Central Vermont Regional Planning Commission

Energy Planning Project
Definition of Resource & Constraint Layers

Mapping & Constraint Layers

Mapping standards are described in the Department of Public Service's Energy Planning Standards for Regional Plans. These standards outline the requirements for which plans are required to identify potential areas for development and siting of renewable energy resources, as well as areas that are unsuitable for siting those resources. By layering constraint areas (areas identified as likely unsuitable for development) over raw energy resource maps (maps that at the most basic, show where the wind blows and the sun shines), the Central Vermont region will be able to identify potential and preferred areas for renewable energy development.

Using input from municipalities, CVRPC is working to develop these energy maps. These maps will be broken out for all municipalities, and municipalities can use these region-provided maps to meet the municipal mapping standards for municipal energy plans if they so choose.

The constraint layers which will be included in the maps are broken out into two categories; ***known*** and ***possible***. The maps and the text describing the policies or rules used to construct the map, as well as the text describing specific policies applicable to map features, should be complementary. Any constraints included on the maps should be clearly identifiable in the text, should a map lack sufficient clarity or granularity regarding the area in which a project is proposed.

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Known constraints: These constraint layers signal likely, those not absolute, unsuitability for development based on statewide or local regulations or designated critical resources. Known constraints are significant because when a proposed development is up for review with the Public Service Board (PSB), a proposed development in an area marked as a known constraint will signify to the PSB that that area is highly unsuitable for development. Known constraints do not guarantee that no development will occur, but they will make it highly unlikely.

State identified known constraints include the following; Vernal Pools (confirmed and unconfirmed layers), DEC River Corridors, FEMA Floodways, State-significant Natural Communities and Rare, Threatened, and Endangered Species, National Wilderness Areas, Class 1 and Class 2 Wetlands (VSWI and advisory layers).

Possible constraints: These constraint layers signal 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 in or in effect. Possible constraints are significant because they signify to a developer that an area might need additional analysis or inspection before development plans are initiated. They also signify to the PSB that while these areas are suitable to a certain extent, they are not a preferred location for development.

State identified possible constraints include the following; Agricultural Soils, FEMA Special Flood Hazard Areas, Protected Lands, Act 250 Ag Mitigation Parcels, Deer Wintering Areas, Vermont Conservation Design include the following Highest Priority Forest Blocks: Connectivity, Interior, and Physical Landscape Diversity, Hydric Soils.

Listed below are the State Know and Possible constraints and the proposed Regional constraints and the data/methodologies/definitions that went into those layers.

Known Constraints

Vernal Pools (confirmed and unconfirmed layers) : A vernal pool is a small wetland in a shallow natural depression that typically fills with water during the spring and/or fall and may dry during the summer. Vernal pools have no permanent inlet stream and no viable populations of fish. Vernal pools are typically sparsely vegetated with herbaceous plants and are shaded by trees from the surrounding upland forest. Many vernal pools provide critical breeding habitat for amphibians.

This dataset is derived from a project by the Vermont Center for Ecostudies (VCE) and Arrowwood Environmental (AE) to map vernal pools throughout the state of Vermont. AE and VCE are mapping locations of potential vernal pools throughout Vermont, and recruiting a corps of volunteers to field-verify the presence of these potential pools. In the process, ANR will develop a GIS layer of potential and known vernal pools, as well as a database populated with biological and physical attributes of each verified pool. With partial funding from the Vermont State Wildlife Grants Program, potential vernal pools will be identified using color infrared aerial photographs. Original 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. The 'confirmed' dataset represents only those sites which have been verified as vernal pools; the 'unconfirmed' data set represents only those sites which have not yet been field-visited or verified as vernal pools. Field visits to confirm vernal pools continue. This statewide dataset has been collected in 2009-present.

DEC River Corridors: 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 (i.e. equilibrium conditions) that would be created and maintained naturally within a given valley setting. River corridors are developed to facilitate ANR's responsibilities in providing municipalities, regional planning commissions, and Act 250 District Commissions with technical assistance and information concerning river sensitivity and fluvial erosion hazards. Vermont river corridors include areas where active, potentially hazardous river erosion and deposition process have occurred or are likely to occur. These delineations do NOT indicate that areas outside river corridors, particularly those immediately abutting the river or river corridor are free from fluvial erosion hazards. 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. For a thorough discussion of the purpose, design and management of the Vermont River Corridors dataset, please see the "Vermont DEC Flood Hazard Area and River Corridor Protection Procedures December 5, 2014" http://www.vtwaterquality.org/rivers/docs/FHARCP_12.5.14.pdf.

This dataset is part of the "applicable maps" used in conjunction with other best available stream geomorphic data to implement both the Flood Hazard Area and River Corridor "Rule" and "Protection Procedure." The data will be updated over time as described in the Procedure. The date of the version posted on the Vermont Natural Resource Atlas indicates the most recent update. Users should cite the Creation Date for the version. Data processing was done using ArcGIS 10.x, Spatial Analyst, and Arc Hydro Tools 2.0. Source and digitized data included VT Meander Centerlines (MCLs), VT Reach Break points, VT Hydrography streams, VT 10-meter DEM, VTHYDRODEM, HUC 8 Basins, and VT Roads and Railroads. Major derived datasets include raster and vector valley walls, catchments per stream reach, variable-width MCL buffers, and the final River Corridor. A Frequently-Asked Questions page is available at: http://floodready.vermont.gov/rcfaq

FEMA Floodways: 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 one foot at any point. Flood hazard areas and floodways may be shown on separate map panels.

The entire Vermont extent of the National Flood Hazard Layer (NFHL) as acquired 12/15/15 from the FEMA Map Service Center msc.fema.gov upon publication 12/2/2015 and converted to VSP. The FEMA DFIRM NFHL database compiles all available officially-digitized Digital Flood Insurance Rate Maps. This extract from the FEMA Map Service Center includes all of such data in Vermont including counties and a few municipalities. This data includes the most recent map update for Bennington County effective 12/2/2015. DFIRM - Letter of Map Revision (LOMR) DFIRM X-Sections DFIRM Floodways Special Flood Hazard Areas (All Available)

State-significant Natural Communities and Rare, Threatened, and Endangered Species: 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 Department is a member of the network of Natural Heritage Programs and Conservation Data Centers network that collaborates with NatureServe, which is the umbrella organization. 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). For community Elements, the EO may represent a stand or patch of a natural community, or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries. An Element Occurrence record is a data management tool that has both spatial and tabular components including a mappable feature and its supporting database. EOs are typically represented by bounded, mapped areas of land and/or water or, at small scales, the centroid point of this area. EO records are most commonly created for current or historically known occurrences of natural communities or native species of conservation interest.

National Wilderness Areas: Federally owned land that is preserved in its natural condition, where mechanized recreation or development is typically prohibited.

Class 1 and Class 2 Wetlands (VSWI and advisory layers): This dataset represents wetlands included in Vermont's Significant Wetlands Inventory (WaterWetlands_VSWI). Questions about wetland location and use should be referred to the ANR DEC Wetlands section, 802-244-6951. NWI maps were used by the State of Vermont Agency of Natural resources as a means of creating this data layer in conjunction with the VSWI. The NWI and VSWI were joined by a union, to create the new 2010 Vermont Significant Wetland Inventory data layer, representing Vermont's regulatory wetlands. The VSWI prior to 2010 was created by hand digitizing nearly two-thirds of Vermont's wetlands from RF 24000 scale NWI mylars. The remainder of the state was scanned from RF 24000 or RF 25000 scale mylars. These mylars were created by transferring wetland polygon boundaries from RF 62500 scale NWI mylars to RF 24000 scale base maps.

Possible Constraints:

Agricultural Soils: Agricultural Soils are those Natural Resources Conservation Service (NRCS) mapped soils including Prime Farmland, Additional Farmland of Statewide Importance, and Additional Farmland of Local Importance that are used to help identify soil map units that represent the best land for producing food, feed, fiber, forage, and oilseed crops. An Important Farmland classification of Prime, Statewide, and Local is assigned to soil map units based on the

characteristics of the dominant soils in the soil map unit. Accompanying each soil unit is a Vermont Soil Fact Sheet which was developed to organize a variety of data about a particular soil map unit on one page. The purpose of this layer is to provide a pre-selected, Vermont specific, subset of the Soil Survey Geographic Database (SSURGO) soil data depicting Prime Farmland, Additional Farmland of Statewide Importance, and Additional Farmland of Local Importance and excluding water, not rated or NPSL (Not Prime, Statewide, or Local) soils.

FEMA Special Flood Hazard Areas: The floodplain within a community subject to a one percent or greater chance of flooding in any given year. This area is usually labeled Zone A, AO, AH, AE, or A1-30 in the most current flood insurance studies and on the maps published by FEMA. Base flood elevations have not been determined in Zone A where the flood risk has been mapped by approximate methods. Base flood elevations are shown at selected intervals on maps of special flood hazard areas that are determined by detailed methods. Please note, where floodways have been determined they may be shown on separate map panels from the Flood Insurance Rate Maps. All zones with a 0.2% chance or higher of flooding annually. Only True special flood hazard areas were used.

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Protected Lands (State fee lands and private conservation lands): Lands owned in fee by the state for conservation or recreation purposes and lands conserved via easement or other legal encumbrance by private conservation organizations, such as land trusts. Conservation restrictions may prevent or otherwise restrict development of these lands, including for energy generation or transmission facilities.

Act 250 Agricultural Soil Mitigation areas: This layer shows land protected by an Act 250 permit condition for the purposes of agricultural use. The mitigation area was required due to a reduction in agricultural potential of other primary agricultural soils caused by development or

subdivision. This data is for planning and informational purposes only. Contact the NRB District Office for additional information and precise mapping.

Deer Wintering Areas: Deer winter habitat is critical to the long term survival of white-tailed deer 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. In this mapping exercise no minimum area is defined, however, most areas less than 20 acres were not delineated, nor were areas above 2,000 feet elevation (approximate). In 2008, the boundaries of deer winter areas where refined using black and white leaf-off 1:5,000 scale orthophotography (1990-1999) and was cross referenced with 1:24,000 scale 2003 NAIP (color, leaf-on) imagery to better delineate fields and open wetlands. Some of the areas were also marked as 'not likely wintering area' based on not having softwood characteristic. The areas were reviewed by VFWD District Biologists in 2009 to 2010 for their concurrence from their knowledge of the site. The 2008 mapping project did not involve any field work, but was based on aerial photography. Potential areas were identified, but they have not been included in this map layer because they have not been field verified. The original DWA mapping was done in the 1970s and early 1980s and was based on field visits and interviews with wildlife biologists and game wardens. The DWA were mapped on mylar overlays on topographic maps and based on small scale aerial photos.

ANR's Vermont Conservation Design Highest Priority Forest Blocks: Highest Priority Forest Blocks are the largest and/or highest ranked forest blocks from all biophysical regions that provide the foundation for interior forest habitat and associated ecological functions. Forest blocks are areas of contiguous forest and other natural communities and habitats (such as wetlands, ponds, and cliffs) that are unfragmented by roads, development, or agriculture. Forest blocks were identified, mapped, and ranked by Sorenson and Osborne (2014). Forest blocks provide many ecological and biological functions critical for protecting native species and the integrity of natural systems. In addition, large, topographically diverse forest blocks will allow many species of plants and animals to shift to suitable habitat within a forest block in response to climate change within the next century without having to cross developed areas to other forest

blocks (Beier 2012). More detailed descriptions and maps are available in the Vermont Conservation Design report and on the BioFinder 2016 website (http://anrmaps.vermont.gov/websites/BioFinder2016/).

Hydric Soils: Areas of hydric soil have a high potential to support significant, unmapped wetlands and require field investigation to determine if significant wetlands are present. Hydric soils means soils that are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part (U.S.D.A. Soil Conservation Service 1987), leading to biological conditions similar to wetlands.

Regional Constraints – to be incorporated as Possible Constraints

Elevations above 2500 feet: This constraint uses USGS contours over 2500 feet.

Lake Shore Protection Buffers (250 Foot and 800 Foot in Calais Only): For this constraint, CVRPC selected Vermont Hydrologic Dataset lakes and ponds greater than 10 acres and then buffered those by 250 feet and use the Town of Calais Land Use Regulations for shore lands in Calais.

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 VCGI Protected Lands Database. This includes town owned conservation easements, town forests and town protected greenspaces. This layer does not include municipal owned parcels such as the town garage or a town green surrounding the town hall.

Determination of Wind and Solar Potential Layers

The "base layers" for wind and solar potential are available from VCGI. The solar resource layer is the same one used for the EAN Energy Atlas, and represents solar ground-mounted potential. It considers incoming solar potential (with a lower value cutoff of 1,000 kWh/m2), slope (anything ≤ 14°), and direction (90° due east clockwise to 270° due west). It should only be used to estimate ground-mounted – not rooftop – solar resource potential. The State is currently in the process of collecting statewide high-resolution LiDAR data, which can and should be used – particularly by regions – where it is available, to look at both ground- and roof-mounted solar potential.

The wind resource layers comprise three sets:

Scale	Residential	Commercial/Community	Utility
•Hub Height •Lower Wind Speed Cutoff	•30 Meter •4.5 m/s	•50 Meter •5.5 m/s	•70 Meter •6.5 m/s

Figure 1: Wind Resources Layer Detail - DPS Regional Guidance_Final

Generally, wind speeds increase with elevation; however, there may be many sites at lower elevations suitable for the development of wind power projects, particularly at the residential and commercial or community scales (≤ 100 kW), but also at the utility scale (≥ 1 MW), particularly in light of recent advancements in wind turbine technologies.