussed in the mapping section, however planning for the siting of renewable energy generation will ensure that, like any other land use, a municipality has made a concerted effort to ensure compatibility with other uses while accounting for possible future needs.

TABLE FOURTEEN
RENEWABLE ENERGY GENERATION OUTPUTS & CAPACITY FACTORS

RESOURCE TYPE	CAPACITY FACTOR	ANNUAL MEGAWATT HOUR OUTPUT PER INSTALLED MEGAWATT
Solar	14% - 16%	1,300
Small Wind	20% - 25%	2,000
Utility Scale Wind	25% - 35%	2,600
Methane	60% - 90%	6,600
Biomass	60% - 80%	6,100
Small Hydroelectric	40% - 60%	4,400

Notes:
1. Information provided by the Vermont Department of Public Service.
2. "Capacity Factor" indicates the percent of time an identified resource is actively producing electricity.

As Table Fourteen indicates, solar installations have the lowest capacity factor, however the costs associated with installation of solar generation facilities are also low compared to other resource types. The economics of using a given resource may prove to be more of a consideration than the actual energy output. As such, measures may need to be considered to off-set the costs associated with higher capacity resource generators if they are to be viable throughout the region.

It should be noted that while biomass has a high level of annual output per installed megawatt, the source of the biomass should be taken into consideration. When possible, locally sourced biomass will have the greatest benefit to the community. In order to limit the secondary impacts associated with biomass, the origin of the fuel source should be considered. Transporting biomass from out of region or out of state will have increased costs and the impacts from transportation will off-set a portion of the efficiencies. Also, invasive species that impact woody biomass need to be considered.

Currently, there are two Federal quarantine regulations that are relevant to the movement of woody biomass (including chips, cordwood, and logs) from New York and Massachusetts. These include the emerald ash borer and the Asian longhorned beetle. Additionally, the State of Vermont has quarantines for external firewood and the hemlock woody adelgid. All of these factors need to be considered to ensure a sustainable supply of woody biomass can be sourced as locally as possible to limit the spread of these invasive species that could adversely impact the forest cover.

Central Vermont enjoys rich natural and scenic resources. This is represented by the peaks of the Worcester and Green Mountain ranges (including Camel's Hump State Park), which are characteristic of many Vermont communities. These areas are important to Central Vermont not only for their natural, scenic, and recreational value, but also for the predominance of critical plant and animal habitat that exists in the undisturbed forest blocks. In support of the protection of these areas, the 2016 Central Vermont Regional Plan identifies critical resources areas including wildlife habitat, steep slopes, and lands above 2,500 feet in elevation. These areas are specifically identified for their value as a regional resource.

With this in mind, the Central Vermont Regional Planning Commission has determined that industrial-scale wind development is not compatible with the future land use patterns of Central Vermont. For the purposes of this plan, industrial-scale wind development will include any wind turbine with a hub height greater than 100 feet (excluding the blades). This is not intended to restrict the development of wind generation facilities at a residential or community scale where renewable energy can be provided to a targeted location.

To further support this limitation on industrial-scale wind generation, the 2016 Central Vermont Regional Plan's Future Land Use identifies two distinct categories that encompass an overwhelmingly significant portion of the region. These categories are Rural and Resource and are delineated on the Future Land Use Map in Appendix A of the 2016 Central Vermont Regional Plan. These categories are described as:

Rural – These areas encompass much of the Region's large forest blocks, sand/gravel/mineral deposits, and prime agricultural soils that, when in productive use, contribute to the working landscape and have significant economic value.

Resource – These areas are dominated by lands requiring special protection or consideration due to their uniqueness, irreplaceable or fragile nature, or important ecological function. These include, protected lands; elevations above 2,500 feet (elevations above 1,700 feet in Waitsfield, as regulated); slopes of 25% or more; rare, threatened or endangered species and significant natural communities; wetlands; special flood hazard areas; and shoreline protection areas. As a subcategory of Resource lands, this plan recognizes critical resource areas as key sites that are particularly sensitive and should be given maximum protection.

Specific polices related to these two future land use districts include:

- Development should be designed to minimize its impact on the viability of agricultural operations or its contribution to fragmentation of large contiguous tracts of woodland.

- Identified wildlife corridors should be protected from fragmentation and uses that reduce their viability for movement of wildlife, particularly where they connect large contiguous tracts of land.

- Conservation of the natural landscape and careful management of lands is sought for these areas. Development in these areas should be subject to extensive planning, review and conditions that ensure its protection.

- Any development proposed within critical resource areas shall provide evidence as to why the development cannot be avoided, and shall provide mitigation for natural resources impacted by the development.

- The extension of permanent roads, energy transmission facilities, and utilities into Resource areas is discouraged.

An analysis of wind resource mapping for the Central Vermont Region identifies approximately 1,100 acres of unconstrained prime resource area for wind that is not located within the rural or resource future land use designations as described above. This acreage would equate to approximately 843,000 megawatt hours of energy generation potential. As such, the limitation on turbine height should not adversely impact the Region's ability to support all types of renewable energy generation.

If, through the development of a local energy plan consistent with Act 174, a municipality identifies industrial-scale wind generation as a community supported resource, the CVRPC may revise or amend this plan to consider the location(s) that has been identified. Prior to any amendments, the CVRPC will consider regional planning goals, mitigation of any identified constraints, and compatibility with the plans of adjacent municipalities.

Energy Storage

Finally, a discussion of electrical conservation and conversions would not be complete without acknowledging the potential limitations. Electricity as the primary power source for future needs will have to also consider the infrastructure and demand. If homes and vehicles are converted to electric power, there will be an increased demand for these resources in locations that may not currently be suited to provide that demand. Additionally, limitations on renewable resource technology will impact peak needs which may create a demand for storage of electrical power.

These factors will need to be considered in all our future decisions if a 90% renewable energy system is to become a reality. This may require potential changes to land use regulations that will accommodate battery or other storage options. Incentives to establish or upgrade infrastructure may be necessary and new construction may be required to include enhanced mechanical systems to handle increased electrical loads or design contingencies for fuel storage. While these challenges are not insurmountable, they will require an additional level of planning and consideration to ensure unforeseen issues are limited. More specific details regarding possible implementation actions to address these needs are included in the Pathways & Implementation Actions section of this plan.

Conclusion

As noted throughout this section, the Central Vermont Region faces challenges similar to the rest of the state regarding its energy future including the need for conservation, renewable energy development, and changing habits and attitudes towards renewable technology and land use choices. All of these components need to work together in order to ensure a collective and comprehensive approach to energy planning is initiated.

The information provided in this section has shown that Central Vermont has the ability to shape its energy future within the spectrum of the avenues that it can control. The unknown component is whether or not the changes and development will occur and when. The State Comprehensive Energy Plan has set a goal of 90% renewable energy by the year 2050. This goal is achievable if all stakeholders including the state, the region, municipalities, energy developers, private land owners, special interest groups, and interested citizens come together to discuss the issues and work collectively to identify the outcomes that satisfy the needs of the whole to the best of their ability.

This plan primarily explores renewable energy related to the production of electricity and electrification of the grid. In addition to the resources noted herein, it's important to consider other forms or technologies that could contribute to our renewable energy future. With advancements in safety, efficiency, and technology, the Region's energy future could look vastly different in the next five or ten years. This will not only impact the generation of energy, but the delivery and infrastructure to support distribution of energy.

PATHWAYS & IMPLEMENTATION ACTIONS

The following policies, pathways, and implementation actions outline the specific strategies for the region to consider in order to effectively support the State of Vermont's goals that are outlined in the 2016 Comprehensive Energy Plan. These actions are intended to cover a variety of pathways that address land use and siting of developments (including renewable energy generation); efficiency of building construction and weatherization; and fuel switching from fossil based fuels to more sustainable and renewable options.

The specific actions identified herein include a list of the responsible parties, the timeframe for the action, and a measure to determine success or to gauge progress towards a specific action. A key factor that will influence the success or progress on these actions will be available resources. This includes funding, personnel, and other work plan priorities. The specific resources available may impact which actions are prioritized for completion. When possible, actions outlined below may be combined with other work plan tasks to limit the duplication of resources and to expedite their completion.

This implementation program reflects actions that will be the primary responsibility of the Central Vermont Regional Planning Commission. When appropriate, other organizations are listed under the heading of "Responsibility" with the expectation that their guidance, insights, or expertise will be sought to support the Regional Planning Commission's efforts. In some cases, the term "regional partners" is used. This general term is intended to be a catch-all to limit the need for an exhaustive list of possible organizations that could assist in completing the identified action as all the partners may not initially be known.

Additionally, groups could be added or removed as an action progresses based on the specific needs identified to complete each task. The groups listed in this column are intended to provide a general sense of who may be involved in a specific action and not intended to be a list of required organizations. The list of responsible parties will provide guidance to the CVRPC to help establish project priorities and how actions may relate to one another.

Finally, the pathways and implementation actions included below outline actions that the Central Vermont Regional Planning Commission will engage in to support the 2016 State Comprehensive Energy Plan's goal of 90 percent renewable energy generation by 2050. As the comprehensive energy plan is updated, priorities may change which could impact the specific actions that will be necessary to meet the state's overall goals. As such, actions may change, be amended, or removed as appropriate to reflect changing trends or priorities.

A. Conservation and Efficiency

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

Conservation of energy is a key component to achieving the State's goals of 90% energy derived from renewable sources by 2050. Conservation of energy in-turn will reduce the amount of energy needed to support the existing and future systems thus allowing small increases in generation to support more uses overall.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Identify and maintain a directory of regional organizations that offer assistance in weatherization and make this information available to the Region's municipalities, including residents, businesses, and other interested parties on a quarterly basis.	CVRPC, Regional Partners, other RPCs	High On-going	Directory is established and available
2	Identify existing information regarding energy efficiency, conservation, weatherization, and their benefits related to cost savings that can be distributed through multiple media formats. a. Work with regional partners to develop this information and update as appropriate. b. Distribute this information to municipalities for display or dissemination at a municipal level.	CVRPC, Regional Partners, Utility Providers, other RPCs	High On-going	Information is identified and available
3	Identify underserved populations such as low-income households and work with regional partners to encourage participation in programs such as the state Weatherization Assistance Program or similar initiatives.	CVRPC, Regional Partners	High 1 to 3 years	Population segments identified and contacts established
4	Work with interested municipalities to form municipally supported Energy or Climate Action Committees to address local energy concerns and provide support as appropriate.	CVRPC, Regional Partners	Medium On-going	Committees formed
5	Continue to provide technical assistance to municipalities and encourage municipal bylaws that promote energy conservation and the development of renewable energy resources.	CVRPC, Regional Partners	High On-going	Regulations updated to reflect energy specific requirements

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

Energy efficient building designs provide benefits to the owners and occupants by reducing the amount of energy needed to heat, cool, and maintain the mechanical systems within the building. Establishing and promoting energy efficiency in design, construction, retrofits, and renovations will ensure new buildings and building practices will be more efficient into the future. These efficiencies can also lead to conservation of energy which can promote cost savings and affordability for owners and renters.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Partner with existing organizations to provide education and support to interested municipalities to establish "stretch codes"[4] for residential and commercial building standards.	CVRPC, State Agencies, Regional Partners	High 1 to 3 years	Codes established and adopted
2	Work with municipalities to develop local energy codes requiring or promoting energy efficient site design and renewable fuel use in new construction projects that require an Act 250 permit.	CVRPC	High 1 to 3 years	New regulations established as appropriate
3	Identify existing educational materials related to net-zero ready buildings[5] to be utilized by municipalities to inform their citizens about the efficiency of this design technique.	CVRPC, Regional Partners	Medium 3 to 5 years	Materials developed and available
4	Work with community organizations or existing businesses to identify available information regarding the use of landscaping for energy efficiency including the importance of tree canopies, pervious surfaces, and similar design practices.	CVRPC, Regional Partners	Low 5 to 10 years	Information identified and available
5	Identify existing information that promotes the use of Vermont's residential building energy label/score to inform the community of the importance of energy efficiency in building design and construction including cost savings and affordability.	CVRPC, Regional Partners	Low 5 to 10 years	Materials identified and available

4. Vermont has Residential Building Energy Standards (RBES) and Commercial Building Energy Standards (CBES). Stretch energy codes are those that achieve greater energy savings than the base RBES and CBES by including more stringent requirements for design and evaluation of energy efficiency.

5. A net-zero ready building is generally defined as a building whereby an equal or greater amount of energy used by a building is produced on site.

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

Reliance on fossil fuels such as oil, kerosene, or propane for heating is an unsustainable practice. Fossil fuels are non-renewable therefore they will eventually be depleted to a point where they are too expensive or too rare to be viable. Establishing alternative sources of renewable fuels for heating or conversions to heating from electric sources (which can be generated through renewable methods) will promote a more sustainable thermal energy future.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Identify existing funding programs or partners that can assist with conversion of heating sources from fossil fuels to renewable based systems for homes and businesses.	CVRPC, Regional Partners, State Agencies	High 1 to 3 years	List of existing funding sources identified
2	Identify innovative products such as solar shingles, solar panels, cold climate heat pumps, ground source heat pumps, district heating[6], or high efficiency combustion wood stoves that would be suitable for home and business conversions and educate users on their advantages.	CVRPC, Industry Experts, Regional Partners	High 1 to 3 years	Information sessions conducted bi-annually
3	Identify potential locations throughout the region that could benefit from district heating projects based on building density, proximity to resources such as biomass, or status as a use by right where applicable.	CVRPC, Municipalities	Low 5 to 10 years	Locations identified and mapped
4	Work with interested municipalities to evaluate and amend as necessary local regulations to ensure district heating or similar centralized renewable generation facilities such as biogas or bio-digesters are permitted in appropriate locations.	CVRPC, Municipalities	High 1 to 3 years	Local regulations updated as needed
5	Identify sources of renewable materials such as biomass, farm waste, or food waste (such as schools, restaurants, or food processors) to determine supply of alternative fuels that may be available for district heating or other heating alternatives for homes or businesses.	CVRPC, Municipalities, Business Community	Medium 3 to 5 years	Locations identified and mapped

6. District heating is a system for distributing heat generated in a centralized location for two or more homes and/or buildings' heating requirements.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
6	Work with state agencies to identify and inventory known sources and supplies of woody biomass that do not contribute to the spread of Federal or state identified invasive species and make this information available to the public as appropriate.	CVRPC, State Agencies	Medium 3 to 5 years	Sources are identified, mapped, and publicized
7	Identify energy storage technologies such as batteries to support off-grid systems or emergency pack-up power and educate the community on the costs, benefits, or challenges associated with these technologies.	CVRPC, Industry Experts, Utility Providers	High 1 to 3 years	Information is collected and disseminated as appropriate
8	Due to the rural nature of Central Vermont, identify and map large farm operations that may provide a sustained source of materials that could be used for bio-digesters.	CVRPC, Agency of Agriculture, Food, & Markets, Municipalities	Medium 3 to 5 years	Locations are identified and mapped

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

Policy 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.

Public transit offers communities the ability to move multiple persons utilizing existing roadway or railway infrastructure. Convenient, reliable and efficient public transit provides an alternative mode for individuals that might otherwise choose to drive alone. Public transit has the ability to reduce the need for parking in certain locations, provide more walkability in communities, and reduce congestion on local roads.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Assist municipalities and regional partners including state agencies and the development community to identify incentives that encourage the inclusion of public transit in land development plans such as reductions in parking requirements, reduced local permit fees, or similar incentives.	CVRPC, Development Community, Regional Partners, State Agencies	High 1 to 3 years	Incentives identified and regulations updated as necessary
2	Work with regional partners including state agencies and the business community to identify incentives that encourage employers to support the use of public transit by their employees such as discounted transit fares, flexibility in work hours, or similar incentives.	CVRPC, Business Community, Regional Partners, State Agencies	High 1 to 3 years	Incentives identified and presented as necessary
3	Work with VTrans and Green Mountain Transit to identify future growth areas or development centers to ensure public transit will be accommodated in these locations including access to park & ride locations when appropriate.	CVRPC, Vtrans, Municipalities, GMT	High 1 to 3 years	Areas identified and prioritized as appropriate
4	Work with public transit providers and other partners to identify underserved communities such as rural areas or low-income neighborhoods to identify transit opportunities in these locations.	CVRPC, VTrans, Regional Partners, GMT	High 1 to 3 years	Service options identified for designated locations
5	Ensure the Central Vermont Regional Plan includes clear policy language that requires large scale developments to consult with transit providers regarding the need to include transit or multi-modal infrastructure with development proposals.	CVRPC	High 1 to 3 years	The Central Vermont Regional Plan is updated as appropriate

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
6	Work with regional partners and municipalities to establish a comprehensive transportation plan that incorporates policies and implementation regarding the expansion of public transit that considers locations of park & ride facilities; public facilities such as schools and government buildings; or other activity centers and uses throughout the Region and identifies possible funding sources to support implementation and the Region's future land use planning efforts.	CVRPC, VTrans, GMT, Regional Partners	High 1 to 3 years	Plan developed, areas prioritized, and funding options identified
7	Ensure the continued support of inter-municipal or inter-regional public transit options are maintained, such as bus or rail service.	CVRPC, VTrans, GMT	On-going	Services are maintained
8	Work with municipalities to evaluate and determine the feasibility of intermodal transit facilities in appropriate regional locations that can be supported by infrastructure, population, and resources.	CVRPC, Municipalities, VTrans, GMT	High 1 to 3 years	Locations are identified and mapped
9	Provide technical assistance to transit providers as appropriate regarding land use, infrastructure, and future planning considerations to help plan for service needs.	CVRPC, VTrans, GMT	On-going	Technical assistance is provided as requested

Policy 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.

Due to the rural nature of Central Vermont, single-occupancy vehicle trips are a common occurrence. While many people rely on their vehicle to perform general day-to-day tasks, reducing the rate of these trips can reduce congestion on local roads; reduce conflicts with vehicles and pedestrians; and provide more support for ride shares, public transit, or similar multi-occupancy trips.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Promote the use of ride share programs within the region such as GoVermont, and maintain an active list of available services that can be distributed to the municipalities.	CVRPC, VTrans	Medium On-going	List of providers developed and maintained
2	Work with regional partners such as VTrans to ensure inventories of park & ride locations and conditions are up-to-date and are consistent with the State Park & Ride Plan. This may include occupancy studies or user surveys to assess specific needs.	CVRPC, VTrans	Medium On-going	Inventories completed and prioritized
3	Identify park & ride facilities that are near or over capacity to ensure future planning will accommodate expansions, upgrades, modifications, or alternative locations are identified as appropriate.	CVRPC, VTrans	High On-going	Facility upgrades/ improvements are identified for priority locations
4	Work with utility companies and municipalities to inventory and map infrastructure such as fiber optic cable to identify gaps that may prohibit information accessibility or telecommuting options.	CVRPC, Utility Providers	High On-going	Identify gaps and prioritize needs

Policy 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.

Reducing the dependency on fossil fuels and other non-renewable fuels is a key pathway to achieving the state's energy planning goals. Switching to electric or non-fossil fuel based vehicles will help reduce greenhouse gas emissions and promote cleaner fuel alternatives.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Work with municipalities to ensure land use regulations do not prohibit the installation of electric vehicle charging stations or similar alternative fuel technologies (such as bio-diesel) and identify model language that can be considered by municipalities to support these uses.	CVRPC, Municipalities	Medium 3 to 5 years	Model regulations developed and approved by municipalities
2	Identify businesses and municipalities in the region that operate large fleets of vehicles to provide assistance evaluating the possibility of integrating electric or non-fossil fuel based vehicles into their fleets.	CVRPC	Medium 3 to 5 years	Businesses inventoried and contacts established
3	Inventory existing locations of electric vehicle charging stations to identify where infrastructure gaps may exist or where needs could be met to provide greater access for electric vehicle owners.	CVRPC, Drive Electric Vermont	Medium On-going	Inventory of locations mapped to identify potential gaps
4	Work with industry advocates and municipalities to ensure open communications exist to disseminate information about alternative fuel vehicles (including financial, environmental, and sustainability benefits) on a routine basis. This may be done through regular meetings, special events, or other avenues as deemed appropriate.	CVRPC, Industry Representatives, Lending Institutions, State Agencies	Low On-going	Contacts established and regularly engaged
5	Consult with the Vermont Energy Investment Corporation's Drive Electric Vermont program to ensure the CVRPC staff is up-to date on current technology trends related to electric vehicles in order to provide guidance to municipalities.	CVRPC, VEIC	On-going	Regular updates are provided as necessary
6	Consider regulations that would require electric vehicle charging stations or infrastructure to be included in large scale developments as appropriate.	CVRPC, municipalities	Low 5 to 10 years	Regulations developed and implemented where appropriate

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

Walking and biking provide valuable alternatives to motorized vehicle travel. Ensuring a safe, efficient, and convenient infrastructure exists to promote walking and biking is essential to the future growth and sustainability of the Region's municipalities.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Evaluate local regulations and recommend changes as necessary to support state complete streets legislation as noted in 19 V.S.A §309d, which would include walking, biking, or transit infrastructure to be considered in the land development process.	CVRPC, municipalities	Medium On-going	Regulations evaluated and recommendations made
2	Develop model regulations to be evaluated by municipalities that require walking and biking infrastructure in downtowns, village centers, growth areas, or locations that propose high density development patterns.	CVRPC, municipalities	Medium 3 to 5 years	Model regulations developed
3	Provide regular updates and training to municipalities that discuss complete streets concepts and to effectively implement these facilities including sample language to be evaluated for inclusion in local regulations.	CVRPC, VTrans	Medium On-going	Regular reports to VTrans regarding trainings held
4	Work with its municipalities and regional partners to develop a walking and biking master plan that identifies priority projects, gaps in the infrastructure, and implementation strategies for incorporating facilities where appropriate.	CVRPC, municipalities, regional partners, state agencies, business community	Low 5 to 10 years	Plan developed and priority projects identified
5	Evaluate land use patterns to ensure walking and biking connections exist or are possible between key land uses such as schools, parks/greenways, commercial areas, or neighborhoods to help create walkable communities.	CVRPC	Low 5 to 10 years	Connections evaluated or established

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

Policy C-1: Central Vermont is committed to reducing sprawl and minimizing low-density development by encouraging density in areas where infrastructure exists or is planned to support growth.

Land use policies that work to limit the proliferation of large lot development in favor of small lots in a compact area help communities address conditions that create sprawl, or the outward pattern of development that is characterized by auto-centric uses in an expanded geography. By limiting conditions that lead to sprawling development patterns, the Region can more effectively support energy independence.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Evaluate municipal regulations to ensure higher density development patterns are located in regional and town centers to maintain existing settlement patterns and do not inadvertently promote sprawling development.	CVRPC, Municipalities	Medium On-going	Regulations are evaluated as needed and recommendations are included
2	Assist municipalities to identify future growth areas that can accommodate development needs while meeting smart growth principles and respecting historic settlement patterns of compact villages, neighborhoods, and urban centers as appropriate.	CVRPC, Municipalities	Medium On-going	Assistance provided and areas identified
3	Assist municipalities in preparing information necessary to acquire or maintain state designations including statutory requirements.	CVRPC, Municipalities, ACCD	Low On-going	State designations are maintained or acquired
4	Work with municipalities and regional partners to inventory and map existing infrastructure such as water and wastewater to evaluate capacity and development potential.	CVRPC, Municipalities	Medium 3 to 5 years	Infrastructure mapped and updated as needed
5	Work with communities to evaluate their land development regulations to ensure these regulations (including scale, massing, building height, and minimum lot size) are suitable to support density in appropriate locations and in proximity to needed infrastructure that is consistent with community character.	CVRPC	Low 5 to 10 years	Regulations evaluated and updated as appropriate
6	Develop or make available model ordinances related to Planned Unit Developments, for review and consideration by municipalities as a way to establish compact development patterns outside of existing growth areas.	CVRPC	Low 5 to 10 years	Model regulations developed

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
7	Provide information related to available funding opportunities (including sources and programs) for municipal infrastructure projects or improvements that will promote or support development density or compact development patterns.	CVRPC, State Agencies	High 1 to 3 years	Information on funding collected and available
8	Work with interested municipalities to create policies that incentivize development in designated growth areas with opportunities that could expedite land development reviews, permitting, or other regulatory processes as appropriate.	CVRPC, Municipalities, State Agencies	High 1 to 3 years	Regulations & processes updated as appropriate
9	Assist interested municipalities to review regulations and develop updates as appropriate that would support the development of community scale infrastructure for renewable energy generation and conservation.	CVRPC, Municipalities	Medium 3 to 5 years	Regulations updated as appropriate
10	Work with interested municipalities to ensure adequate land exists for agricultural uses as a way to encourage local food production.	CVRPC, Municipalities	Medium 3 to 5 years	Regulations updated as appropriate
11	Work with municipalities and the Agency of Agriculture, Food & Markets to ensure prime farmland inventories are up-to-date and mapped.	CVRPC, Agency of Agriculture, Food, & Markets, municipalities	On-going	Prime agricultural land inventories are updated and mapped
12	Support amendments to local regulations that encourage local food production through regulatory and non-regulatory approaches that focus development and preserve agricultural opportunities.	CVRPC, Municipalities, Agency of Agriculture, Food, & Markets	Medium 3 to 5 years	Regulations are updated as appropriate

Policy C-2: Strongly prioritize development in compact, mixed-use centers when feasible and appropriate; and identify ways to make compact development more feasible throughout Central Vermont.

Compact development patterns create opportunities whereby land uses that support where people live, work, and recreate, are all within close proximity. This not only creates a greater sense of place but it provides opportunities to walk, bike, or utilize public transit as the primary mode of transportation. Additionally, compact development patterns can promote conservation of energy through the redevelopment of underutilized spaces therefore including more energy efficient building designs.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Provide information to municipalities regarding alternative land use regulations such as form-based codes and identify communities where similar regulations have been successfully implemented including rural or non-urban scale regulations.	CVRPC	Low 5 to 10 years	Workshops or other informational sessions conducted
2	Evaluate municipal regulations and recommend amendments that will support and encourage infill development, redevelopment, adaptive reuse of existing buildings such as historic structures, and reuse of "brownfield" sites	CVRPC, Municipalities, Regional Partners	High 1 to 3 years	Regulations evaluated and recommendations made as appropriate
3	Provide information to municipalities on capital planning, public investment strategies, or state and federal programs that support infill development within core community areas.	CVRPC, State Partners	High 1 to 3 years	Workshops or other informational sessions conducted
4	Evaluate roadways in existing villages, downtowns, or municipal activity centers to identify conflict points between motorized and non-motorized modes of travel and recommend options to promote walkable and bike friendly centers that encourage alternative transportation choices	CVRPC, VTrans, Municipalities	Medium 3 to 5 years	Evaluations completed as needed and recommendations provided
5	Work with municipalities to identify priority development zones, growth areas, or locations where high demand for electric loads exist or are planned (such as industrial parks) to ensure current planning acknowledges future needs.	CVRPC, Municipalities, State Partners	High 1 to 3 years	Locations are identified and incentives established as appropriate

D. Development and Siting of Renewable Energy Resources

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

Identifying and mapping existing renewable energy generation facilities throughout the region will provide a baseline to determine the generation that currently exists. This information can provide a better understanding for where developments are currently being established and can help prioritize assistance that may be needed at the municipal level. Additionally, mapping existing constraints will provide municipalities with a better understanding of resources that are available within their community.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Provide regular mapping updates to municipalities regarding existing generation facilities to maintain an up-to-date inventory of locations.	CVRPC, Department of Public Service	On-going	Updated maps provided as requested
2	Provide regular mapping updates to municipalities regarding known and possible constraints to ensure consistency with state guidelines on renewable energy siting.	CVRPC, State Agencies	On-going	Updated maps provided as necessary
3	Update regional maps to reflect changes at the municipal level regarding preferred or unsuitable locations for renewable energy generation.	CVRPC, Municipalities	On-going	Maps and information updated as necessary
4	Work with state agencies to map locations of woody biomass or methane generation for possible fuel sources.	CVRPC, State Agencies	On-going	Specific locations are identified and mapped

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

Identifying and mapping potential renewable energy generation throughout the region will provide municipalities with information regarding available land area where renewable energy generation could be located. This information can be used to help municipalities prioritize and evaluate where future renewable generation could or should occur based on municipal land use policies and constraints. Additionally, information on potential renewable energy generation will ensure municipalities are working to support the state's renewable energy generation goals of 90% of the state's energy needs coming from renewable sources by 2050.

	IMPLEMENTATION ACTION	RESPONSIBILITY	PRIORITY/ TIMELINE	MEASURE OF SUCCESS
1	Evaluate known, possible, and regionally identified constraints to ensure up-to-date information is available for future planning purposes.	CVRPC, State Agencies	On-going	Constraints will be evaluated and mapped as necessary
2	Update information on utility infrastructure including existing and proposed transmission facilities to ensure accurate data exists.	CVRPC, Utility Providers	On-going	Utility information is updated and mapped as necessary
3	Evaluate and update preferred and unsuitable locations for future renewable energy generation siting as needed based on state, regional, and municipal policies and plans.	CVRPC, Municipalities, State Agencies	On-going	Preferred and prohibited locations are evaluated and mapped as necessary
4	Update generation potential based on future land developments, changes to land uses, or updates to priority areas as identified by state, regional, or municipal actions.	CVRPC, Municipalities, State Agencies	On-going	Generation potential is updated as necessary
5	Work with municipalities, as requested, to evaluate and prioritize future renewable energy generation technologies and locations to best suit municipal needs and policies.	CVRPC, Municipalities	On-going	Locations and technologies will be evaluated and prioritized

MAPPING

As noted in the Pathways & Implementation Actions section, specific policies have been identified related to mapping. These policies include evaluation of existing renewable energy generation and future renewable energy generation potential. The following information provides additional detail related to mapping including infrastructure, constraints, and specific locational preferences. In addition to the information in this section, Appendix B includes regional maps to support the discussion in this section.

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 the region and its municipalities to evaluate the renewable energy generation options that are available to meet these goals.

To this end, maps were created for Central Vermont at a regional and municipal level 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 Central Vermont. The following information will address the evaluation of current and future generation potential within the region.

Existing Renewable Energy Generation

As noted in the Analysis & Targets section, Table One identifies the existing renewable generation for Central Vermont. 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 2014. Projects that are currently under review are not included in these numbers therefore additional renewable energy generation may be developed that will not be included in the total generation represented in Table One.

One resource that provides data on existing generation is the Vermont Energy Action Network's Energy Dashboard. This resource incorporates data from the Department of Public Service relative to projects that have received a Certificate of Public Good, but also includes information from the community on self-reported actions. These include activities such as weatherization of buildings, switching of lightbulbs to high efficiency LED technologies, conversions to high efficiency appliances, or replacement of fossil fueled vehicles with alternative fuel technologies. The Energy Dashboard can be accessed by visiting http://www.vtenergydashboard.org/energy-atlas.

Appendix B includes maps with existing solar generation greater than 15 kW and all wind and woody biomass generation sites. Solar projects are the predominant form of generation in Central Vermont. In addition to the mapped locations for solar generation, the Energy Dashboard identifies approximately 1,000 additional solar sites in the region that are less than 15 kW. These are primarily individual homes with solar installations to supplement conventional electrical service. Also, approximately 250 solar hot water installations existing within the region bringing the total number of solar generation facilities in the region to just over 1,300 installations.

Potential Renewable Energy Generation

Table Thirteen in the Analysis & Targets section identifies potential generation of renewable energy for Central Vermont. 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[7]

As part of this effort, the CVRPC has identified information related to renewable energy generation that includes an analysis and evaluation of resource areas within the region and how those resource areas are impacted by statewide and regionally identified constraints. In order to determine the impacts, an understanding of the constraints needs to be discussed.

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 resources are very limited and therefore not likely to occur. Known constraints that have been identified 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

7. Appendix A provides specific definitions for the known and possible constraints.

In addition to the items listed above, the Regional Planning Commission, through its Regional Energy Committee, has identified additional constraints to be included. For the purposes of this mapping exercise, all of the regional constraints are considered possible constraints. This is due to the fact that 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 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

It should be noted that the regionally identified constraints are intended to be a starting point. Future updates to the Regional Energy Plan may include additional analysis of regional constraints. Changes to regional priorities may impact specific constraints that should be considered. This could include factors such as contiguous blocks of farmland, parcel sizes, or other factors that are identified as regional priorities.

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 resources 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 Central Vermont.

As noted in Table Thirteen of the Analysis & Targets section, based on the solar, wind, and hydroelectric potential within Central Vermont, approximately 90,000,000 megawatt hours of energy could be produced, well above the region's allocation of 418,531 megawatt hours by 2050. The potential energy generation for Central Vermont increases when other sources of renewable energy generation such as biomass, biogas, and methane are included. No specific generation numbers are listed in Table Thirteen 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.

Finally, the constraints outlined above have been evaluated to ensure sufficient resource area will exist to meet the region's share of the state's renewable energy targets. As noted, the regional constraints are included as "possible" therefore development of renewable resources could occur in these locations after an analysis of the specific site has been concluded. Additionally, multiple technologies could be used to meet the region's target. This means that some technologies, such as wind or hydroelectric, could be replaced by biomass or biogas to meet the region's target.

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 region. This is important to include because large-scale renewable energy generation typically needs three phase power to provide energy generation back to the grid. Smaller generation facilities (such as residential scale) can typically be accommodated by single phase transmission even when not located close to the load, therefore three phase power may not be a limiting factor in renewable energy development.

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. Locations of high energy use were not included on the current mapping and this information should first be considered at a municipal level before being identified regionally. This process would be consistent with others herein that support municipal identification of energy planning needs to ensure consistency with local regulations and planning efforts.

In the future, it may be appropriate to evaluate the entire transmission and distribution network to determine not only where there may be limitations to grid capacity, but also to identify where there may be surplus capacity. Identifying where limits and excesses exist throughout the electrical grid will be valuable information to inform future planning decisions related to both the siting of future renewable energy generation, but also when considering future land uses or development patterns. These evaluations could also identify locations that may be suitable for microgrids to address critical facilities or similar needs to ensure continuous power supplies are available.

Preferred & Unsuitable Siting Locations

Similar to the discussion regarding the identification of constraints at a regional scale, the Regional Energy Committee recommended that preferred and unsuitable areas would not be included on the mapping with the exception of statewide preferred locations that may exist within the region. The statewide preferred locations include:

- Parking lots
- Gravel pits
- Brownfield sites as defined in 10 V.S.A. §6642[8]
- Sanitary Landfills as defined in 10 V.S.A. §6602
- Rooftop installations

8. The State of Vermont is developing specific guidance to ensure brownfield sites have been properly evaluated to include the identification and the extent of the possible contamination. Based on this guidance, a Phase I and/or Phase II analysis may be required prior to the site being formally designated as a brownfield. This may impact the eligibility of a specific site to meet this designation and be considered a preferred site for renewable energy development.

The Regional Energy Committee further concluded that the final determination and identification of suitable sites would be left to the individual municipalities as they develop and evaluate their needs, development patterns, and future land use goals. Similarly, unsuitable areas for development of renewable energy generation were not included on the regional maps and no specific examples beyond the constraint layers are noted. This will allow the municipalities to use local insight and knowledge to evaluate and establish the criteria for identifying locally preferred or unsuitable locations. Regional maps may be updated to include locally identified preferred or unsuitable sites as municipalities work to identify these locations through local energy planning processes. This could include siting for all resource technologies including biogas, biosolids, wind, solar, and woody biomass.

The CVRPC will also evaluate and consider preferred locations as identified by the Public Utility Commission's net metering rules. This will ensure consistency between state, regional, and locally preferred locations for renewable energy siting. In addition to the actions outlined in the Pathways & Implementation Actions section, a map identifying existing locations of statewide preferred locations as noted previously can be found in Appendix B.

Finally, the Central Vermont Regional Energy Plan supports the development of renewable energy generation technology that will not result in an undue adverse impact on the built or natural environment or conflict with identified regional policies. Similar to constraint mapping, it was decided that the region should not limit the extent to which municipalities can plan for their energy future. Due to the diverse nature of Central Vermont, including urban and rural areas, there was no way to develop a consistent regional policy that would be equitable to all the municipalities, therefore all renewable energy generation types (both current and developed through future advances in technology or innovations in the industry) may be considered for application in Central Vermont.

Municipal Information

As part of this effort, the Central Vermont Regional Planning Commission developed information for all 23 municipalities within the region related to Analysis & Targets and Mapping, using best available information. This information was completed and distributed on April 28, 2017. The CVRPC website was the mechanism for this information to be disseminated and including guidance and other resources for how to best use the information. This information is available at http://centralvtplanning.org/programs/energy/municipal-energy-planning/

Regional Mapping

To provide a more specific visual representation of resources and constraints, mapping was developed that includes:

- Solar Resource Areas
- Wind Resource Areas
- Hydroelectric Resource Areas
- Known Constraints
- Possible Constraints
- Woody Biomass Resource Area

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 B.

APPENDIX A

KNOWN & POSSIBLE CONSTRAINT DEFINITIONS & DESCRIPTIONS

The following is a list of the known, possible, and regional constraints that were used and referenced in the mapping section of this document. A definition of the constraint including source of the data is provided.

Known Constraints

Vernal Pools (confirmed and unconfirmed layers) –
Source: Vermont Fish and Wildlife, 2009 - present

Vernal pools are temporary pools of water that provide habitat for distinctive plants and animals. Data was collected remotely using color infrared aerial photo interpretation. "Potential" vernal pools were mapped and available for the purpose of confirming whether vernal pool habitat was present through site visits. This layer represents both those site which have not yet been field-visited or verified as vernal pools, and those that have.

Department of Environmental Conservation (DEC) River Corridors –
Source: DEC Watershed Management District Rivers Program, January 2015

River corridors are delineated to provide for the least erosive meandering and floodplain geometry toward which a river will evolve over time. River corridor maps guide State actions to protect, restore and maintain naturally stable meanders and riparian areas to minimize erosion hazards. Land within and immediately abutting a river corridor may be at higher risk to fluvial erosion during floods.

River corridors encompass an area around and adjacent to the present channel where fluvial erosion, channel evolution and down-valley meander migration are most likely to occur. River corridor widths are calculated to represent the narrowest band of valley bottom and riparian land necessary to accommodate the least erosive channel and floodplain geometry that would be created and maintained naturally within a given valley setting.

Federal Emergency Management Agency (FEMA) Floodways –
Source: FEMA Floodway included in Zones AE – FEMA Map Service Center

These are areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

State-significant Natural Communities and Rare, Threatened, and Endangered Species –
Source: Vermont Fish and Wildlife, National Heritage Inventory

The Vermont Fish and Wildlife Department's Natural Heritage Inventory (NHI) maintains a database of rare, threatened and endangered species and natural (plant) communities in Vermont. The Element Occurrence (EO) records that form the core of the Natural Heritage Inventory database include information on the location, status, characteristics, numbers, condition, and distribution of elements of biological diversity using established Natural Heritage Methodology developed by NatureServe and The Nature Conservancy.

An Element Occurrence (EO) is an area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential

continued (or historical) presence and/or regular recurrence at a given location. For species Elements, the EO often corresponds with the local population, but when appropriate may be a portion of a population or a group of nearby populations (e.g., metapopulation).

National Wilderness Areas –
Source: United States Department of Agriculture Forest Service

A parcel of Forest Service land congressionally designated as wilderness.

Class 1 and Class 2 Wetlands –
Source: Vermont Significant Wetland Inventory (VSWI) and advisory layers

The State of Vermont protects wetlands which provide significant functions and values and also protects a buffer zone directly adjacent to significant wetlands. Wetlands in Vermont are classified as Class I, II, or III based on the significance of the functions and values they provide. Class I and Class II wetlands provide significant functions and values and are protected by the Vermont Wetland Rules. Any activity within a Class I or II wetland or buffer zone which is not exempt or considered an "allowed use" under the Vermont Wetland Rules requires a permit.

Class I wetlands have been determined to be, based on their functions and values, exceptional or irreplaceable in its contribution to Vermont's natural heritage and, therefore, merits the highest level of protection. All wetlands contiguous to wetlands shown on the VSWI maps are presumed to be Class II wetlands, unless identified as Class I or III wetlands, or unless determined otherwise by the Secretary or Panel pursuant to Section 8 of the Vermont Wetland Rules.

Possible Constraints

Agricultural Soils –
Source: Natural Resources Conservation Service (NRCS)

Primary agricultural soils" are defined as "soil map units with the best combination of physical and chemical characteristics that have a potential for growing food, feed, and forage crops, have sufficient moisture and drainage, plant nutrients or responsiveness to fertilizers, few limitations for cultivation or limitations which may be easily overcome, and an average slope that does not exceed 15 percent. Present uses may be cropland, pasture, regenerating forests, forestland, or other agricultural or silvicultural uses.

The soils must be of a size and location, relative to adjoining land uses, so that those soils will be capable, following removal of any identified limitations, of supporting or contributing to an economic or commercial agricultural operation. Unless contradicted by the qualifications stated above, primary agricultural soils include important farmland soils map units with a rating of prime, statewide, or local importance as defined by the Natural Resources Conservation Service of the United States Department of Agriculture.

FEMA Special Flood Hazard Areas -

The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

Protected Lands –

State fee land and private conservation lands are considered protected lands. Other state level, non-profit and regional entities also contribute to this dataset. The Vermont Protected Lands Database is based on an updated version of the original Protected Lands Coding Scheme reflecting decisions made by the Protected Lands Database Work Group to plan for a sustainable update process for this important geospatial data layer.

Act 250 Ag Mitigation Parcels –
Source: Vermont Department of Agriculture

All projects reducing the potential of primary agricultural soils on a project tract are required to provide "suitable mitigation," either "onsite or offsite," which is dependent on the location of the project. This constraint layer includes all parcels in the Act 250 Ag Mitigation Program as of 2006.

Deer Wintering Areas (DWA) –
Source: Vermont Department of Fish and Wildlife

Deer winter habitat is critical to the long term survival of white-tailed deer (Odocoileus virginianus) in Vermont. Being near the northern extreme of the white-tailed deer's range, functional winter habitats are essential to maintain stable populations of deer in many years when and where yarding conditions occur. Consequently, deer wintering areas are considered under Act 250 and other local, state, and federal regulations that require the protection of important wildlife habitats. DWAs are generally characterized by rather dense softwood (conifer) cover, such as hemlock, balsam fir, red spruce, or white pine. Occasionally DWAs are found in mixed forest with a strong softwood component or even on found west facing hardwood slopes in conjunction with softwood cover. The DWA were mapped on mylar overlays on topographic maps and based on small scale aerial photos.

Vermont Conservation Design include the following Highest Priority Forest Blocks: Connectivity, Interior, and Physical Landscape Diversity –
Source: Vermont Department of Fish and Wildlife

The lands and waters identified in this constraint are the areas of the state that are of highest priority for maintaining ecological integrity. Together, these lands comprise a connected landscape of large and intact forested habitat, healthy aquatic and riparian systems, and a full range of physical features (bedrock, soils, elevation, slope, and aspect) on which plant and animal natural communities depend.

Hydric Soils –
Source: Natural Resources Conservation Service

A hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part. This constraint layer includes soils that have hydric named components in the map unit.

Regional Constraints

Elevations above 2500 feet –

This constraint uses USGS contours over 2500 feet.

250 Foot Lake Shore Protection Buffers –

For this constraint, CVRPC selected Vermont Hydrologic Dataset lakes and ponds greater than 10 acres and then buffered those by 250 feet.

Slopes Greater Than 25% –

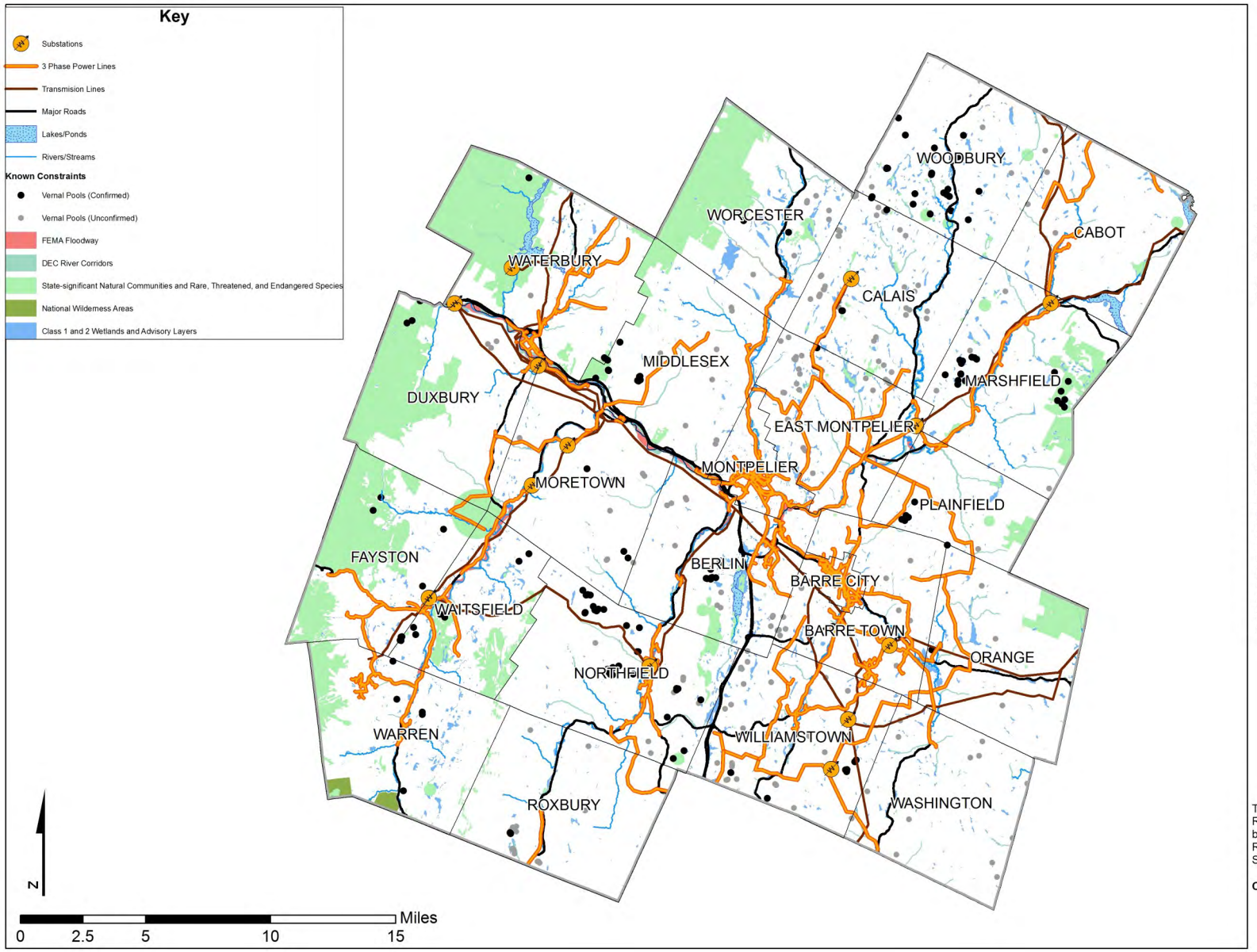
For this constraint, CVRPC performed a slope analysis using a 10 meter Digital Elevation Model.

Municipal Lands –

For this constraint, CVRPC used the Vermont Center for Geographic Information's Protected Lands Database.

APPENDIX B

REGIONAL RESOURCE MAPS



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.

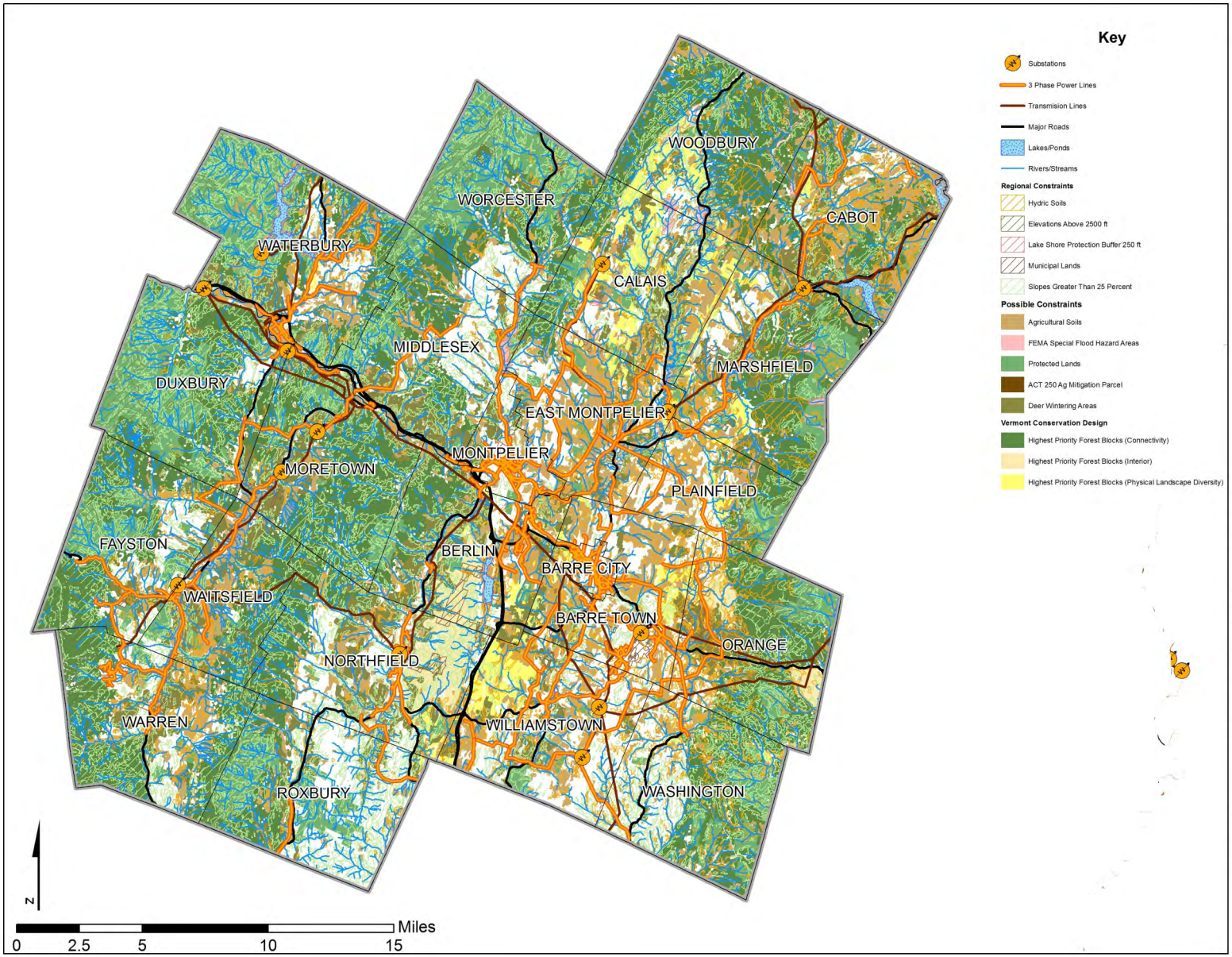
Link to Data - http://vcgi.vermont.gov/opendata/act174

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.

CVRPC



Key

- Substations
- 3 Phase Power Lines
- Transmision Lines
- Major Roads
- Lakes/Ponds
- Rivers/Streams

Regional Constraints

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

Possible Constraints

- Agricultural Soils
- FEMA Special Flood Hazard Areas
- Protected Lands
- ACT 250 Ag Mitigation Parcel
- Deer Wintering Areas

Vermont Conservation Design

- Highest Priority Forest Blocks (Connectivity)
- Highest Priority Forest Blocks (Interior)
- Highest Priority Forest Blocks (Physical Landscape Diversity)

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.

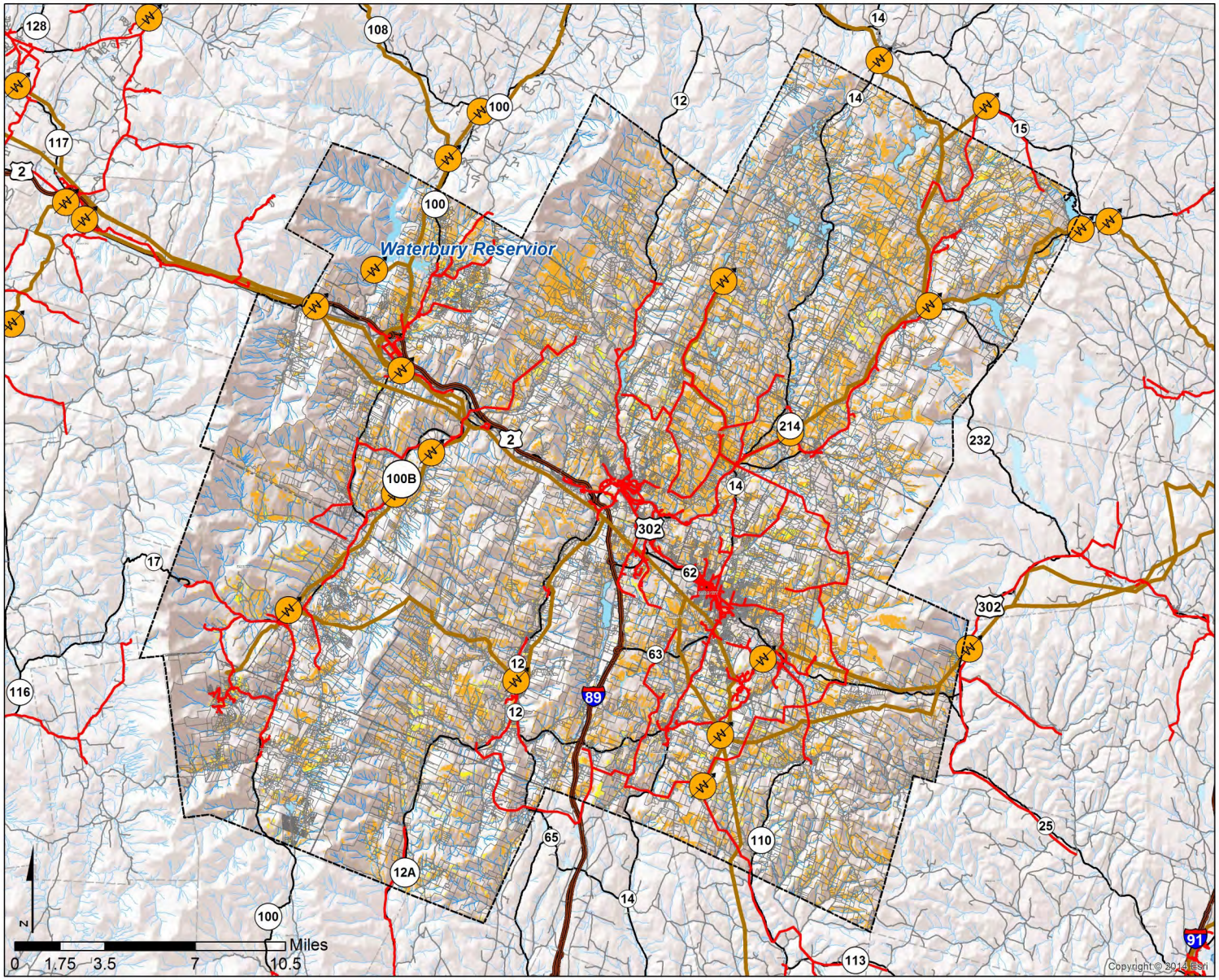
Link to Data - http://vcgi.vermont.gov /opendata/act174

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



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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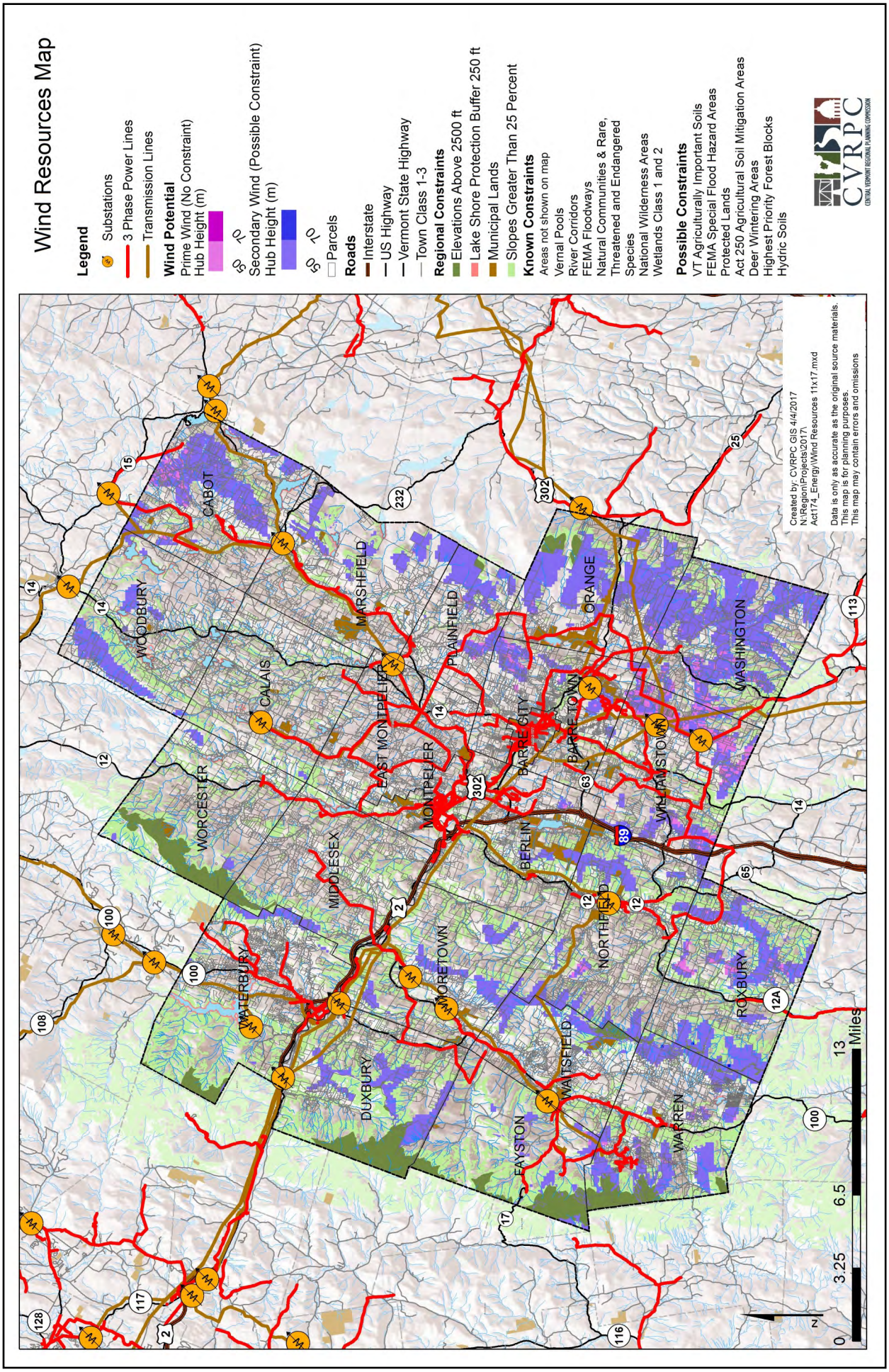
Act174_Energy\Solar Resources 11X17

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

CVRPC
CENTRAL VERMONT REGIONAL PLANNING COMMISSION


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
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Created by: CVRPC GIS 4/4/2017
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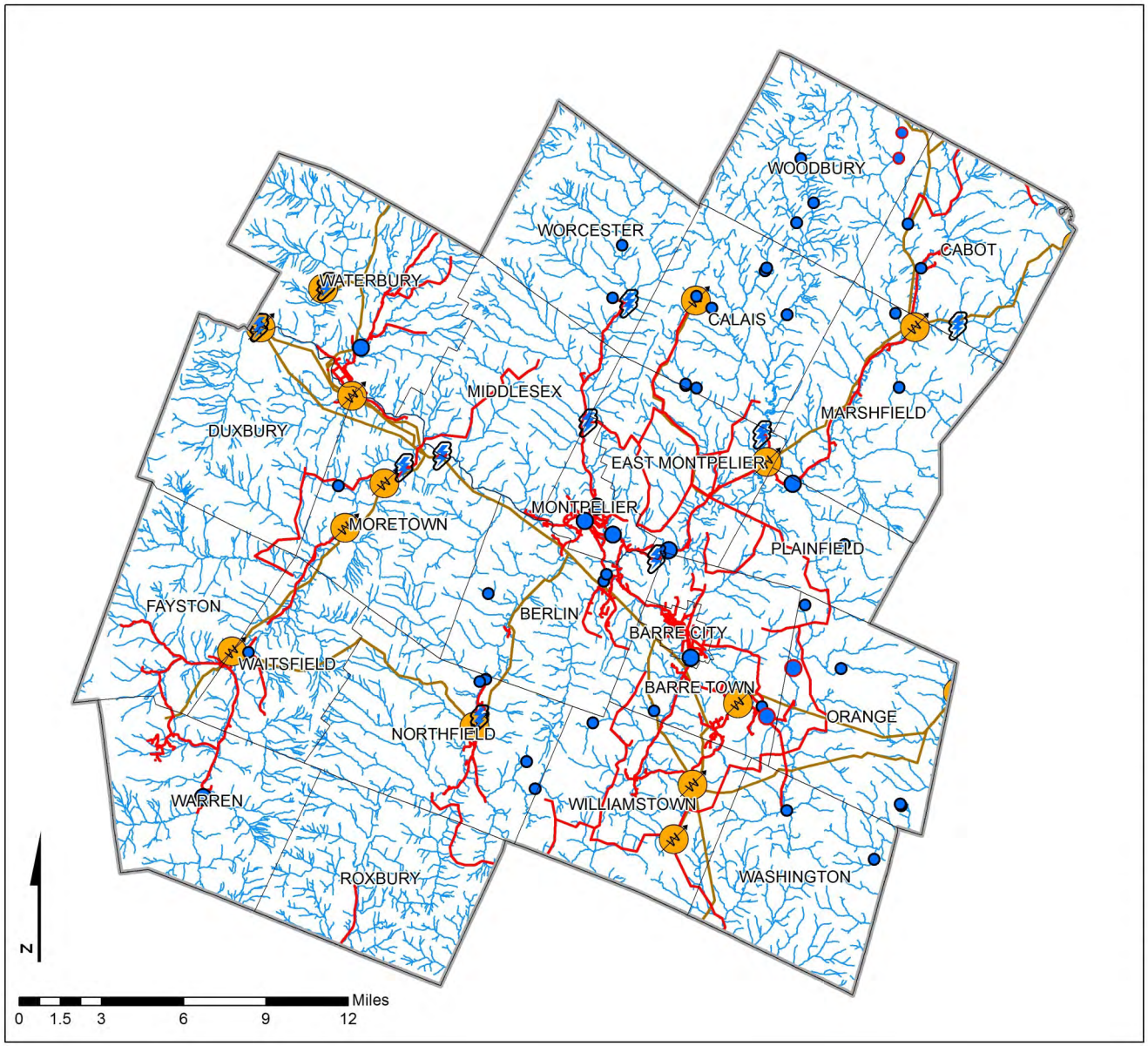
Act174_Energy\Wind Resources 11x17.mxd
Data is only as accurate as the original source materials.
This map is for planning purposes.
This map may contain errors and omissions
WOODBURY
CABOT
MARSHFIELD
CALAIS
WORCESTER
EAST MONTPELIER
PLAINFIELD
MONTPELIER
BARRE CITY
BARRE TOWN
ORANGE
WASHINGTON
MIDDLESEX
BERLIN
WILLIAMSTOWN
WATERBURY
DUXBURY
MORETOWN
NORTHFIELD
ROXBURY
WAITSFIELD
FAYSTON
WARREN
0
3.25
6.5
13
Miles
N



Hydroelectric Resources Map

Key

- Substations
- 3 Phase Power Lines
- Transmission Lines
- Major Roads
- Lakes/Ponds
- Rivers/Streams
- Dams not on National Wild and Scenic Rivers
- Dams on National Wild and Scenic Rivers

Potential Hydroelectric Facilities

Potential Hydroelectric Facilities

- < 50 kW Capacity
- > 50 kW Capacity
- High Hazard with < 50 kW Capacity
- High Hazard with > 50 kW Capacity

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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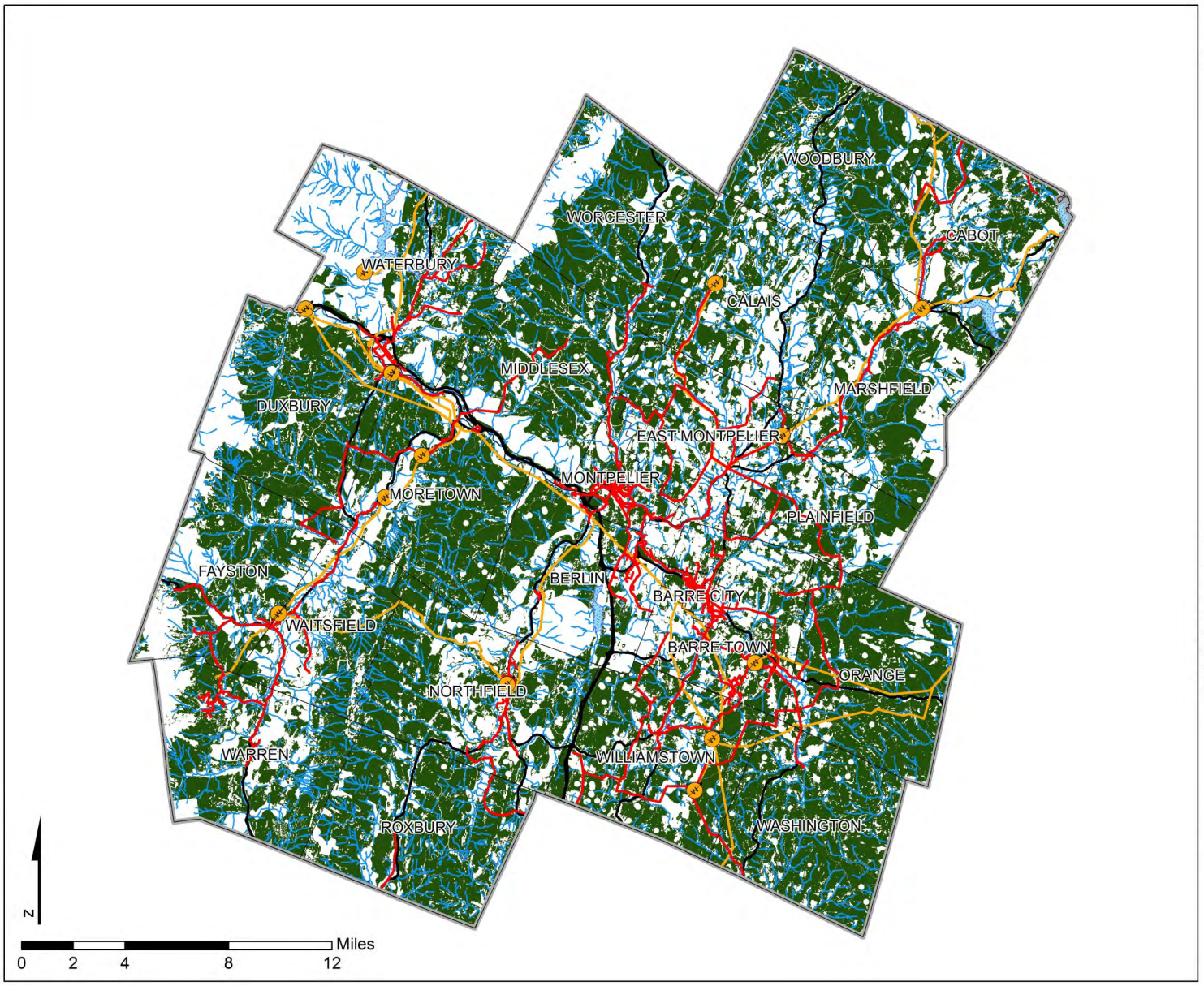


Woody Biomass Resources Map

Key

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

Methodology

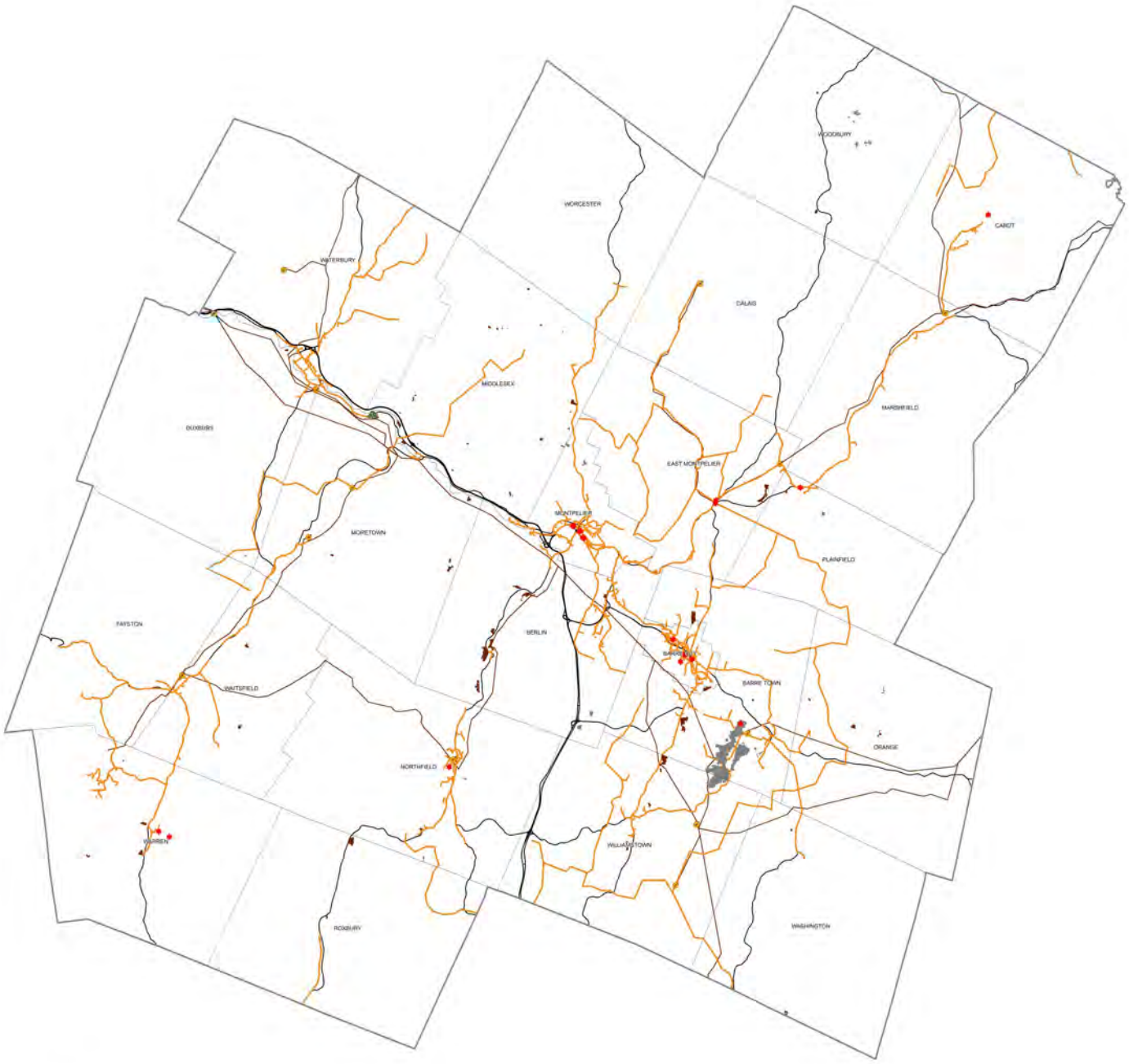
This map shows areas of resource potential for woody biomass, i.e., locations where forested areas are. This map also considers various other conditions, such as ecological zones, that may impact the feasibility of renewable energy/alternative heating source. These conditions are referred to as constraints. 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
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

Central Vermont Regional Planning Commission
Energy Planning Statewide Preferred Sites



Key

- Brownfields Sites
- Moretown Landfill
- Sand and Gravel Pits
- Quarries
- Substations
- 3 Phase Power Lines
- Transmision Lines
- Major Roads

N

0 2.25 4.5 9 Miles

CVRPC
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

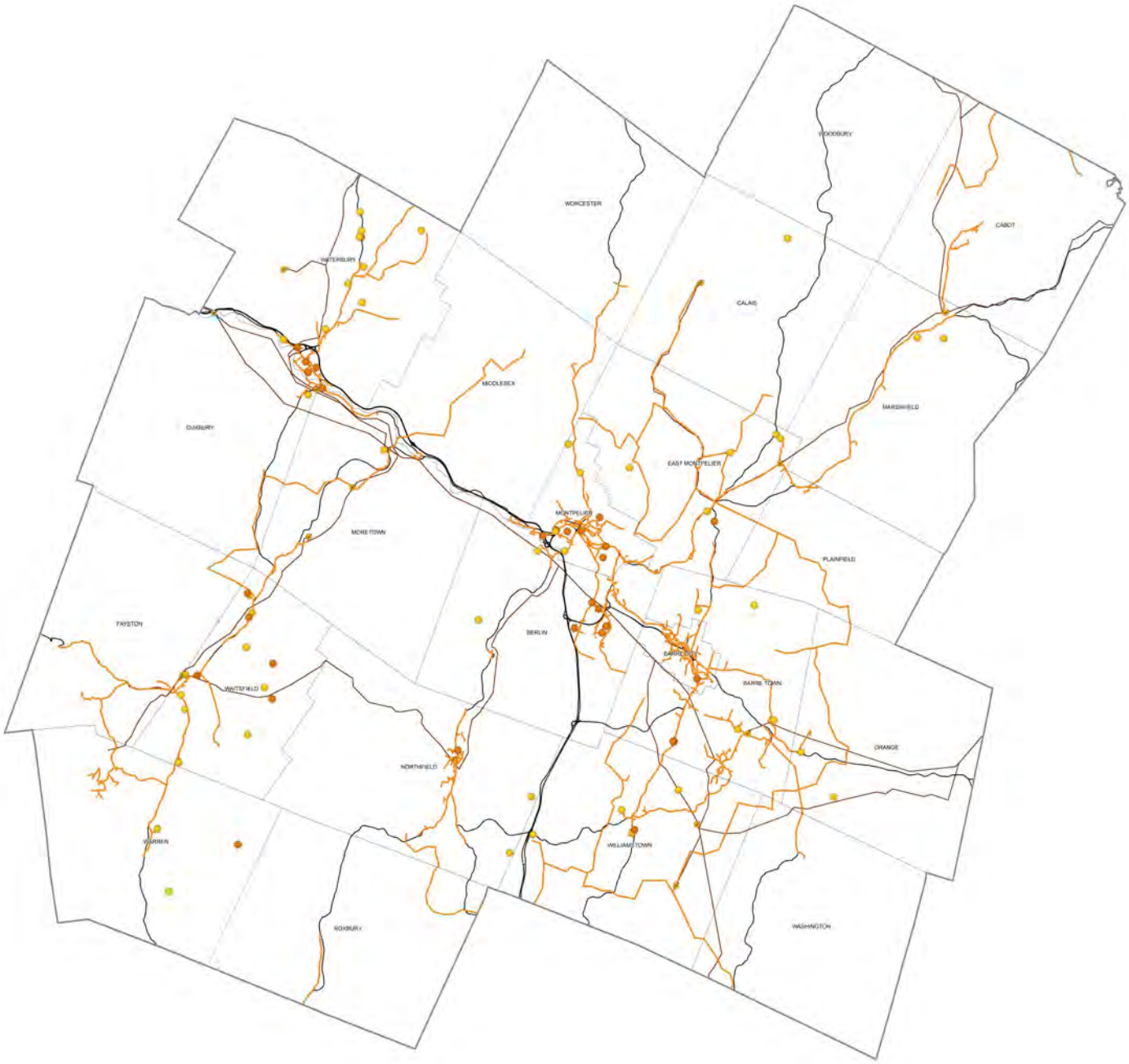
Data:

Brownfields: VT ANR, VCGI.
Sand and Gravel Pits, Quarries: CVRPC, 2013 disgitized from 1998 imagery

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.

Central Vermont Regional Planning Commission
Current Solar Energy Generation Sites > 15 KW



Key

Solar Sites - Current Generation > 15 KW

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

N

0 2.25 4.5 9 Miles

CVRPC
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

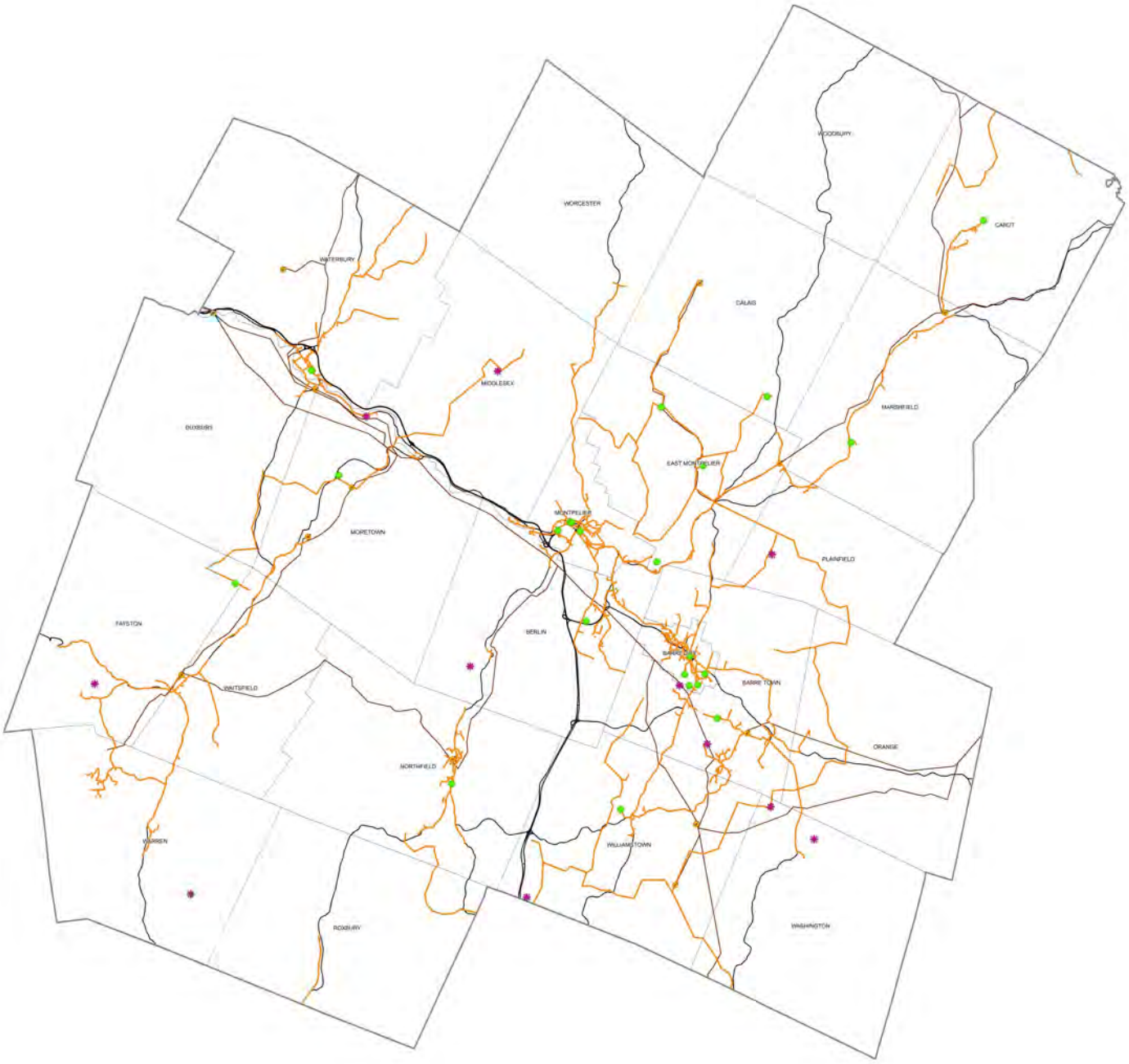
Data:

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.

Central Vermont Regional Planning Commission
Current Wind and Biomass for Heat Sites



Key

- Biomass for Heat - Current Sites
- Wind Generation - Current Sites
- Substations
- 3 Phase Power Lines
- Transmision Lines
- Major Roads

N

0 2.25 4.5 9 Miles

CVRPC
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

Data:

Wind and Biomass generation: 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.

APPENDIX C

LONG-RANGE ENERGY ALTERNATIVES PLANNING DATA & INFORMATION

Introduction

This document supplements the regional energy plans created by each Regional Planning Commission (RPC). It was developed by Vermont Energy Investment Corporation (VEIC) as documentation to modeling work performed for the RPCs. An award from the Department of Energy's SunShot Solar Market Pathways program funded the creation of a detailed statewide total energy supply and demand model. The VEIC team used the statewide energy model as a foundation for the region-specific modeling efforts. More detailed methodology is included at the end of this report.

Statewide Approach

Historic information was primarily drawn from the Public Service Department's Utility Facts 2013[1] and EIA data. Projections came from the Total Energy Study (TES)[2], the utilities' Committed Supply[3], and stakeholder input.

Demand Drivers

Each sector has a unit that is used to measure activity in the sector. That unit is the "demand driver" because in the model it is multiplied by the energy intensity of the activity to calculate energy demand. The population change for each region is calculated from town data in *Vermont Population Projections 2010-2030*[4]. Growth rates are assumed constant through 2050.

RPC	ANNUAL GROWTH
Addison	0.00%
Bennington	0.02%
Central VT	0.12%
Chittenden	0.48%
Lamoille	1.46%
Northwest	0.87%
NVDA	0.21%
Rutland	-0.27%
Southern Windsor	0.24%
Two Rivers	0.29%
Windham	0.34%

1. Vermont Public Service Department, Utility Facts 2013, http://publicservice.vermont.gov/sites/dps/files/documents/Pubs_Plans_Reports/Utility_Facts/Utility%20Facts%202013.pdf

2. Vermont Public Service Department, Total Energy Study: Final Report on a Total Energy Approach to Meeting the State's Greenhouse Gas and Renewable Energy Goals. December 8, 2014. http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/TES/TES%20FINAL%20Report%2020141208.pdf.

3. Vermont Public Service Department provided the data behind the graph on the bottom half of page E.7 in Utility Facts 2013. It is compiled from utility Integrated Resource Plans

4. Jones, Ken, and Lilly Schwarz, *Vermont Population Projections-2010-2030*, August, 2013. http://dail.vermont.gov/dail-publications/publications-general-reports/vt-population-projections-2010-2030.

People per house are assumed to decrease from 2.4 in 2010 to 2.17 in 2050. This gives the number of households, the basic unit and demand driver in the model for **residential energy** consumption.

Projected change in the **energy demand from the commercial sector** was based on commercial sector data in the TES. The demand driver for the commercial sector is commercial building square feet which grow almost 17% from 2010 to 2050.

The team entered total **industrial consumption** by fuel from the TES directly into the model. It grows from 1.1 TBtu in 2010 to 1.4 TBtu in 2050.

Transportation energy use is based on projections of vehicle miles traveled (VMT). VMT peaked in 2006 and has since declined slightly[5]. Given this, and Vermont's efforts to concentrate development and to support alternatives to single occupant vehicles, VMT per capita is assumed to remain flat at 12,000.

The regional models use two scenarios. The **reference scenario** assumes a continuation of today's energy use patterns, but does not reflect the Vermont's renewable portfolio standard or renewable energy or greenhouse gas emissions goals. The main changes over time in the reference scenario are more fuel efficient cars because of CAFE standards and the expansion of natural gas infrastructure. The **90% x 2050 $_{VEIC}$ scenario** is designed to achieve the goal of meeting 90% of Vermont's total energy demand with renewable sources. It is adapted from the TES TREES Local scenarios. It is a hybrid of the high and low biofuel cost scenarios, with biodiesel or renewable diesel replacing petroleum diesel in heavy duty vehicles and electricity replacing gasoline in light duty vehicles. Despite a growing population and economy, energy use declines because of efficiency and electrification. Electrification of heating and transportation has a large effect on the total demand because the electric end uses are three to four times more efficient than the combustion versions they replace.

Regionalization Approach

The demand in the statewide model was broken into the state's planning regions. Residential demand was distributed according to housing units using data from the American Community Survey. Commercial and industrial demand was allocated to the regions by service-providing and goods-producing NAICS codes respectively. Fuel use in these sectors was allocated based on existing natural gas infrastructure. In the commercial sector, it was assumed that commercial fuel use per employee has the same average energy intensity across the state. All commercial natural gas use was allocated to the regions currently served by natural gas infrastructure, and the rest of the fuel was allocated to create equal consumption by employee.

The industrial sector was assumed to be more diverse in its energy consumption. In the industrial sector, natural gas was allocated among the regions currently served by natural gas based on the number of industrial employees in each region. Other non-electric fuels were distributed among regions without access to natural gas, as it was assumed that other non-electric fuels were primarily used for combustion purposes, and that purpose could likely be served more cheaply with gas. Transportation demand was primarily regionalized through population. The passenger rail sector of transportation demand was regionalized using Amtrak

5. Jonathan Dowds et al., "Vermont Transportation Energy Profile," October 2015, http://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Vermont%20Transportation%20Energy%20Profile%202015.pdf.

boarding and alighting data to create percentages of rail miles activity by region[6]. The freight rail sector of transportation was regionalized using the following approach: in regions with freight rail infrastructure, activity level was regionalized by share of employees in goods-producing NAICS code sectors. Regions without freight rail infrastructure were determined using a Vermont Rail System map and then assigned an activity level of zero[7]. A weighting factor was applied to regions with freight rail infrastructure to bring the total activity level back up to the calculated statewide total of freight rail short-ton miles in Vermont. Each region's share of state activity and energy use is held constant throughout the analysis period as a simplifying assumption.

Results

The numbers below show the results of the scenarios in "final units," sometimes referred to as "site" energy. This is the energy households and businesses see on their bills and pay for. Energy analysis is sometimes done at the "source" level, which accounts for inefficiency in power plants and losses from transmission and distribution power lines. The model accounts for those losses when calculating supply, but all results provided here are on the demand side, so do not show them.

The graphs below show the more efficient 90% x 2050 $_{\text{VEIC}}$ scenario, which is one path to reduce demand enough to make 90% renewable supply possible. This scenario makes use of wood energy, but there is more growth in electric heating and transportation to lower total energy demand. Where the graphs show "Avoided vs. Reference," that is the portion of energy that we do not need to provide because of the efficiency in this scenario compared to the less efficient Reference scenario

6. National Association of Railroad Passengers, "Fact Sheet: Amtrak in Vermont," 2016, https://www.narprail.org/site/assets/files/1038/states_2015.pdf.

7. Streamlined Design, "Green Mountain Railroad Map" (Vermont Rail System, 2014), http://www.vermontrailway.com/maps/regional_map.html.

Statewide Total Energy Consumption

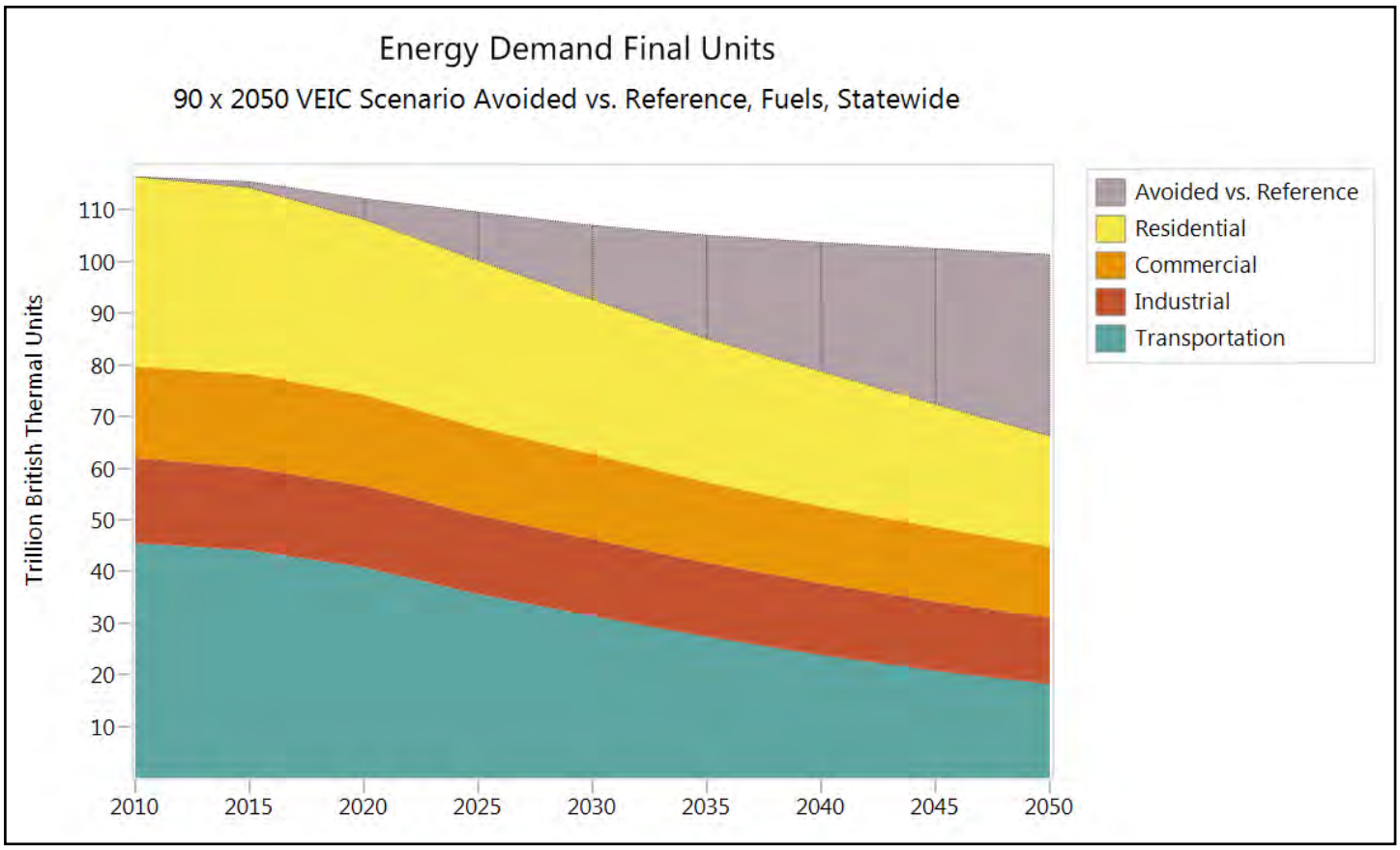


Figure 1 - Statewide energy consumption by sector, 90% x 2050 $_{VEIC}$ scenario compared to the reference scenario

Regional Total Energy Consumption

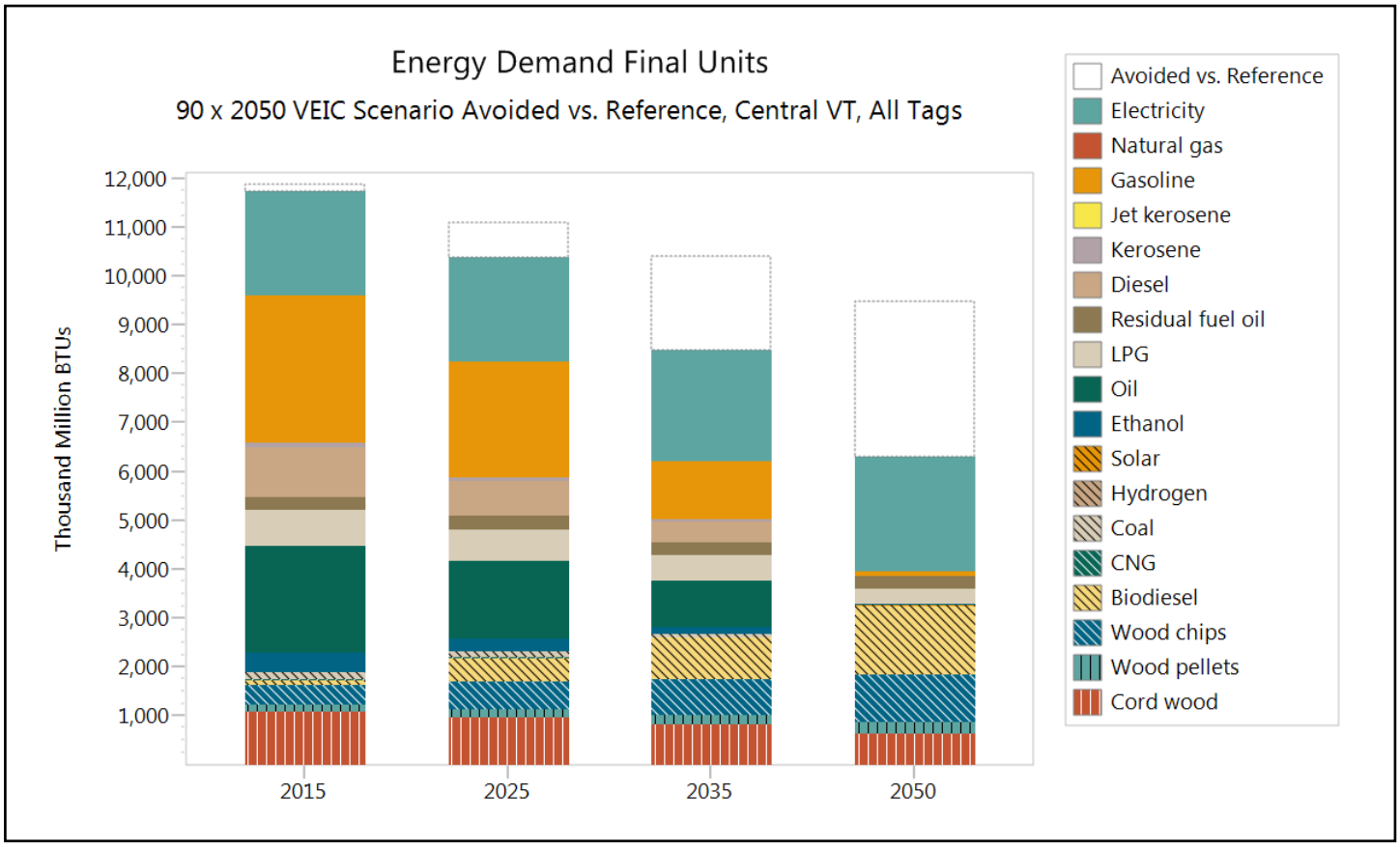


Figure 2: Regional energy consumption by fuel

Regional Energy Consumption by Sector

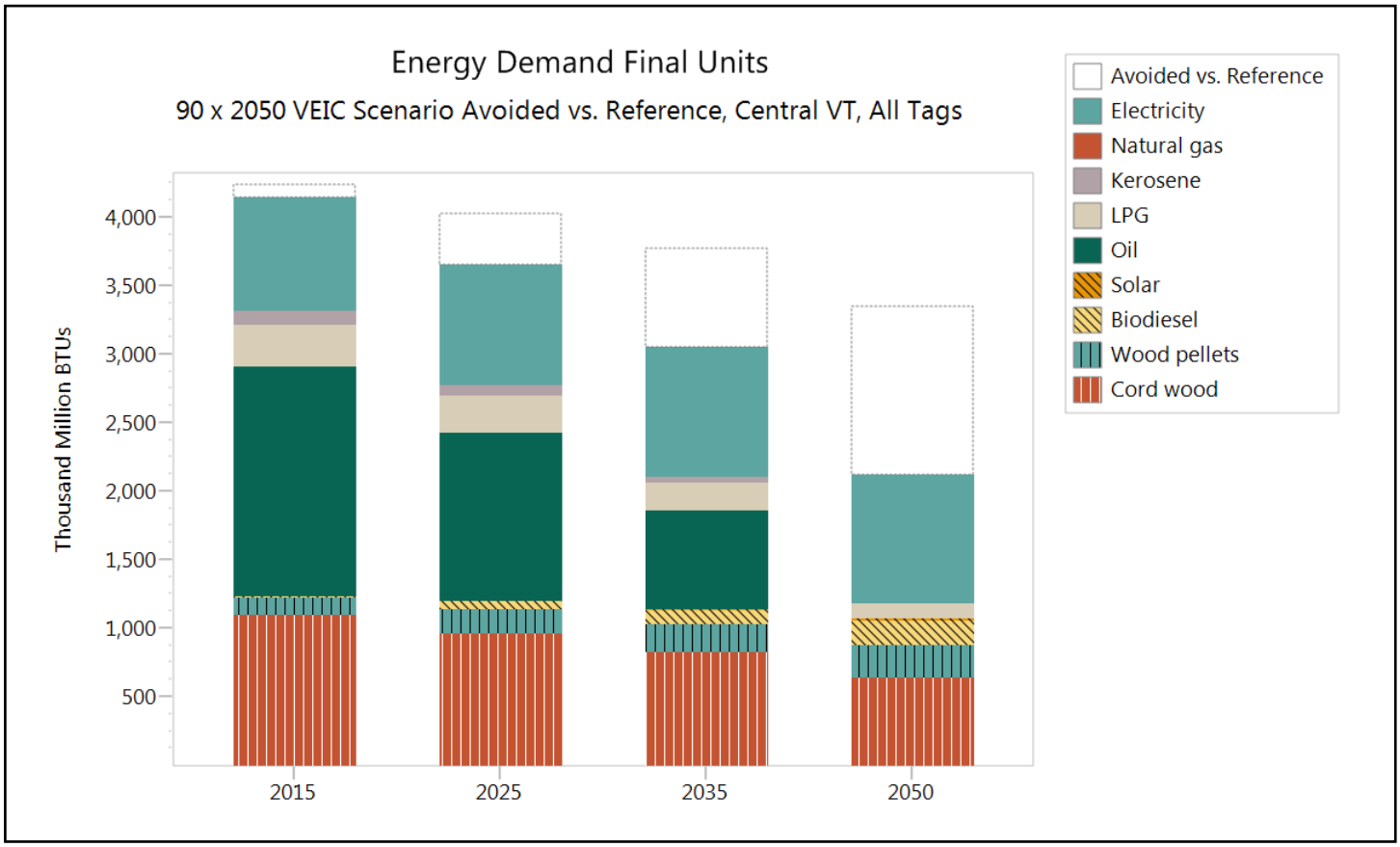


Figure 3: Regional residential energy consumption by fuel

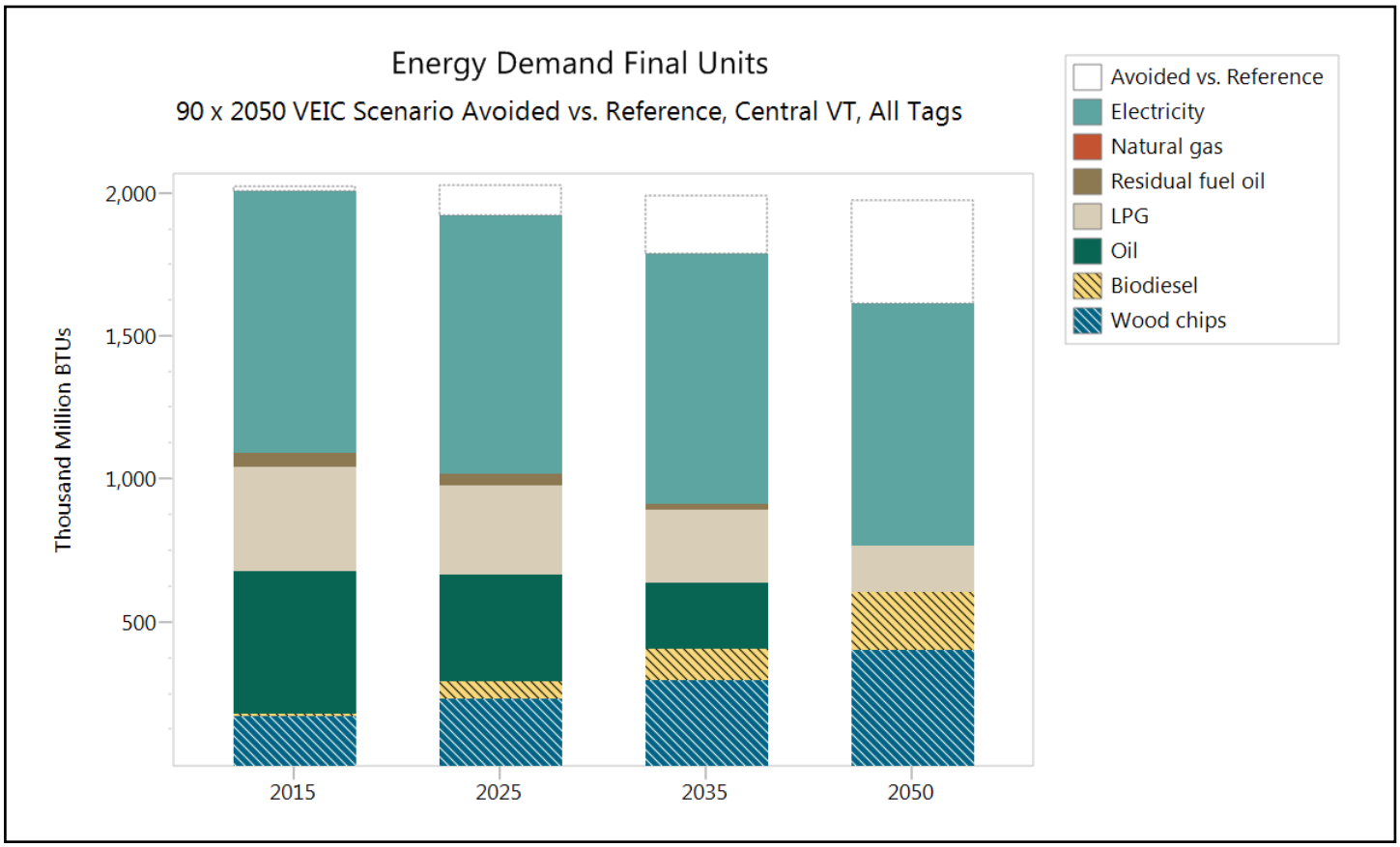


Figure 4: Regional commercial energy consumption by fuel

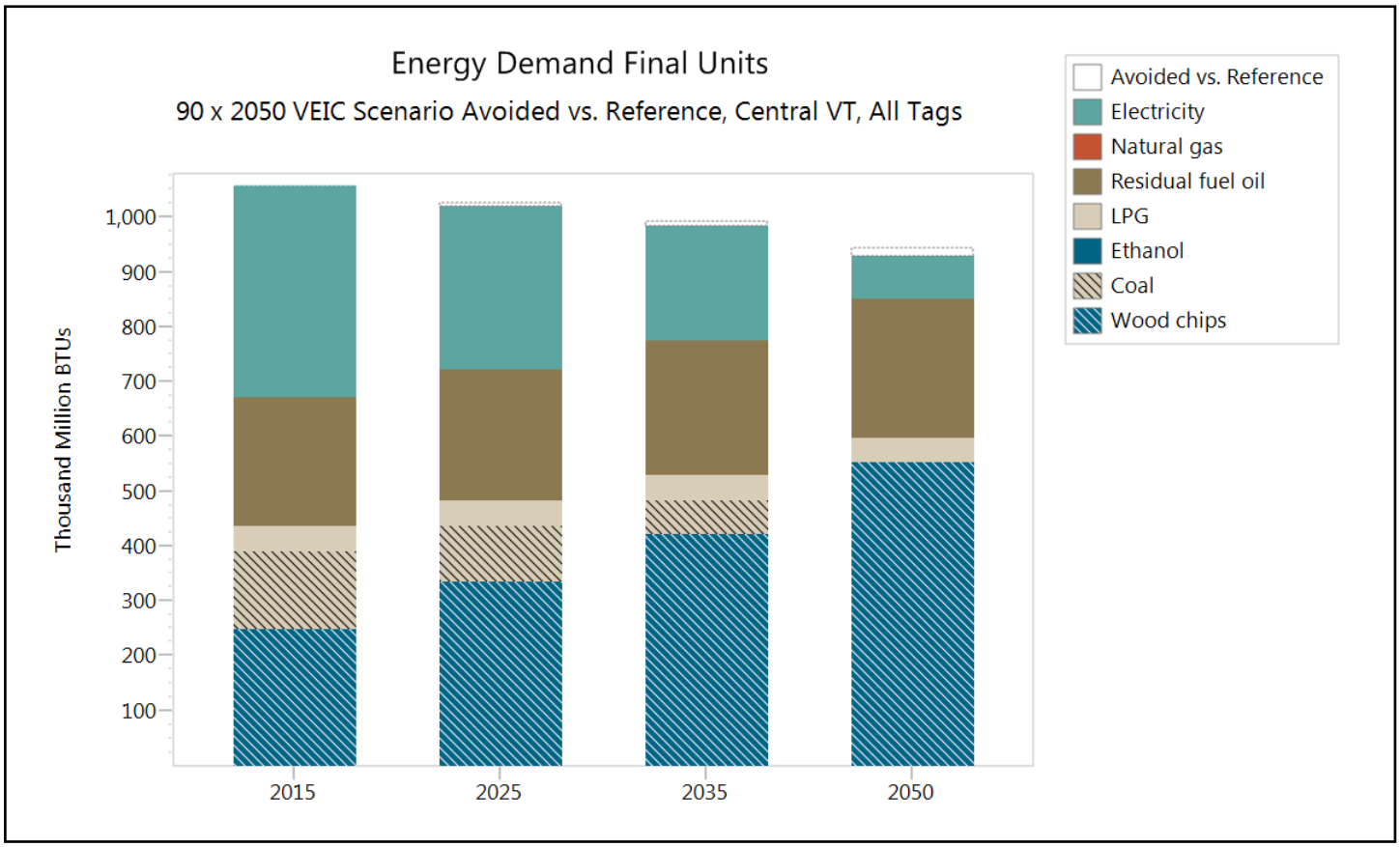


Figure 5: Regional industrial energy consumption by fuel

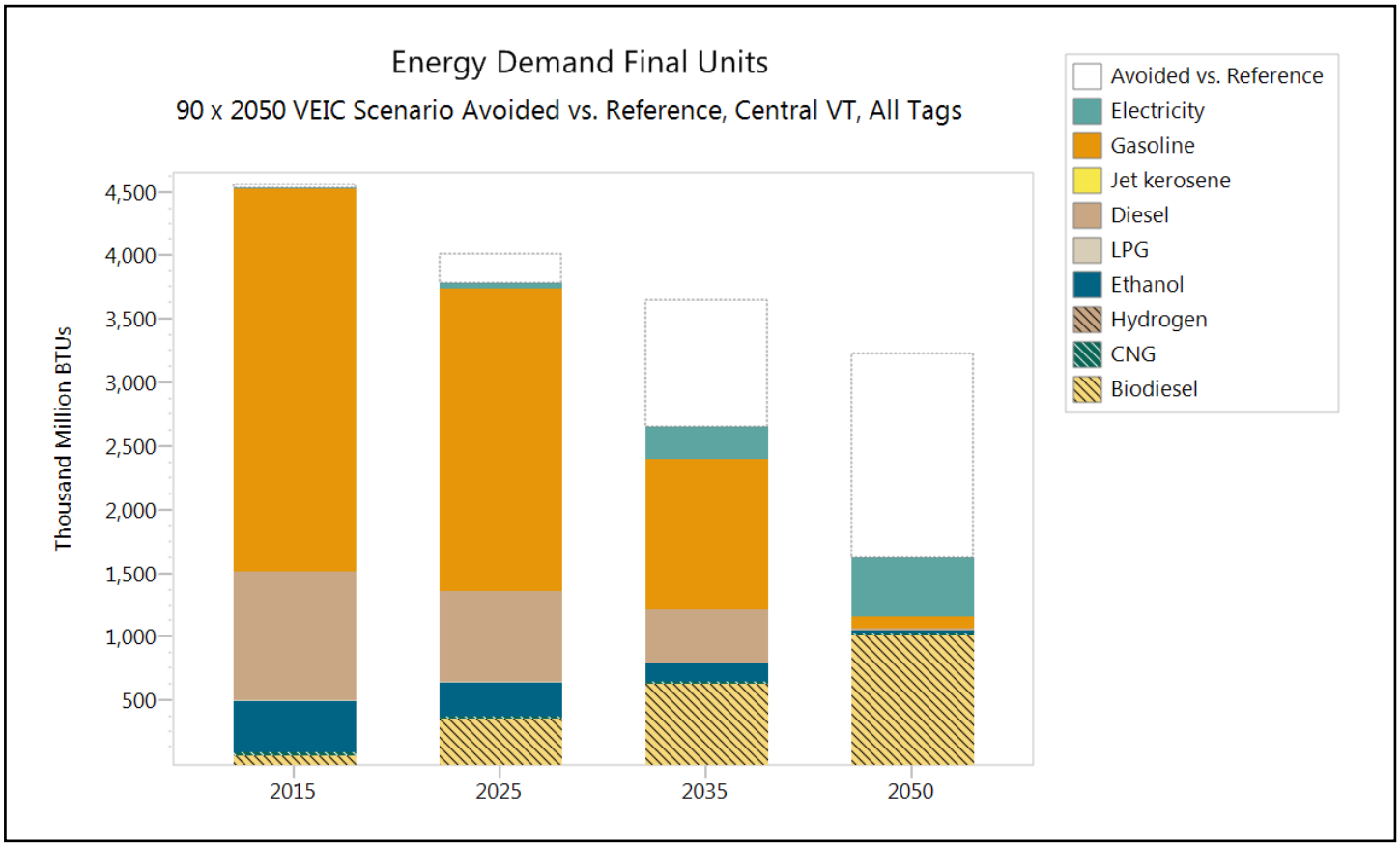


Figure 6: Regional transportation energy consumption by fuel

Detailed Sources and Assumptions

Residential

The TES provides total fuels used by sector. We used a combination of industry data and professional judgement to determine demand inputs at a sufficiently fine level of detail to allow for analysis at many levels, including end use (heating, water heating, appliances, etc.), device (boiler, furnace, heat pump) or home-type (single family, multi-family, seasonal, mobile). Assumptions for each are detailed below. All assumptions for residential demand are at a per-home level.

Space Heating

The team determined per home consumption by fuel type and home type. EIA data on Vermont home heating provides the percent share of homes using each type of fuel. 2009 Residential energy consumption survey (RECS) data provided information on heating fuels used by mobile homes. Current heat pumps consumption estimates were found in a 2013 report prepared for Green Mountain Power by Steve LeTendre entitled *Hyper Efficient Devices: Assessing the Fuel Displacement Potential in Vermont of Plug-In Vehicles and Heat Pump Technology*. Future projections of heat pump efficiency were provided by Efficiency Vermont Efficient Products and Heat Pump program experts.

Additional information came from the following data sources:

- 2010 Housing Needs Assessment[8]
- EIA Vermont State Energy Profile[9]
- 2007-2008 VT Residential Fuel Assessment[10]
- EIA Adjusted Distillate Fuel Oil and Kerosene Sales by End Use[11]

The analyst team made the following assumptions for each home type:

- Multi-family units use 60% of the heating fuel used by single family homes, on average, due to assumed reduced size of multi-family units compared to single-family units. Additionally, where natural gas is available, the team assumed a slightly higher percentage of multi-family homes use natural gas as compared to single family homes, given the high number of multi-family units located in the Burlington area, which is served by the natural gas pipeline. The team also assumed that few multi-family homes rely on cordwood as a primary heating source.

- Unoccupied/Seasonal Units: On average, seasonal or unoccupied homes were expected to use 10% of the heating fuel used by single family homes. For cord wood, we expected unoccupied

8. Vermont Housing and Finance Agency, "2010 Vermont Housing Needs Assessment," December 2009 http://www.vtaffordablehousing.org/documents/resources/623_1.8_Appendix_6_2010_Vermont_Housing_Needs_Assessment.pdf.

9. U.S. Energy Information Administration, "Vermont Energy Consumption Estimates, 2004," https://www.eia.gov/state/print.cfm?sid=VT

10. Frederick P. Vermont Residential Fuel Assessment: for the 2007-2008 heating season. Vermont Department of Forest, Parks and Recreation. 2011.

11. U.S. Energy Information Administration, "Adjusted Distillate Fuel Oil and Kerosene Sales by End Use," December 2015, https://www.eia.gov/dnav/pet/pet_cons_821usea_dcu_nus_a.htm.

or seasonal homes to use 5% of heating fuel, assuming any seasonal or unoccupied home dependent on cord wood are small in number and may typically be homes unoccupied for most of the winter months (deer camps, summer camps, etc.)

- Mobile homes—we had great mobile home data from 2009 RECS. As heat pumps were not widely deployed in mobile homes in 2009 and did not appear in the RECs data, we applied the ratio of oil consumed between single family homes and mobile homes to estimated single family heat pump use to estimate mobile home heat pump use.

- The reference scenario heating demand projections were developed in line with the TES reference scenario. This included the following: assumed an increase in the number of homes using natural gas, increase in the number of homes using heat pumps as a primary heating source (up to 37% in some home types), an increase in home heated with wood pellets, and drastic decline in homes heating with heating oil. Heating system efficiency and shell efficiency were modeled together and, together, were estimated to increase 5-10% depending on the fuel type. However, heat pumps are expected to continue to rapidly increase in efficiency (becoming 45% more efficient, when combined with shell upgrades, by 2050). We also reflect some trends increasing home sizes.

- In the 90% x 2050 $_{\text{VEIC}}$ scenario, scenario heating demand projections were developed in line with the TES TREES Local scenarios, a hybrid of the high and low biofuel cost scenarios. This included the following: assumed increase in the number of homes using heat pumps as a primary heating source (up to 70% in some home types), an increase in home heated with wood pellets, a drastic decline in homes heating with heating oil and propane, and moderate decline in home heating with natural gas. Heating system efficiency and shell efficiency were modeled together and were estimated to increase 10%-20% depending on the fuel type. However, heat pumps are expected to continue to rapidly increase in efficiency (becoming 50% more efficient, when combined with shell upgrades by 2050). We also reflect some trends increasing home sizes.

Lighting

Lighting efficiency predictions were estimated by Efficiency Vermont products experts.

Water Heating

Water heating estimates were derived from the Efficiency Vermont Technical Reference Manual[12].

Appliances and Other Household Energy Use:

EnergyStar appliance estimates and the Efficiency Vermont Electric Usage Chart[13] provided estimates for appliance and other extraneous household energy uses.

12. Efficiency Vermont, "Technical Reference User Manual (TRM): Measure Savings Algorithms and Cost Assumptions, No. 2014-87," March 2015, http://psb.vermont.gov/sites/psb/files/docketsandprojects/electric/majorpendingproceedings/TRM%20User%20Manual%20No.%202015-87C.pdf

13. Efficiency Vermont, "Electric Usage Chart Tool," https://www.efficiencyvermont.com/tips-tools/tools/electric-usage-chart-tool. www.eia.gov/dnav/pet/pet_cons_821usea_dcu_nus_a.htm.

Using the sources and assumptions listed above, the team created a model that aligned with the residential fuel consumption values in the TES.

Commercial

Commercial energy use estimates are entered in to the model as energy consumed per square foot of commercial space, on average. This was calculated using data from the TES.

Industrial

Industrial use was entered directly from the results of the TES data.

Transportation

The transportation branch focused on aligning with values from the Total Energy Study (TES) Framework for Analysis of Climate-Energy-Technology Systems (FACETS) data in the transportation sector in the Business as Usual (BAU) scenario. The VEIC 90% x 2050 scenario was predominantly aligned with a blend of the Total Renewable Energy and Efficiency Standard (TREES) Local High and Low Bio scenarios in the transportation sector of FACETS data. There were slight deviations from the FACETS data, which are discussed in further detail below.

Light Duty Vehicles

Light Duty Vehicle (LDV) efficiency is based on a number of assumptions: gasoline and ethanol efficiency were derived from the Vermont Transportation Energy Profile[14]. Diesel LDV efficiency was obtained from underlying transportation data used in the Business as Usual scenario for the Total Energy Study, which is referred to as TES Transportation Data below. Biodiesel LDV efficiency was assumed to be 10% less efficient than LDV diesel efficiency[15]. Electric vehicle (EV) efficiency was derived from an Excel worksheet from Drive Electric Vermont. The worksheet calculated EV efficiency using the number of registered EVs in Vermont, EV efficiency associated with each model type, percentage driven in electric mode by model type (if a plugin hybrid vehicle), and the Vermont average annual vehicle miles traveled. LDV electric vehicle efficiency was assumed to increase at a rate of .6%. This was a calculated weighted average of 100-mile electric vehicles, 200-mile electric vehicles, plug-in 10 gasoline hybrid and plug-in 40 gasoline hybrid vehicles from the Energy Information Administration Annual Energy Outlook[16].

Miles per LDV was calculated using the following assumptions: data from the Vermont Agency of Transportation provided values for statewide vehicles per capita and annual miles traveled[17]. The total number of LDVs in Vermont was sourced TES Transportation Data. The calculated LDV miles per capita was multiplied by the population of Vermont and divided by the number of LDVs to calculate miles per LDV.

14 Jonathan Dowds et al., "Vermont Transportation Energy Profile," October 2015, http://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Vermont%20Transportation%20Energy%20Profile%202015.pdf.

15. U.S. Environmental Protection Agency: Office of Transportation & Air Quality, "Biodiesel," Www.fueleconomy.gov, accessed August 19, 2016, https://www.fueleconomy.gov/feg/biodiesel.shtml.

16. U.S. Energy Information Administration, "Light-Duty Vehicle Miles per Gallon by Technology Type," Annual Energy Outlook 2015, 2015, https://www.eia.gov/forecasts/aeo/data/browser/#/?id=50-AEO2016&cases=ref2016~ref_no_cpp&sourcekey=0.

17. Jonathan Dowds et al., "Vermont Transportation Energy Profile."

The number of EVs were sourced directly from Drive Electric Vermont, which provided a worksheet of actual EV registrations by make and model. This worksheet was used to calculate an estimate of the number of electric vehicles using the percentage driven in electric mode by vehicle type to devalue the count of plug-in hybrid vehicles. Drive Electric Vermont also provided the number of EVs in the 90% x 2050 $_{VEIC}$ scenario.

Heavy Duty Vehicles

Similar to the LDV vehicle efficiency methods above, HDV efficiency values contained a variety of assumptions from different sources. A weighted average of HDV diesel efficiency was calculated using registration and fuel economy values from the Transportation Energy Data Book[18]. The vehicle efficiency values for diesel and compressed natural gas (CNG) were all assumed to be equal[19]. Diesel efficiency was reduced by 10% to represent biodiesel efficiency[20]. Propane efficiency was calculated using a weighted average from the Energy Information Administration Annual Energy Outlook table for Freight Transportation Energy Use[21].

In the 90% x 2050 $_{VEIC}$ scenario, it was assumed HDVs will switch entirely from diesel to biodiesel or renewable diesel by 2050. This assumption is backed by recent advances with biofuel. Cities such as Oakland and San Francisco are integrating a relatively new product called renewable diesel into their municipal fleets that does not gel in colder temperatures and has a much lower overall emissions factor[22]. Historically, gelling in cold temperatures has prevented higher percentages of plant-based diesel replacement products.

Although there has been some progress toward electrifying HDVs, the VEIC 90% x 2050 scenario does not include electric HDVs. An electric transit bus toured the area and gave employees of BED, GMTA, and VEIC a nearly silent ride around Burlington. The bus is able to fast charge using an immense amount of power that few places on the grid can currently support. The California Air Resources Board indicated a very limited number of electric HDVs are in use within the state[23]. Anecdotally, Tesla communicated it is working on developing an electric semi-tractor that will reduce the costs of freight transport[24].

The total number of HDVs was calculated using the difference between the total number of HDVs and LDVs in 2010 in the Vermont Transportation Energy Profile and the total number of LDVs from TES Transportation Data[25]. HDV miles per capita was calculated using the ratio of total HDV miles traveled from the 2012

18 Ibid.

19. "Natural Gas Fuel Basics," Alternative Fuels Data Center, accessed August 19, 2016, http://www.afdc.energy.gov/fuels/natural_gas_basics.html.

20. U.S. Environmental Protection Agency: Office of Transportation & Air Quality, "Biodiesel."

21. US Energy Information Administration (EIA), "Freight Transportation Energy Use, Reference Case," Annual Energy Outlook 2015, 2015, http://www.eia.gov/forecasts/aeo/data/browser/#/?id=58-AEO2015&region=0-0&cases=ref2015&start=2012&end=2040&f=A&linechart=ref2015-d021915a.6-58-AEO2015&sourcekey=0.

22. Oregon Department of Transportation and U.S. Department of Transportation Federal Highway Administration, "Primer on Renewable Diesel," accessed August 29, 2016, http://altfueltoolkit.org/wp-content/uploads/2004/05/Renewable-Diesel-Fact-Sheet.pdf.

23. California Environmental Protection Agency Air Resources Board, "Draft Technology Assessment: Medium- and Heavy-Duty Battery Electric Trucks and Buses," October 2015, https://www.arb.ca.gov/msprog/tech/techreport/bev_tech_report.pdf.

24. Elon Musk, "Master Plan, Part Deux," Tesla, July 20, 2016, https://www.tesla.com/blog/master-plan-part-deux.

25. Jonathan Dowds et al., "Vermont Transportation Energy Profile."

Transportation Energy Data Book and the 2012 American Community Survey U.S. population estimate[26, 27]. The total number of HDVs and HDV miles per capita were combined with the population assumptions outlined above to calculate miles per HDV.

Rail

The rail sector of the transportation branch consists of two types: freight and passenger. Currently in Vermont, freight and passenger rail use diesel fuel[28, 29]. The energy intensity (Btu/short ton-mile) of freight rail was obtained from the U.S Department of Transportation Bureau of Transportation Statistics[30]. A 10-year average energy intensity of passenger rail (Btu/passenger mile) was also obtained from the U.S Department of Transportation Bureau of Transportation Statistics[31]. Passenger miles were calculated using two sets of information. First, distance between Vermont Amtrak stations and the appropriate Vermont border location were estimated using Google Maps data. Second, 2013 passenger data was obtained from the National Association of Railroad Passengers[32]. Combined, these two components created total Vermont passenger miles. We used a compound growth rate of 3% for forecast future passenger rail demand in the 90% x 2050 VEIC scenario, consistent with the historical growth rates of rail passenger miles in Vermont[33]. Passenger rail is assumed to completely transform to electric locomotion. Freight rail is assumed to transform to biodiesel or renewable diesel.

Air

The total energy of air sector used appropriate FACETS data values directly. The air sector is expected to continue using Jet Fuel in both scenarios.

26 "Transportation Energy Data Book: Edition 33" (Oak Ridge National Laboratory, n.d.), accessed August 18, 2016.

27 U. S. Census Bureau, "Total Population, Universe: Total Population, 2012 American Community Survey 1-Year Estimates," American Fact Finder, 2012, http://factfinder.census.gov/bkmk/table/1.0/en/ACS/12_1YR/B01003/0100000US.

28. US Energy Information Administration (EIA), "Freight Transportation Energy Use, Reference Case."

29. Vermont Agency of Transportation Operations Division - Rail Section, "Passenger Rail Equipment Options for the Amtrak Vermonter and Ethan Allen Express: A Report to the Vermont Legislature," January 2010, http://www.leg.state.vt.us/reports/2010ExternalReports/253921.pdf.

30. U.S. Department of Transportation: Office of the Assistant Secretary for Research and Technology Bureau of Transportation Statistics, "Table 4-25: Energy Intensity of Class I Railroad Freight Service," accessed August 26, 2016, http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_25.html.

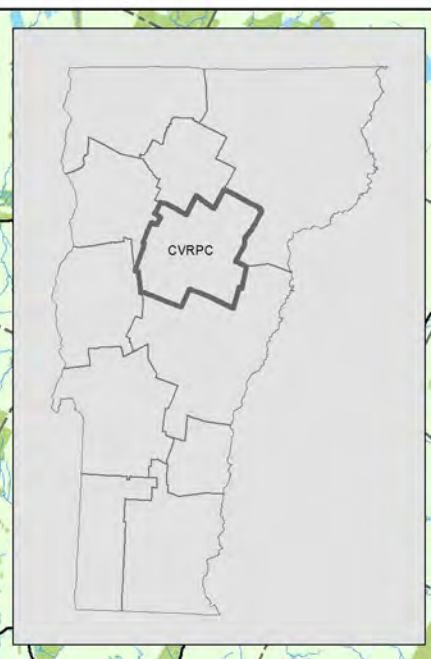
31. U.S. Department of Transportation: Office of the Assistant Secretary for Research and Technology Bureau of Transportation Statistics, "Table 4-26: Energy Intensity of Amtrak Services," accessed August 26, 2016, http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_26.html.

32. National Association of Railroad Passengers, "Fact Sheet: Amtrak in Vermont," 2016, https://www.narprail.org/site/assets/files/1038/states_2015.pdf

33. Joseph Barr, AICP et al., "Vermont State Rail Plan: Regional Passenger Rail Forecasts."

Central Vermont Region

2008 Future Land Use Map



WOODBURY
Woodbury Village
South Woodbury
CABOT
Cabot Village
WORCESTER
North Calais
Maple Corner
WATERBURY
Waterbury Center
Worcester Village
CALAIS
East Calais
Marshfield Village
Putnamville
Adamant
Colbyville
Waterbury Village
Duxbury Village
MIDDLESEX
MARSHFIELD
DUXBURY
EAST MONTPELIER
North Montpelier
East Montpelier Center
Middlesex Village
MONTPELIER
Plainfield Village
East Montpelier Village
MORETOWN
Moretown Village
PLAINFIELD
BERLIN
BARRE TOWN
FAYSTON
Riverton
BARRE CITY
Irasville
Waitsfield Village
South Barre
Lower Websterville
WAITSFIELD
Upper Websterville
Northfield Falls
Lower Graniteville
East Barre
ORANGE
NORTHFIELD
Upper Graniteville
Orange Village
Northfield Village
Cogswell
Warren Village
South Village
Williamstown Village
East Warren
WILLIAMSTOWN
Washington Village
East Orange
WARREN
Roxbury Village
ROXBURY
WASHINGTON

Future Land Use

- Resource
- Rural
- Regional Center
- Town Centers
- Industrial
- Mixed-Use Commercial
- Hamlets
- Resort Centers
- Villages

N

Adopted 10/13/2015

0 2 4 6 8 10 Miles

Data should be verified during permitting process per the provisions of the regulatory authority. This map is for general planning purposes only. This map may contain errors and omissions. See page 2-19 and 2-31 of the Land Use Element for a complete explanation.

CVRPC
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

Document Path: M:\Regional Plan\Update 2016\Maps and Analysis\Future Land Use\Future_Land_Use.mxd

Central Vermont Topography

Legend

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate
- Stream/River
- Surface Water
- × Summits

Contours (100 ft. intervals)

- 500 - 3900 feet (odd values)
- 600 - 4000 feet; < 500 feet (even values)

0 1.75 3.5 7 Miles

N

1 inch equals 3.5 miles

GIS
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

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Data Source:
Roads - VTrans, VGIS 2007
Surface Waters - VT Hydrologic Data, VCGI 2007
Regional Boundaries - VCGI 2006
Topologic - USGS 1999

Created 12/19/07 by CVRPC
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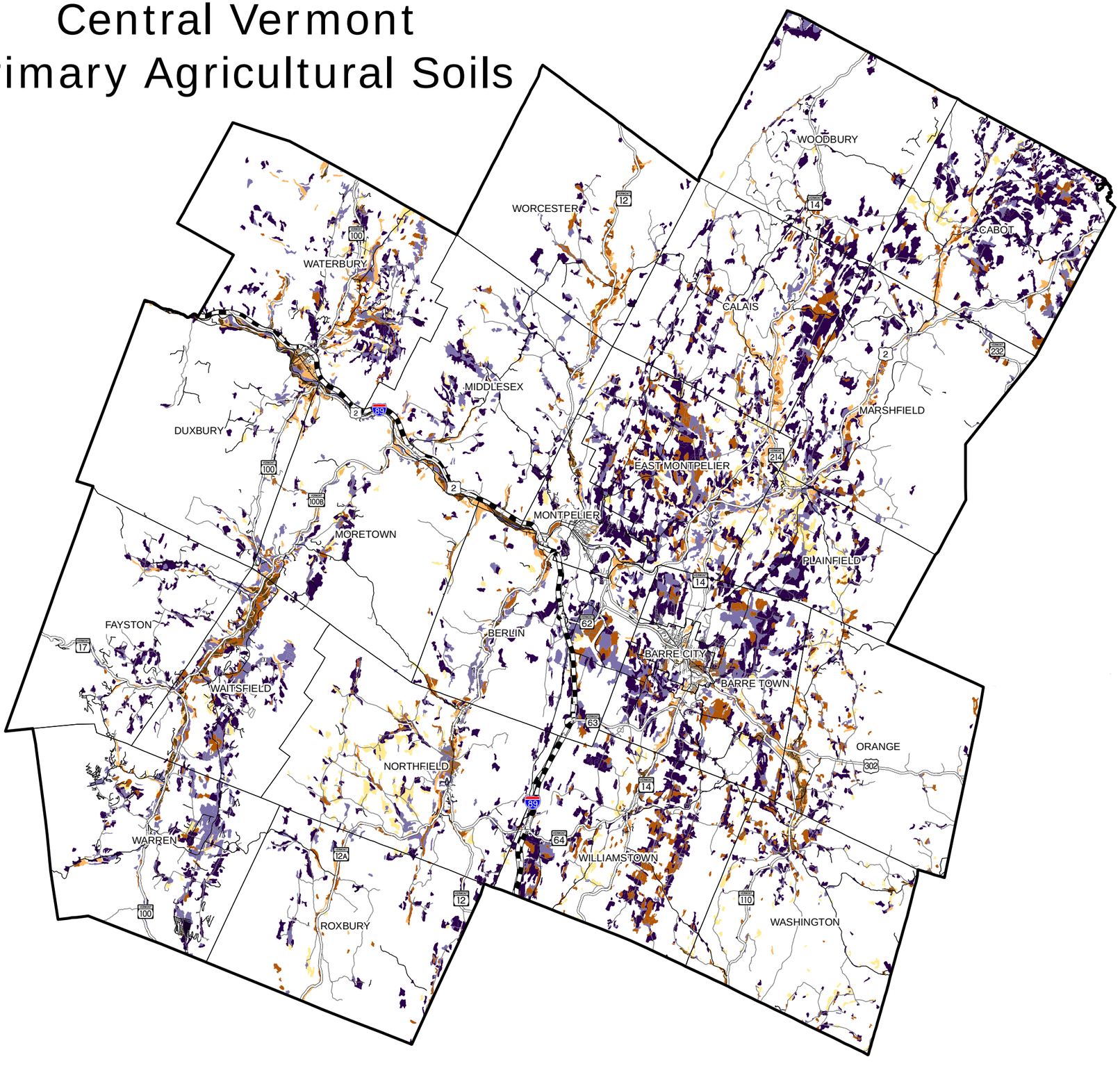
Central Vermont
Primary Agricultural Soils



Legend

Agricultural Value

1 2 3 4 5 6 7

|<----Few Limitations ------ Greater Limitations --->|

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
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Data Source:
Soils - ANR 2004
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

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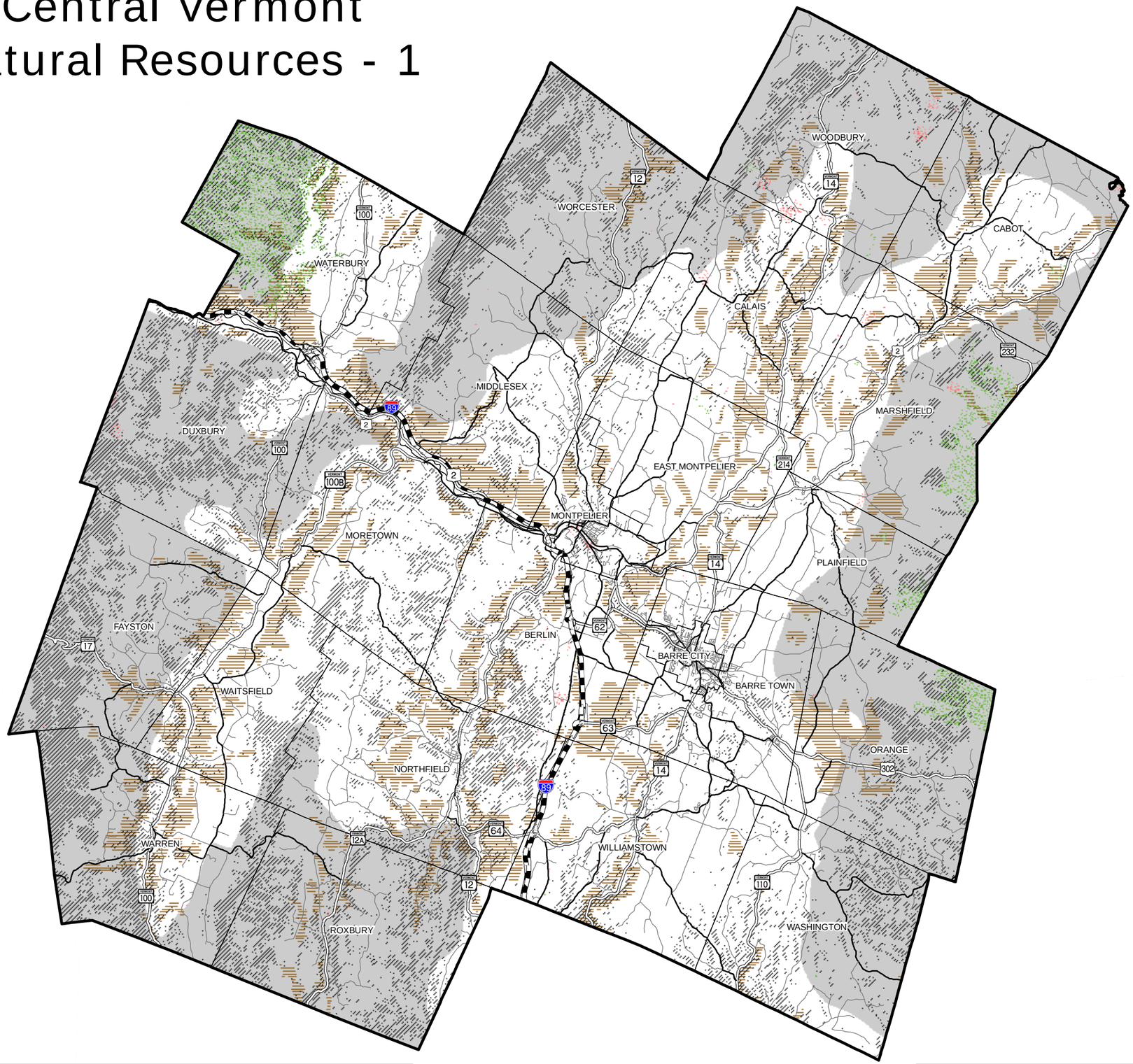
Central Vermont
Natural Resources - 1



Legend

- Natural Communities
- Endangered Species
- Deer Wintering Habitat
- Bear Reproduction Zones
- 25% Slope or Greater

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7

Miles

1 inch equals 3.5 miles

GIS
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

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Data Source:
Deer Yards - ANR
Bear Habitat - ANR
Slopes - ANR
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 12/27/07 by CVRPC
M:/Region/RegionalPlan_Update200/GIS/Maps/Natural Resources 1.mxd

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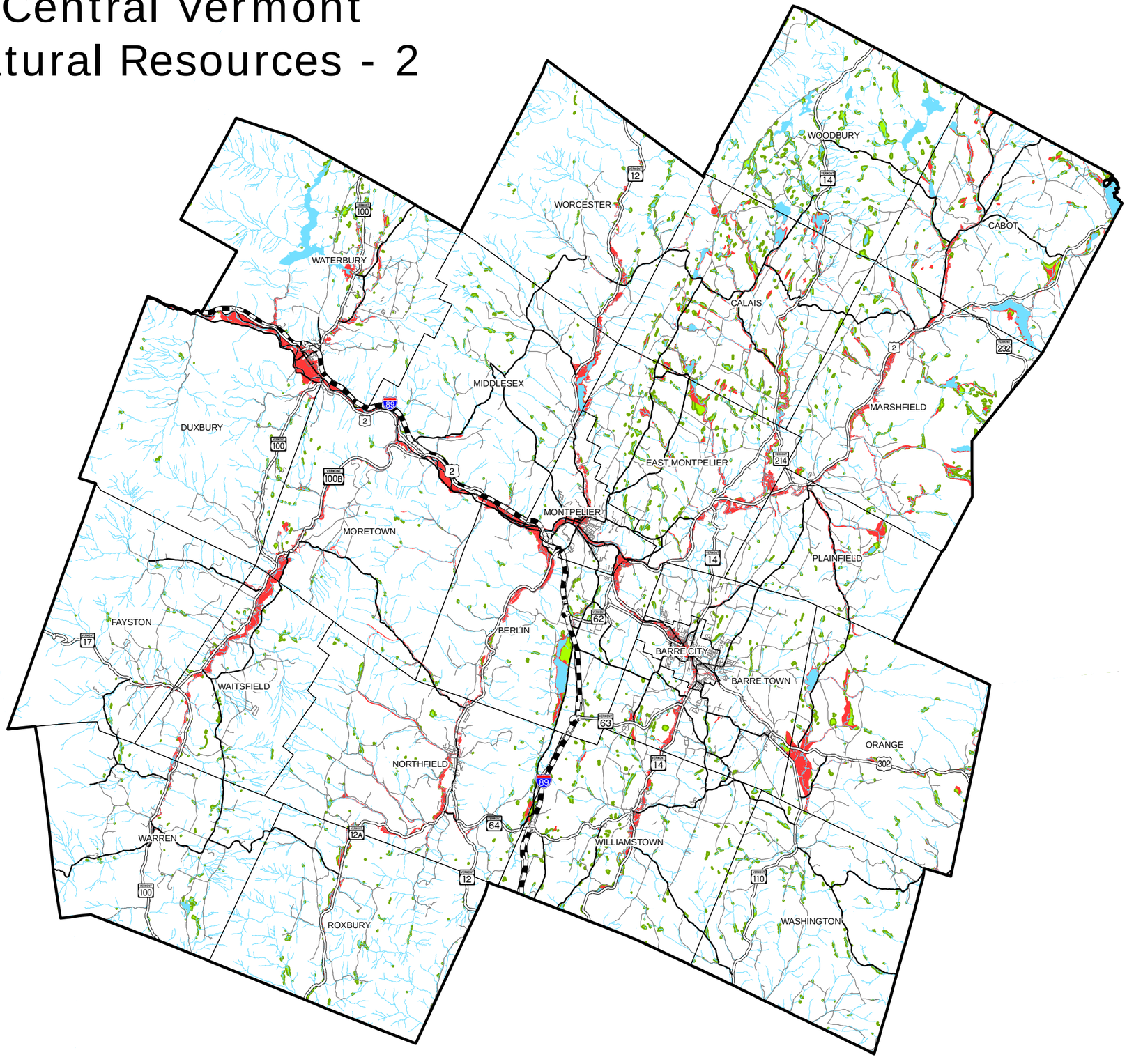
Central Vermont
Natural Resources - 2



Legend

- Fema Floodplain
- Wetlands
- Streams/Rivers
- Surface Water

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
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Data Source:
Wetlands - ANR
FEMA Floodplain - FEMA
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

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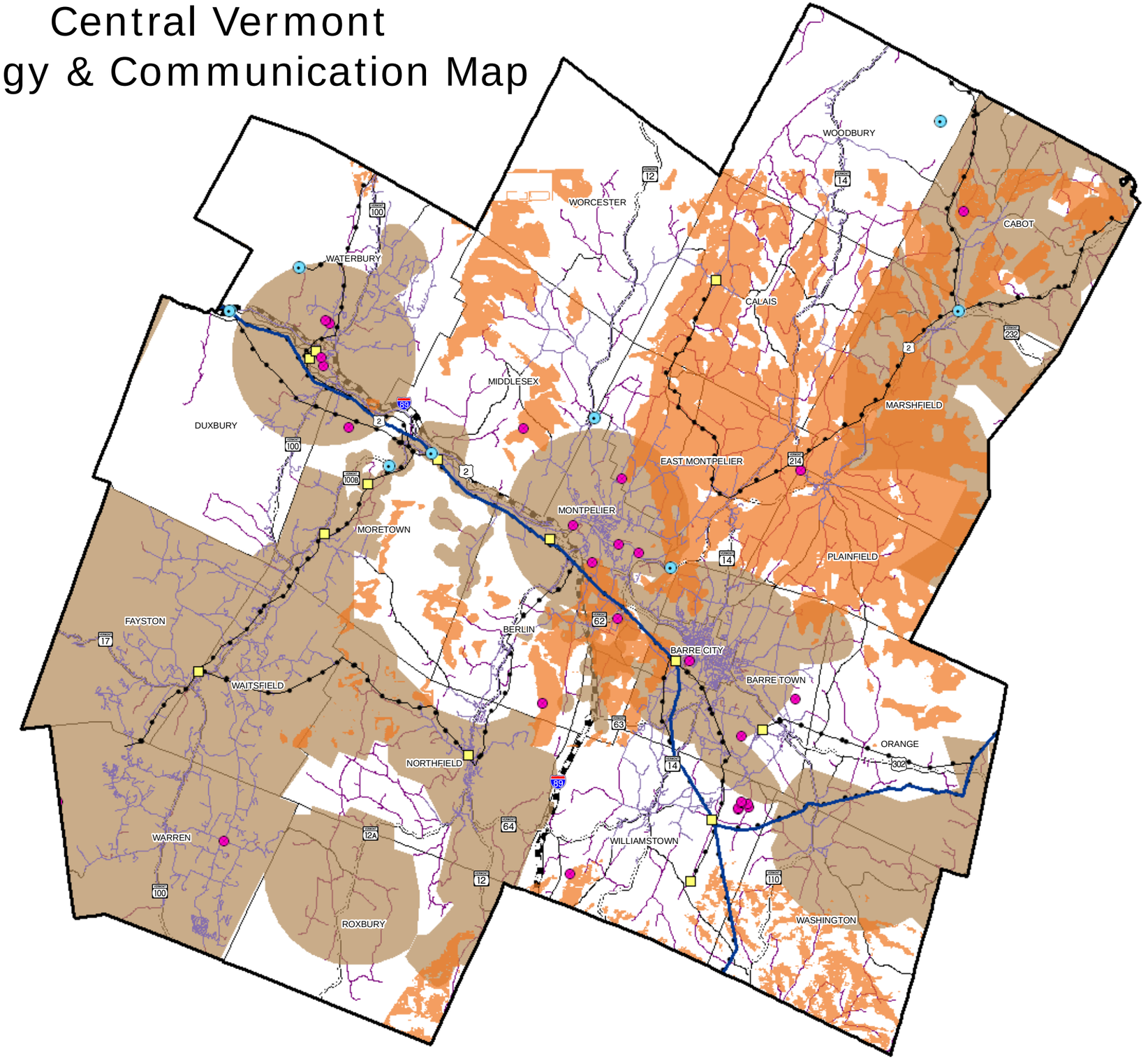
Central Vermont
Energy & Communication Map



Legend

Energy Generation
- Substations
- Hydro Plants

Communications
- Cell, Radio, and TV Towers
- Cable TV Lines
- Cable Modem Lines
- Wireless Service Area
- DSL Service Area
- Both Service Areas
- VELCO Transmission Lines
- Electrical Distribution Lines

Roads:
- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7

Miles

1 inch equals 3.5 miles

GIS
CENTRAL VERMONT
REGIONAL PLANNING
COMMISSION

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Data Source:
Telecommunication: Data obtained from VCGI, ANR, and CVRPC
Roads - VTrans, VGIS 2007
Tourism Trails: ANR, 2007
Regional Boundaries - VCGI 2006

Created 2/25/08 by CVRPC
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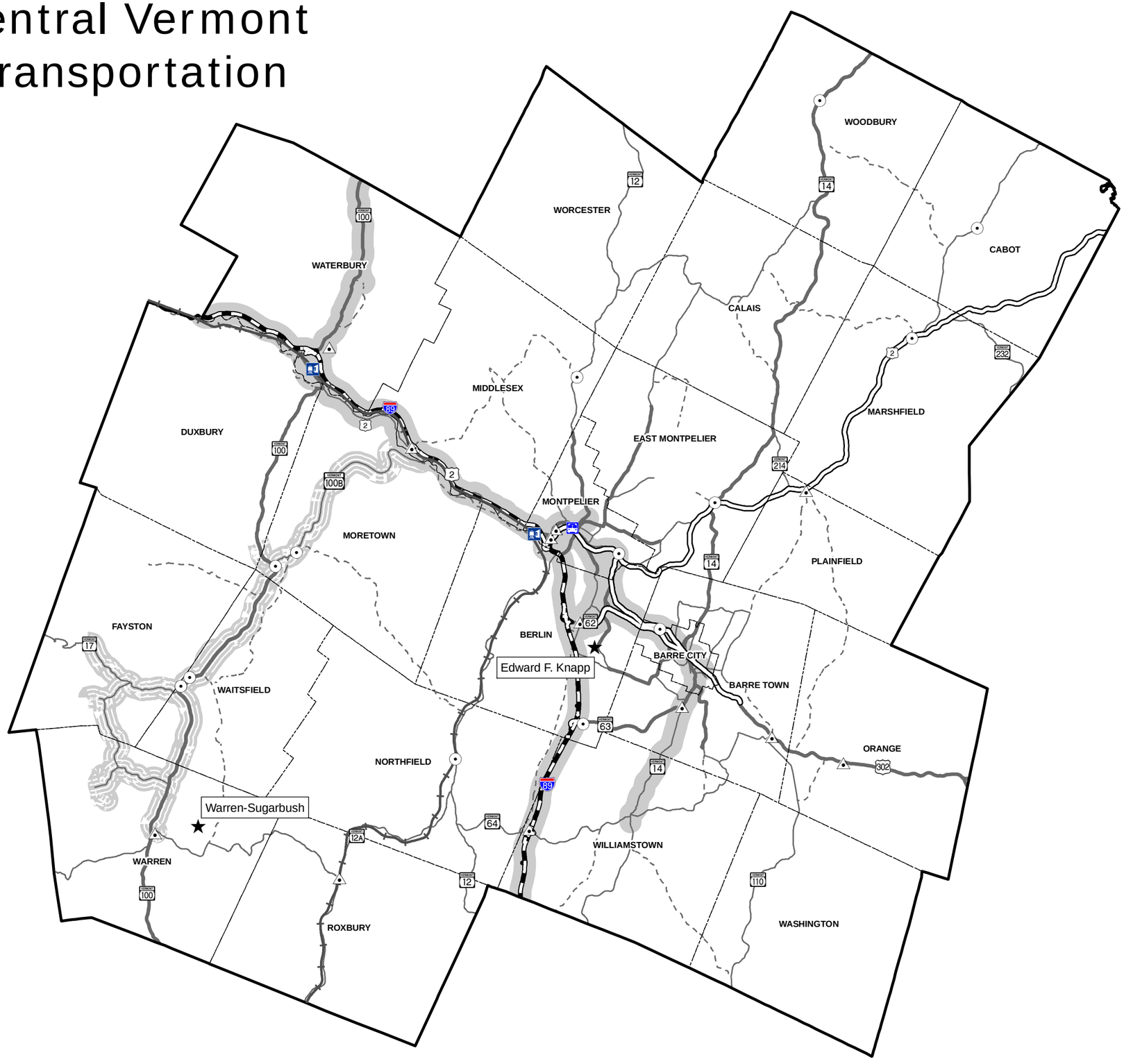
Data is only as accurate as the original source materials. This map is for planning purposes. This map may contain errors and omissions.

Central Vermont Transportation



Legend

Functional Class

- Interstate/Expressway
- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- ★ Airports

Bus Service Areas

- Year Round
- Seasonal
- Vermont Transit Stop

Park and Ride Lots

- Existing Lots
- Future Lots

Amtrak Route

- Central Vermont
- Amtrak Stops

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

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Data Source:
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

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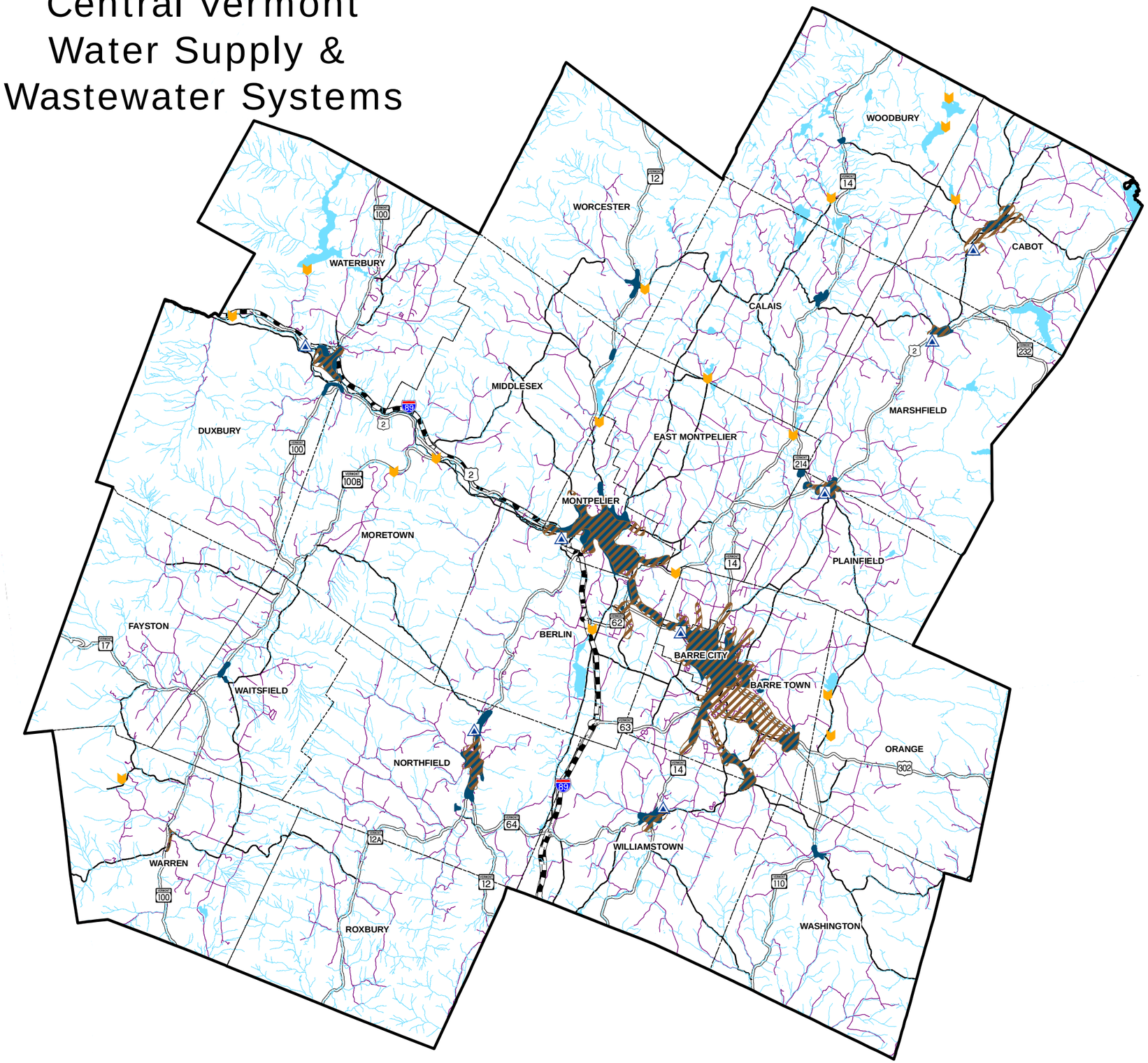
Central Vermont Water Supply & Wastewater Systems



Legend

Facilities

- Public Wastewater Treatment Plants

Sewer & Water Service Areas

- Public Wastewater
- Public Water Supply

Dams

- In Service (Water Storage, Supply, & Flood Control)

Roads

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

- Surface Water
- StreamRiver

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

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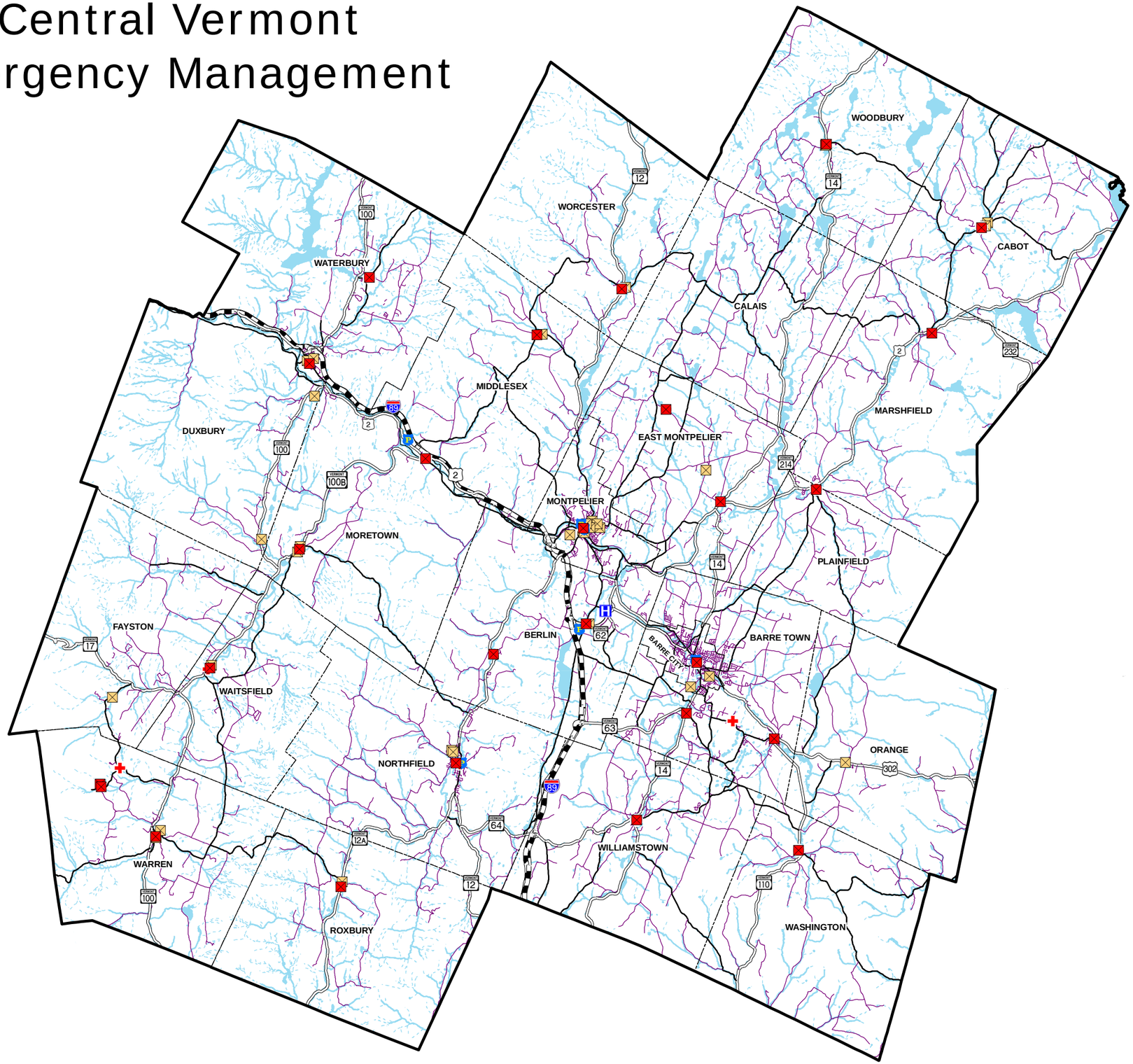
Data Source:
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 3/10/08 by CVRPC
M:/Region/RegionalPlan_Update200/GIS/Maps/Wastewater_Systems.mxd

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

Central Vermont Emergency Management



Legend

Emergency Operation Facilities

- Fire Station
- Police
- Hospital
- EMT Station Locations
- Emergency Shelters

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7

Miles

1 inch equals 3.5 miles

GIS

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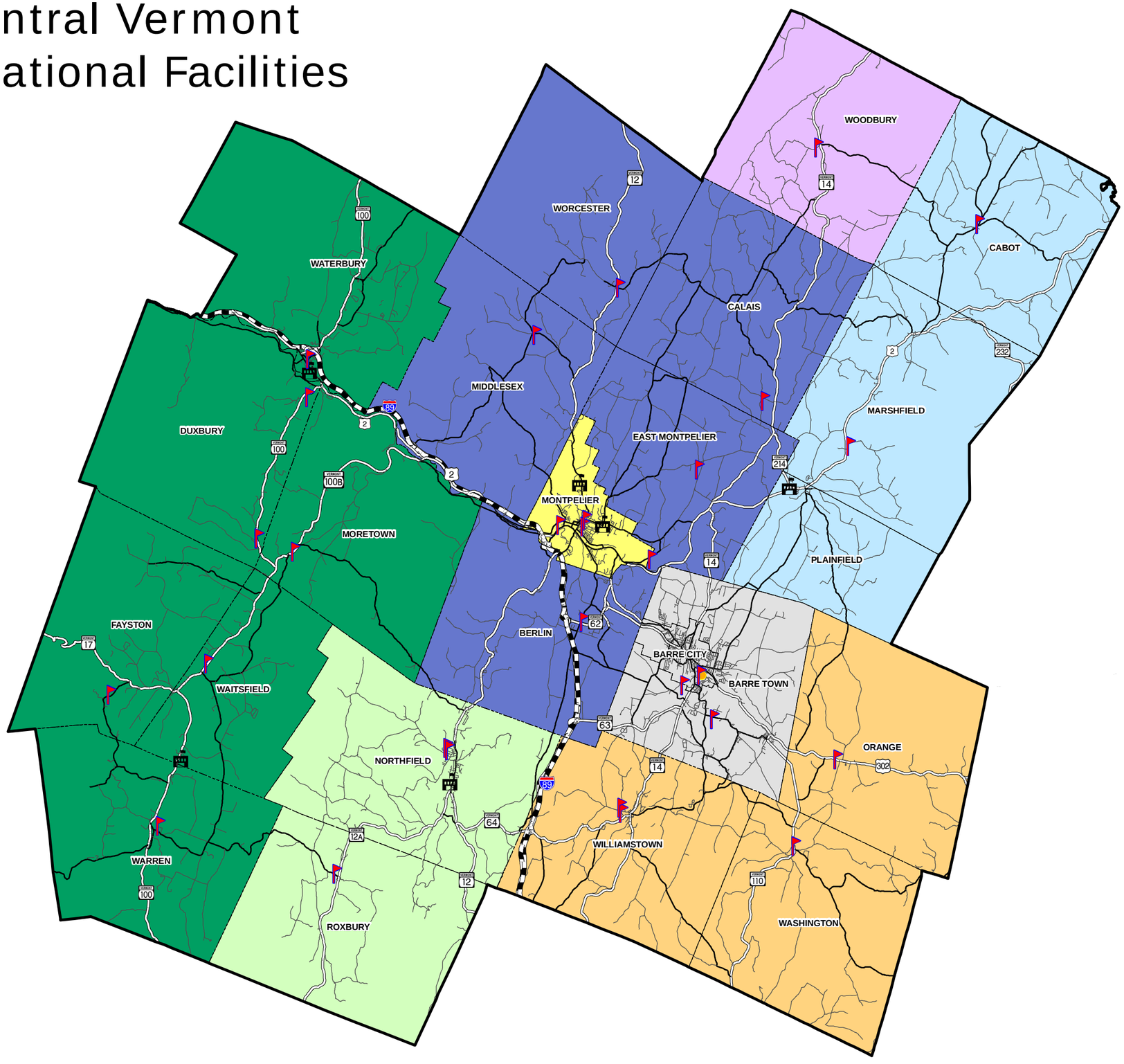
Data Source:
Emergency Operations Facilities - CVRPC, 2007
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 2/29/08 by CVRPC
M:/Region/RegionalPlan_Update2008/GIS/Maps/Emergency_Management.mxd

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

Central Vermont Educational Facilities



Legend

School Districts

- Barre Town/City
- Montpelier School District
- Orange North
- Orleans Southwest
- Washington Central
- Washington Northeast
- Washington South
- Washington West

Public Schools

- Elementary, Middle, High School
- College / Post Secondary School
- Vocational School

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
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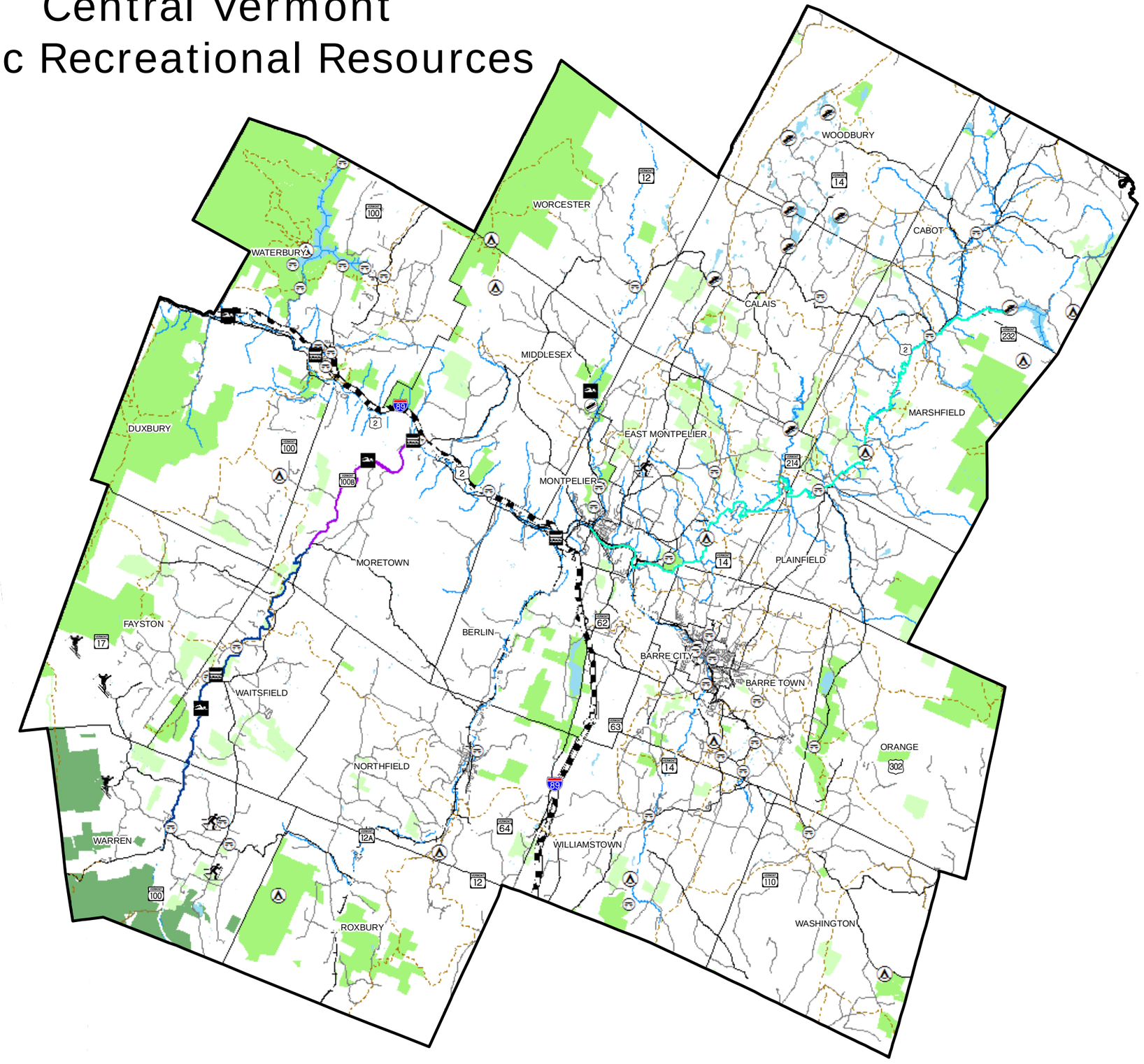
Data Source:
School Districts & Facilities - VCGI, 2007
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 12/27/07 by CVRPC
M:/Region/RegionalPlan_Update200/GIS/Maps/Educational_Facilities.mxd

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

Central Vermont
Public Recreational Resources



Legend

Conserved Lands

- Green Mountain National Forest
- State and Municipal Public Lands
- Private Conserved Lands

Recreational Sites

- Alpine Skiing
- Nordic Skiing
- Boat & Fishing Access (Lakes, Ponds, & Marshes)
- Swimming Areas
- Canoe Access
- Public Campgrounds
- Public Recreational Fields & Parks
- Trails (VAST, Long Trail, Catamount Trail, etc.)

Recreational River Uses

- Expert Kayaks & Open Boats
- Mixed / Whitewater Rapids
- Open Boats

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 Miles

GIS
CENTRAL VERMONT REGIONAL PLANNING COMMISSION

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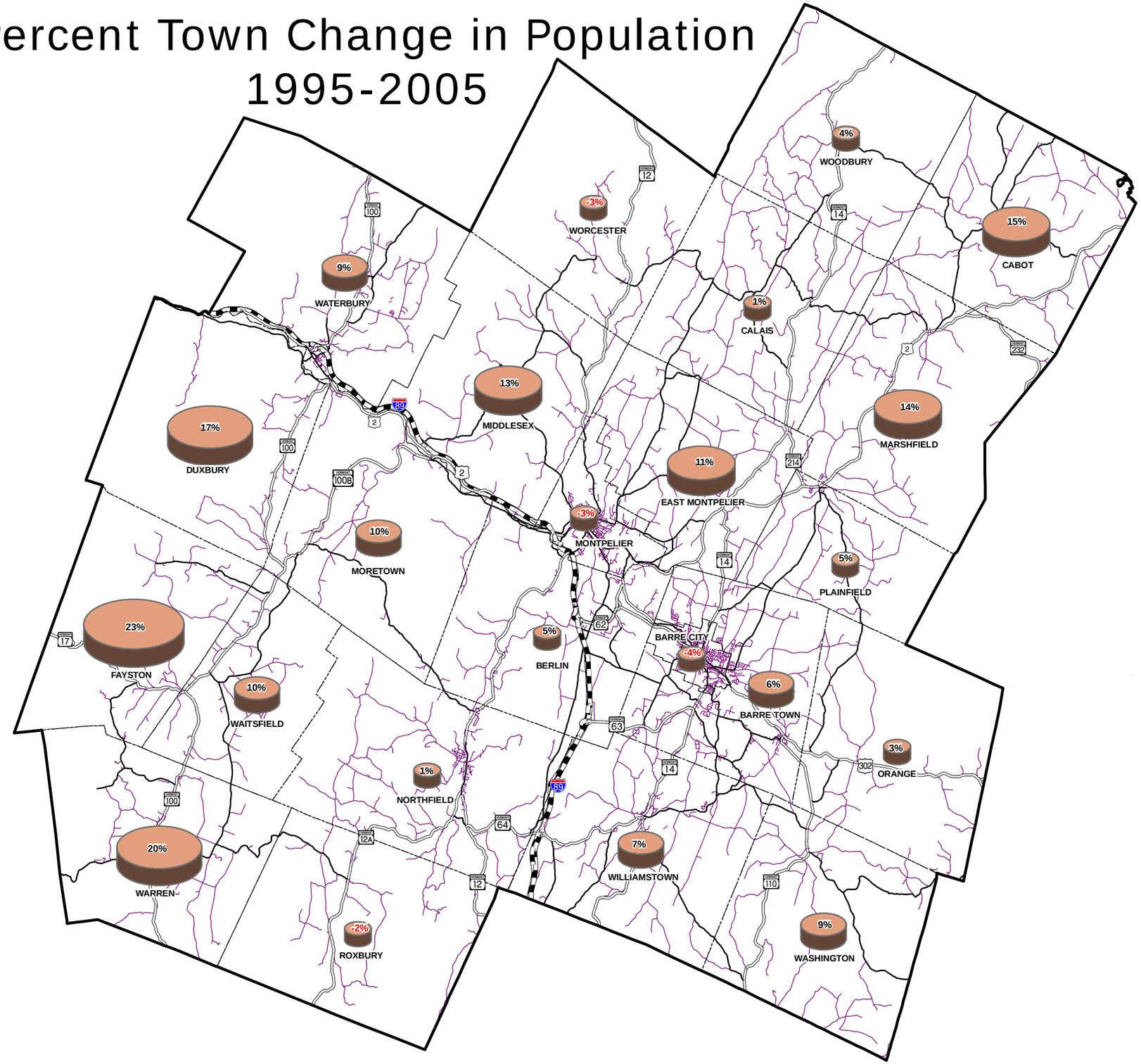
Data Source:
Conserved Lands: UVM, 2005
Recreational Sites: VCGI, 2007
Recreational River Reaches: ANR, 2007
Roads - VTrans, VGIS 2007
Tourism Trails: ANR, 2007
Created 2/25/08 by CVRPC
M:/Region/RegionalPlan_Update2008/GIS/Maps/Public Recreational Resources.mxd

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

Central Vermont
Percent Town Change in Population
1995-2005



Legend

% Town Population Change 1995 - 2005

- \- 4% - + 5%
- 6% - 10%
- 11% - 15%
- 16% - 20%
- 21% - 25%

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
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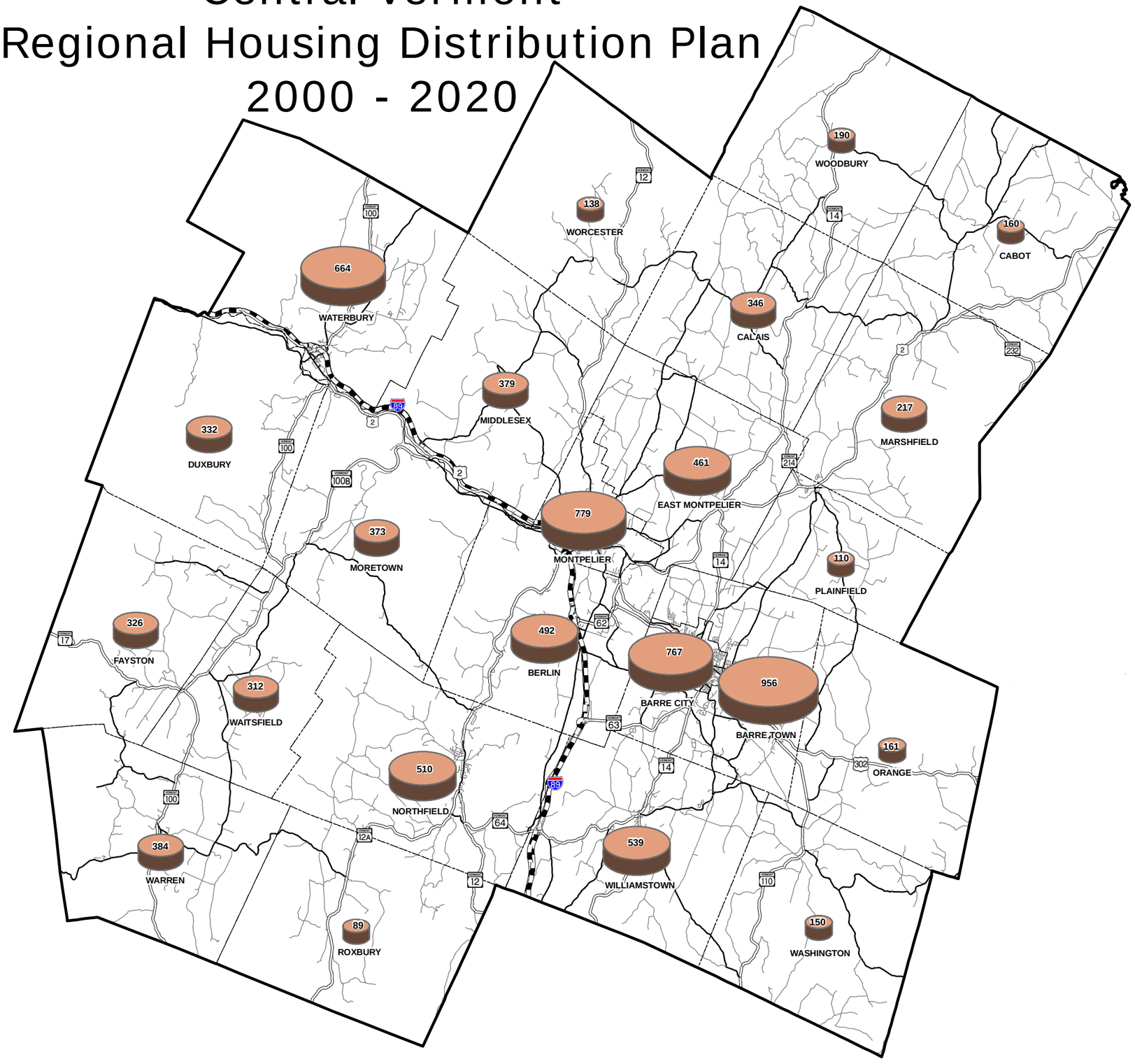
Data Source:
Population : Percent change was calulated use the Vermont Department of Health 1995 and 2005 population values.
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 12/27/07 by CVRPC
M:/Region/RegionalPlan_Update200/GIS/Maps/Population_changes.mxd

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

Central Vermont
Regional Housing Distribution Plan
2000 - 2020



Legend

Housing Distribution Values

- 0 - 199
- 200 - 399
- 400 - 599
- 600 - 799
- 800 - 1000

Roads:

- Class 1 Town Highway
- Class 2 Town Highway
- Class 3 Town Highway
- State Highway; US Highway
- Interstate

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
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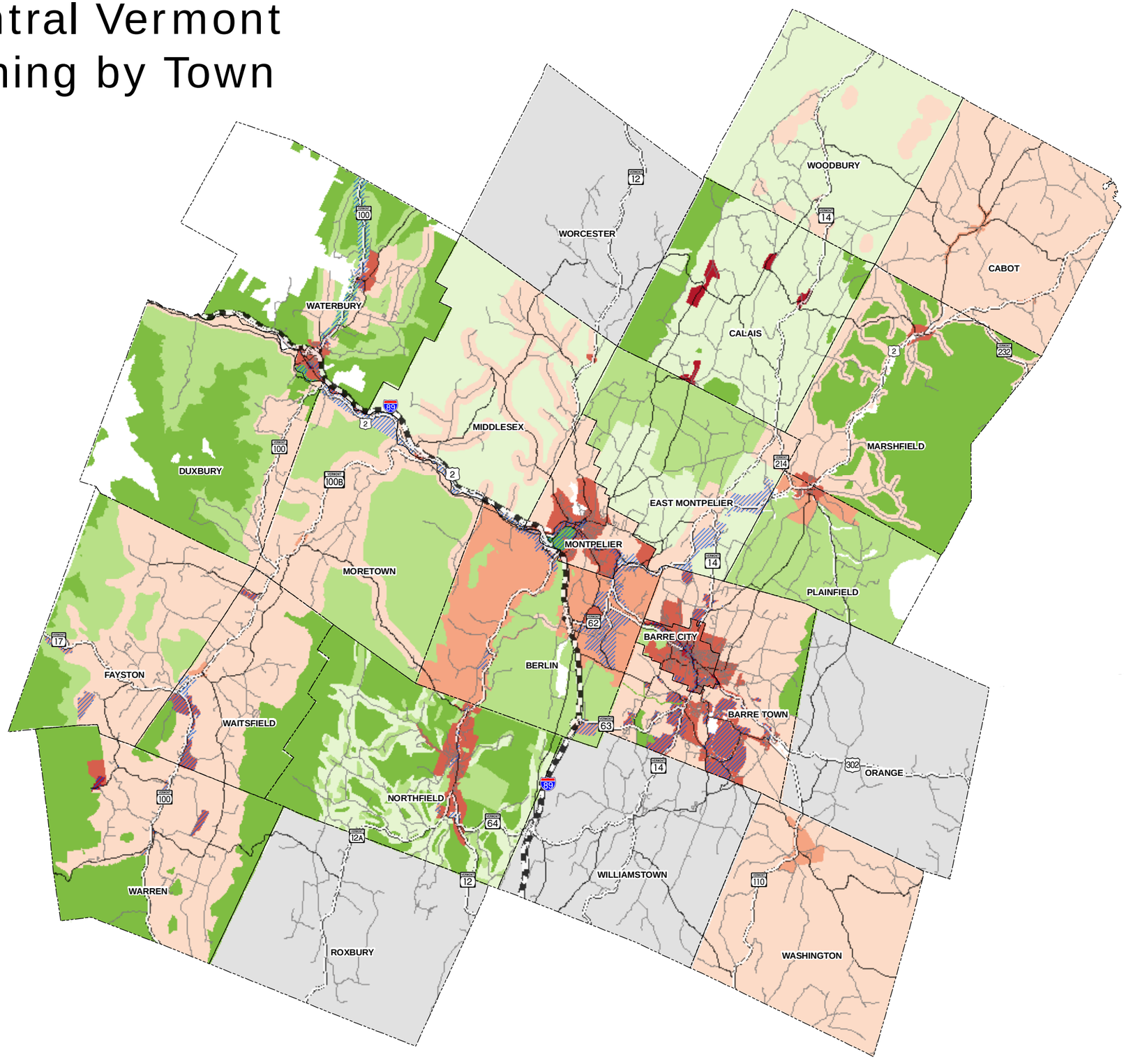
Data Source:
Housing Need : Housing need values are derived from Regional Housing Ditribution Plan 2000-2020 totals.
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 3/10/08 by CVRPC
M:/Region/RegionalPlan_Update200/GIS/Maps/Housing_needs.mxd

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

Central Vermont Zoning by Town



Legend

Residential Zoning by Density

- White — No Development
- No Minimum Lot Size
- 0 - 0.49 Acres
- 0.5 - 0.99 Acres
- 1 - 2.99 Acres
- 3 - 4.99 Acres
- 5 - 9.99 Acres
- 10 and Greater Acres

Commercial Zoning by Density

- White — No Development
- No Minimum Lot Size
- 0 - 0.49 Acres
- 0.5 - 0.99 Acres
- 1 - 2.99 Acres
- 3 - 4.99 Acres
- 5 - 9.99 Acres
- 10 and Greater Acres

- No Zoning

N

0 1.75 3.5 7 Miles

1 inch equals 3.5 miles

GIS
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Data Source:
Zoning: Data obtained from Towns and CVRPC
Roads - VTrans, VGIS 2007
Regional Boundaries - VCGI 2006

Created 3/11/08 by CVRPC
M:/Region/RegionalPlan_Update200/GIS/Maps/CVRegion_Zoning.mxd

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