CHITTENDEN COUNTY RPC
Communities Planning Together

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MEMORANDUM

To: Ravi Venkataraman, Winooski Director of City Planning
From: Chittenden County Regional Planning Commission
Date: May 1, 2025
Re: Energy Data Guide for Energy Planning

The purpose of this memo is to share CCRPC's *Municipal Energy Data Guide* for your municipality. This replaces the guide issued in 2018. The data in the guide meets the Public Service Department's Energy Planning Standards for Municipal Plans. If a Municipal Plan meets the standards, it will be given an affirmative "determination of energy compliance," and its land conservation measures, and specific policies will be given "substantial deference" in the Public Utility Commission's review of whether an energy project meets the orderly development criterion in the Section 248 process. Additionally, the data in this guide provides an overview of needed changes in energy demand to advance the State's energy and climate goals.

The State's energy and climate goals are:

- To obtain 90% of all energy across all sectors (transportation, heating and electricity) from renewable sources by 2050, with the interim goals of 25% renewable by 2025 and 45% renewable by 2035.
  - In the transportation sector, 10% of energy needs will be from renewable energy by 2025, and 45% by 2040.
  - In the thermal sector, 30% of energy needs from renewable energy by 2025, and 70% by 2042.
- In the electric sector, 100% of energy needs will be from carbon-free resources by 2032, with at least 75% from renewable energy.
- Reductions in greenhouse gas emissions: 26% reduction from 2005 levels by 2025; 40% reduction from 1990 levels by 2030, and 80% reduction from 1990 levels by 2050.

The data in this guide provide an overview of current energy use and set targets for advancing the State's 2050 goals for energy use from heating, transportation, electricity, as well as the State's 2050 goals for renewable energy generation. Intermediate targets for 2025 and 2035 provide each municipality with checkpoints towards meeting these goals. This document includes all data required to plan for these goals at a municipal level. Consistency with the goals above is measured through the Vermont Department of Public Service's "Energy Planning Standards for Municipal Plans." For the full standards, visit the Department of Public Service's website: http://publicservice.vermont.gov/content/act-174-recommendations-and-determination-standards. The data in this document meets the *Analysis and Targets* section of the Standard.

The projections in this guide are consistent with the draft 2026 Chittenden County ECOS Regional Plan-Enhanced Energy Plan. The guide is meant to be only a starting point for discussions on how towns and the regions can begin to plan for meeting the Act 174 standards. It is a representation of possible conditions and should be used for planning purposes only. These data will not be used to assess whether energy generation projects, utilities or municipalities are meeting energy goals.

A. Current Energy Use and Generation

The data below are from various sources and represent actual current consumption and generation in the transportation, electricity and heating/building sectors. **Data in this section meet the requirements of energy planning standard 4A.**

	Table A1. Current Household Transportation Energy Use in Metric Million British Thermal Units (MMBTU)	
1	Total Energy Consumption for Light Duty Vehicles (LDVs)	166,225 MMBTU
2	Total Energy Consumption for Fossil Fuel LDVs	164,317 MMBTU
3	Total Energy Consumption for Electric LDVs	1,909 MMBTU
4	Fossil Fuel Burning LDVs Registered to Households (2022)	3,874
5	All-Electric (Battery) LDVs (2023)	75
6	Plug-in Hybrid LDVs (2023)	47
7	Total Electric Light Duty Vehicles (2023)	122
8	% of Regional Share of Electric Light Duty Vehicles	2.7%
Sources: Transportation Research Center, Drive Electric Vermont		

Table A2. Home Heating by Fuel Type, 2022

	Heat Source	**# of Homes**	**Margin of Error**	**% of Homes**	**% Margin of Error**
1	Utility gas	2,296	+/-279	62%	+/- 5.9%
2	Fuel oil, Kerosene	119	+/- 86	3%	+/- 2.3%
3	Propane	118	+/-67	3%	+/- 1.8%
4	*Subtotal Oil, Kerosene, Propane*	*237*	*+/-110*	6%	*+/- 2.9%*
5	Wood	0	+/- 14	0%	+/- 0.4%
6	Electricity	1,091	+/- 223	30%	+/- 5.6%
7	Non-PV solar energy	0	+/-14	0%	+/- 0.4%
Sources: American Community Survey 2022 5-Year Estimate, Table B25040. Data are associated with a margin of error.					

Table A3. Recent Residential Energy Efficiency Projects	**2021**	**2022**	**2023**	**Total**
Total Residential Projects (includes projects below)	135	151	152	**438**
Home Performance with ENERGY STAR® Projects	1	0	0	**1**
Other Weatherization Projects	3	4	5	**12**
Residential New Construction Projects	0	0	0	**0**
Other Selected Measure and Engagement Counts				
Home Energy Visits	1	1	2	**4**
Heat Pump Water Heater Installations	4	3	2	**9**
Cold Climate Heat Pump Installations	78	101	98	**277**
Wood Heating Installations	1	1	0	**2**
Source: Efficiency Vermont, RPC Report Produced 6/2024				

Heat Pump Hot Water Heater Installations - This is a subset of all hot water measures listed in the Measure Category tables, the number of heat pump domestic hot water installations processed through Efficiency Vermont's upstream and midstream programs.

Home Energy Visits - A home walk through provided by Efficiency Vermont staff to help residential homeowners prioritize efficiency improvements and answer energy-related questions. Staff spend approximately an hour and a half in the home and at the end deliver a personalized set of recommendations to meet customer energy goals and make their homes more efficient, comfortable, and healthy.

Home Performance with ENERGY STAR® - Sponsored by the Department of Energy, this program connects homeowners with experienced and trusted contractors that can help them understand their home's energy use and identify home improvements that increase energy performance, improve comfort and health, and lower utility bills. The program is cosponsored with Vermont Gas Systems and Burlington Electric Department for homes in their service territories.

Measure - A purchased and installed item or an action that has electrical and/or thermal and/or water savings associated with it.

Other Weatherization Projects - Launched in 2018, Efficiency Vermont offers several programs that help customers install weatherization measures smaller in scope than a comprehensive Home Performance with ENERGY STAR® project. Programs include attic, basement, and do-it-yourself weatherization installations.

Project - A collection of one or more energy efficient measures that have been implemented at a customer's premise (physical location). A customer can be associated with one or more projects and in some cases, a project may be associated with multiple customers.

Residential New Construction Projects - Comprehensive energy efficiency services to customers building new or gut-rehabbing single-family homes. This program maximizes energy efficiency, durability, and comfort through direct technical assistance, third party certification, incentives, and code compliance support. The RNC program is cosponsored with Vermont Gas Systems and Burlington Electric Department for homes in their service territories.

Table A4. Annual Electricity Use (KWH)

Sector	2021	2022	2023
Commercial & Industrial	24,418,711	25,398,360	25,162,272
Residential	18,437,382	18,676,585	18,254,144
Total	42,856,093	44,074,945	43,416,416
Count of Residential Premises	3,368	3,425	3,387
Average Residential Usage	5,474	5,453	5,389
Source: Efficiency Vermont, 2024 RPC Report Produced 6/2024			

Table A5. Existing Renewable Electricity Generation	Sites	Power (MW)	Energy (MWh)
Solar	86	1.7	2,234.33
Wind	0	0	0
Hydro	1	3.73	16,326.45
Biomass for Electric Generation	0	0	0
Total	87	5.43	18,560.78
Source: Vermont Department of Public Service, Generation Scenarios Tool, Distributed Generation Survey + data as of 1/31/2023			

B. Projected Energy Use

Projected future energy use targets are drawn from the Vermont Public Service Department's energy analysis. PSD worked with the Stokholm Environment Institute (SEI) to employ the Low Emissions Analysis Platform (LEAP). The LEAP analysis is not prescriptive but is instead an indicative analysis designed to show the estimated magnitude and timing of needed changes and the relative importance of major economic sectors to meet Vermont's energy and climate goals.

Using LEAP, SEI modeled sector specific approaches that would enable Vermont to meet its energy and climate goals. The sectors that were modeled include but are not limited to electricity generation, transportation, and buildings. The model accounts for the replacement or stock turnover of technologies through 2050 and identifies the pace of technology adoption needed to reach Vermont's emission reduction requirements. Within each sector, specific technologies are identified to reduce emissions from end uses, but the list of technologies is not exhaustive. For example, throughout the modeled years air- and ground-source heat pumps have been increasingly deployed to replace heating and cooling needs previously met by fossil fuel-fired heating and cooling systems. Wherever possible, the model incorporates Vermont-specific sectoral data to better evaluate more granular impacts of policy interventions in the state.

Per the PSD's Energy Planning Standards, if a municipality chooses to update or create an enhanced energy plan they must include targets for future energy use. The data in this section is designed to satisfy the analysis and targets standards. It is important to remember these targets represent only one way to achieve each municipality's energy goals. Other strategies may allow the municipality to meet its goals (for example, switching some wood heating systems to heat pump systems). If desired, CCRPC will provide the spreadsheets and source materials used to calculate these data, and a municipality can revise their targets. Many of these targets are associated with concrete implementation actions discussed in the enhanced energy plan.

For more information on the LEAP model, including its underlying assumptions, please refer to Vermont's 2022 Comprehensive Energy Plan found here: https://publicservice.vermont.gov/about-us/plans-and-reports/department-state-plans/2022-plan.

Data in this section meets the requirements of energy planning standard 4B-4D.

	Table B1. Projected Light Duty Vehicle (LDV) Transportation Energy Demand	**2025**	**2035**	**2050**
1	**Estimate of total light-duty vehicles***	4,161	4,582	5,296
2	**Estimate for number of area battery electric and plug-in hybrid LDV (passenger cars and light trucks)**	229	2,399	5,201
3	**Light Duty Electric and Hybrid Electric Vehicles (% of Vehicle Fleet)**	5.5%	52.4%	98%
4	**Non-Electric Light Duty Energy Demand (gas, diesel, ethanol, CNG, biodiesel) (MMBtu)**	247,214	117,269	15,656
5	**Electricity Demand for Light Duty (passenger cars and light trucks) Transportation (MMBtu)**	3,880	40,674	76,827
6	**Biofuel share of biofuel-blended LDV transportation energy consumed**	8%	10%	10%

Source: LEAP Model, UVM Transportation Research Center

**Growth rate for LDV is based on the county-wide 10-year average annual change of new homes built between 2012-2022, annual rate is 1.15%*

Table B2. Projected Commercial Thermal Energy Use, 2025-2050		2025	2035	2050
1	Projected Number of future commercial establishments*	327	373	455
2	Percent of Commercial Establishments Weatherized	22%	43%	59%
3	Energy Saved by Weatherization (MMBtu)	12,418	27,347	45,504
4	Number of Heat Pumps installed in Commercial Buildings**	601	1,817	2,323
5	Commercial Establishments Using Wood Heating (%)	9%	10%	11%
6	Commercial Thermal Energy Use Attributable to Wood Heating (MMBtu)	18,567	22,731	28,157

Sources: VT Department of Labor, ECOS Plan Forecasts, CCRPC Bottom-Up Approach for Commercial Sector
**Growth rate for future commercial establishments is based on the ECOS Plan employment forecast rate of 1.34%*
**** Contemplates multiple mini split heat pumps per commercial establishment. However, larger commercial establishments would likely use a centrally ducted system.

Table B3. Projected Residential Thermal Energy Use, 2025-2050		2025	2035	2050
1	Projected number of future residences*	3,970	4,449	5,278
2	Residential thermal energy use (MMBtu)	378,481	220,002	135,455
3	Energy saved by weatherization or other thermal efficiency improvements (MMBtu)	45,465	116,343	154,707
4	Estimated number of Homes weatherized	883	1,909	3,088
5	Percent of residences weatherized	22%	43%	59%
6	Heat pump energy consumed by residences (MMBtu)	119,984	91,689	63,394
7	Estimated number of heat pumps in homes	1,209	3,294	4,922
8	Percent of residences using heat pumps	30%	74%	93%
9	Wood heat (cord wood + wood pellets) consumed by residences (MMBTU)	6,892	13,783	20,675
10	Estimated number of residences using wood heat	66	140	220
11	Residences using wood heat (%)	1.7%	3.2%	4.2%
12	Biogas Heat Energy consumed by residences (MMBtu)	201,119	105,682	10,245
13	Estimated number of residences using natural/biogas**	1,936	1,076	109
14	Percent of residences using natural gas/biogas**	49%	24%	2%

Sources: LEAP Model, Department of Public Service
**Growth rate for future residences is based on municipal 10-year average annual change of new homes built between 2012-2022, annual rate is 1.15%. This may not align with growth rates anticipated for housing targets required under 24 V.S.A. § 4382(a)(10).*
***Biogas is a combination of natural gas and renewable natural gas. In 2025, the heat energy is traditional natural gas then decreases as homes transition to heat pumps and then the fuel type is mostly renewable natural gas in future years.*

Table B4. Electric Efficiency Targets, kilo-watt hours (kWh)		2025	2035	2050
1	Total cumulative electric energy saved from improvements in area residential equipment efficiency, in kWh	437,164	2,431,077	4,395,463
2	Residences that have increased their Electric Efficiency	257	1,427	2,580
3	Total cumulative electric energy saved from improvements in area commercial equipment efficiency, in kWh	858,061	4,189,473	3,460,701
4	Commercial and Industrial Establishments that have Increased Their Electric Efficiency	30	148	148

Source: Energy Efficiency Utility Potential Study, CCRPC, and the Department of Public Service

C. Projected Renewable Energy Generation Potential

Section C reports how much wind and solar generation potential exists in the municipality and sets targets for additional renewable energy generation within each municipality. The generation targets are technology neutral, meaning a municipality can use any form of renewable generation (wind, solar, biomass, hydroelectric, etc.) to meet its goals.

Prime solar or wind areas are areas where models show the appropriate conditions for electricity generation, and where there are no constraints. Base solar or wind areas are areas where models show the appropriate conditions for electricity generation, but where there are possible constraints, which must be considered during development and may reduce the development potential of a site. The 2018 ECOS Plan indicates that *"development should be located to avoid state and local known constraints that have been field verified, and to minimize impacts to state and local possible constraints that have been field verified."* Please see Table C4 for the list of constraints.

A municipality's reported land available for wind and solar generation and generation potential are based on models of the elevation, slope, and aspect of land, or the modeled wind speed, in a municipality. These models do not remove existing impervious surfaces. Therefore, land-based generation potential may be over-estimated for municipalities with a high percentage of impervious surface.

Table C1. Land Available for Wind and Solar Generation

	Acres with Prime Potential	Acres with Base Potential	Total Energy Potential (MWh)
Solar	108	214	25,690
Wind	59	121	8,870
Solar Rooftop	41		23,658
Source: CCRPC and the Department of Public Service, Vermont Center for Geographic Information			

To better understand how the region can achieve its 2050 renewable energy generation targets, CCRPC used a tool provided by the PSD to determine generation targets for each municipality in its region as a portion of the region's overall target. The total municipal electric generation targets were calculated by multiplying the regional target the municipality's share of the county total of three equally weighted factors: population, current electricity consumption, and land area available for renewable energy production. The incremental municipal targets are obtained by subtracting existing generation facilities located within a municipality's borders.

Table C2. New Renewable Electricity Generation Targets in Megawatt hour (MWh)	2032	2040	2050
Total Target (MWh)	18,561	18,561	18,561
Incremental Generation Target – Any Technology (MWh)	0	0	0
Grid Distribution Headroom (MW)	21.2	21.2	21.2
Sources: CCRPC and the Department of Public Service			

For some municipalities, existing renewable generation capacity exceeds the total municipal target. This excess generation was redistributed among other municipalities based on the weighting factors noted previously to further reduce municipal incremental generation targets. Therefore, some municipalities will have an incremental generation target of 0. Tables C1 and C2 demonstrate that there are sufficient

land area absent constraints and of high energy potential to meet the municipality's renewable energy generation targets.

Based on PSD data and tools, CCRPC also estimated the capacity of the electric distribution grid based on the growth in renewable energy generation. A negative number in a milestone year indicates that grid infrastructure (typically transformers) will need to be upgraded to accommodate projected generation.

Table C3. State/Local Known and Possible Constraints

State Known Constraints	State Possible Constraints	Local Known Constraints	Local Possible Constraints
FEMA Floodways DEC River Corridors National Wilderness Areas State-significant Natural Communities Rare, Threatened, and Endangered Species Class 1 and 2 wetlands (VSWI and advisory layers) Vernal Pools (confirmed)	Agricultural Soils Hydric Soils Vernal Pools (unconfirmed) Act 250 Ag. Soil Mitigation Areas FEMA Special Flood Hazard Areas VT Conservation Design Highest Priority Forest Blocks (Forest Blocks – Connectivity, Forest Blocks – Interior, Forest Blocks - Physical Land Division), Highest Priority Surface Water and Riparian Area Protected Lands (State fee lands and private conservation lands) Deer Wintering Areas	None identified	None identified

D. Mapping

The maps in this section meet the Act 174 Mapping standards for your municipality. Municipal plans must include the maps contained within this section. These maps identify potential areas for development and siting of solar and wind generation, which account for areas that are unsuitable for siting renewable energy generation because of the presence of state/local known and possible constraints, identified in table C3. Maps showing preferred sites/existing renewable generation facilities, hydro and biomass generation are also included.

These maps should be used in conjunction with complementary policies in the town plan. The map identifying constrained areas is a visual representation of the constraints listed above. A certified Enhanced Energy Plan means that a municipality's "land conservation measures and specific policies" might be given substantial deference during project review under 30 V.S.A. § 248. However, for these measures and policies to be given substantial deference, they must be clearly included in the text, as a map may lack sufficient clarity or granularity regarding the area in which a project is proposed.

Preferred Sites for Net Metering & Existing Renewable Energy Generation

Winooski, Vermont
Act 174 - The Energy Development Improvement Act of 2016

Preferred Sites (VT Net-Metering Rule) *not all sites are shown

- Closed Landfill
- Sand or Gravel Pit
- Brownfield
- Parking Lots

Existing Generation

- McNeil Biomass-Electricity
- Wind Site
- Methane
- Wood Chip or Pellet Heat
- Solar Site
- Hydro Electric

0 0.1 0.2 0.4 Miles

Chittenden County, VT

N

Sources:
Existing Sites-EAN,2018
Disclaimer:
The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Chittenden County Regional Planning Commission is not responsible for these. Questions of on-the-ground location can be resolved by site inspections and/or surveys by registered surveyor. This map is not sufficient for delineation of features on-the-ground. This map identifies the presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.

Date: 11/11/2024

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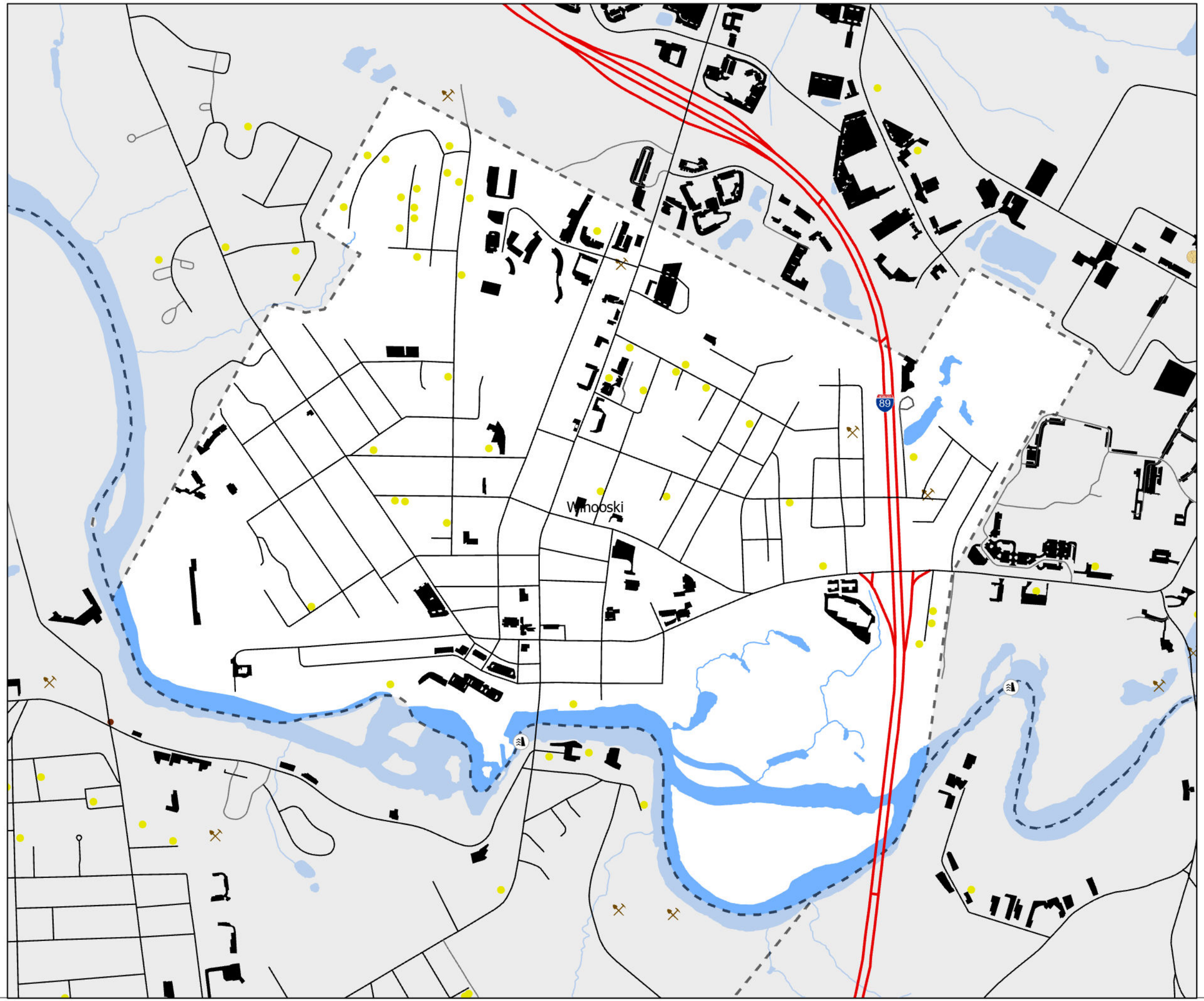


State Known Constraints

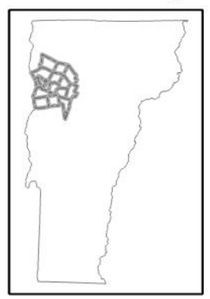
Winooski, Vermont
Act 174 - The Energy Development Improvement Act of 2016

Known Constraints are the presence of conditions, based on statewide resources that likely signal unsuitability for renewable energy development.

- Stream or River Centerline
- DFIRM Floodway
- Lake or Pond
- Confirmed Vernal Pool
- VSWI Significant +Advisory Wetlands
- River Corridor
- Significant Natural Communities
- Rare Threatened and Endangered Species

0 0.1 0.2 0.4 Miles

Chittenden County, VT



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Sources:
Vernal Pools; VCGI, 2022
DEC River Corridors; VCGI, 2019
FEMA DFIRM Floodways;VCGI,2022
RTE + Sig. Natural Comm;VCGI,2022
Wetlands: VSWI Wetlands Class Layer, VSWI Advisory Layer, 2022
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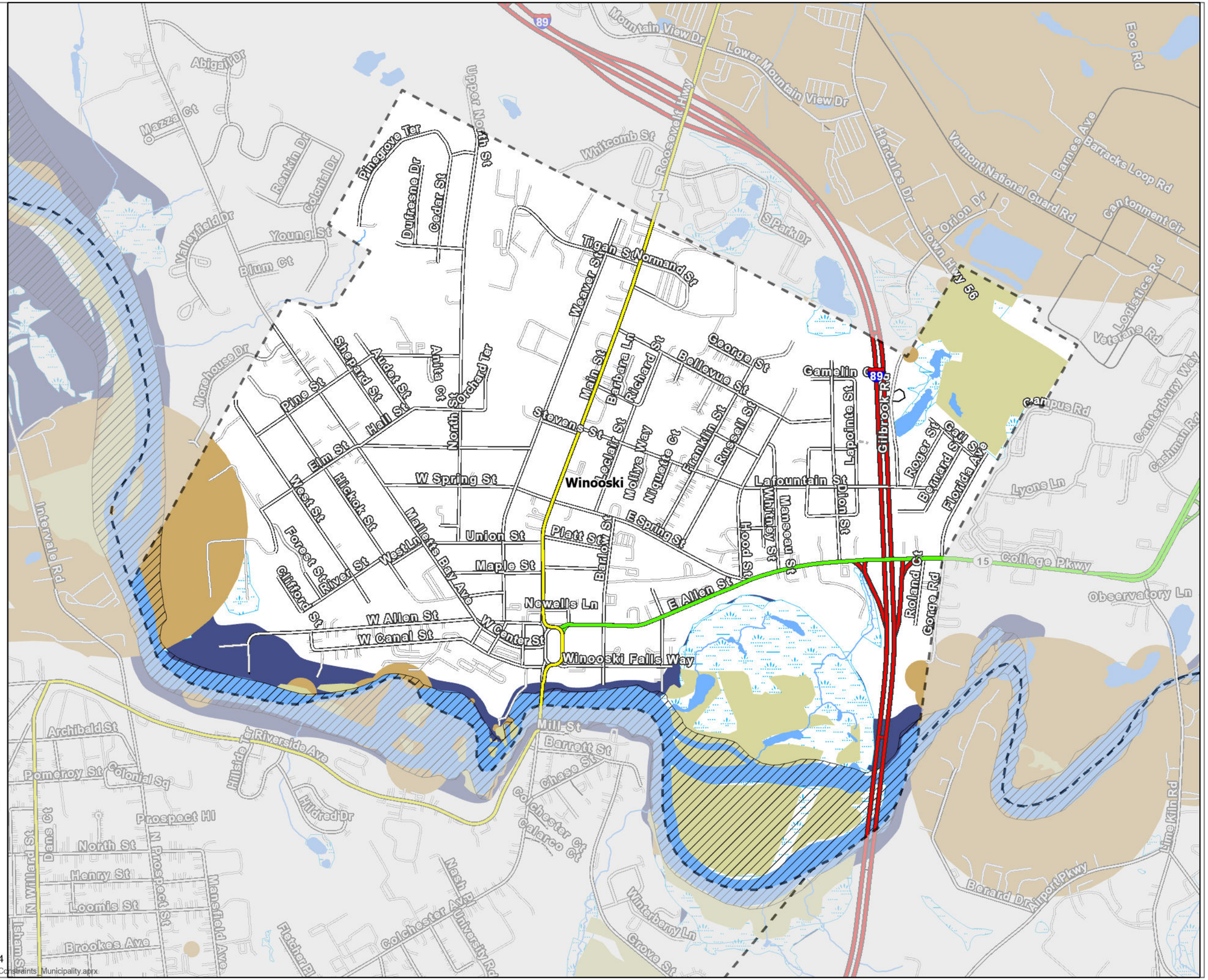


State Possible Constraints

Winooski, Vermont

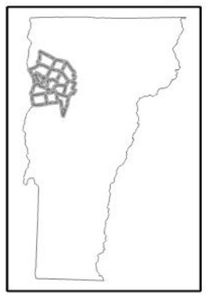
Act 174 - The Energy Development Improvement Act of 2016

Possible constraints are the presence of conditions, based on statewide resources that likely signal the need for on-site mitigation to avoid encroachment on these resources.

- Stream or River Centerline
- Lake or Pond
- DFIRM Special FloodHazard Areas
- Unconfirmed Vernal Pool
- Protected Lands
- Agriculturally Important Soil
- Act 250 Agricultural Onsite Soil Mitigation
- Hydric Soils
- VT Conservation Design Highest Priority Elements
- Deer Wintering Areas

0 0.13 0.25 0.5 Miles

Chittenden County, VT



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Sources:
Vernal Pools; VCGI, 2022
Protected Lands;VCGI, 2022
SFHA,VCGI,2022
VT Conservation Design, ANR,2022
Hydric Soils, VCGI 2022

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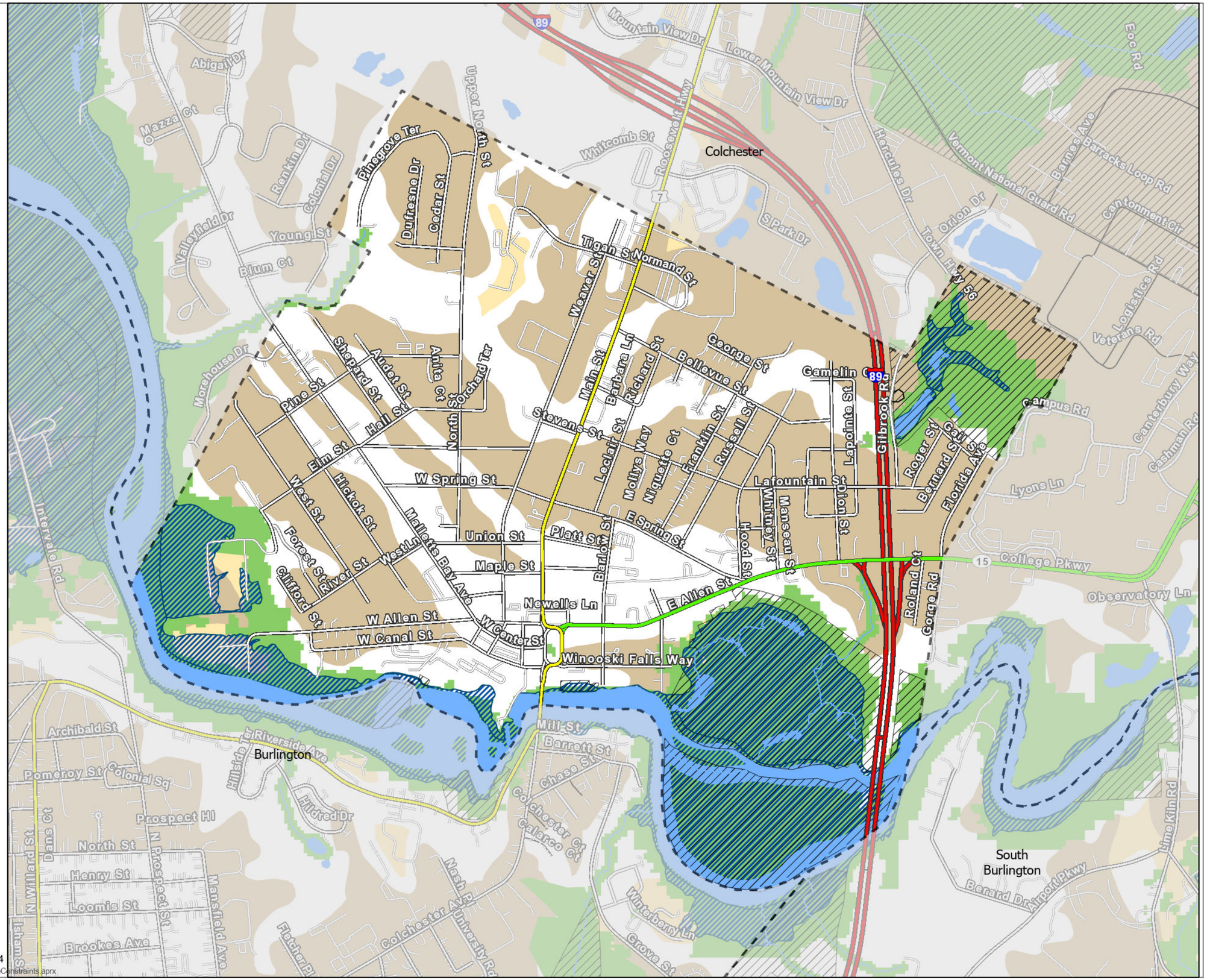


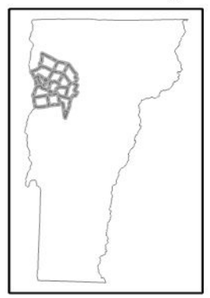
Solar Energy Resources

Winooski, Vermont
Act 174 - The Energy Development Improvement Act of 2016

- Stream or River Centerline
- Lake or Pond
- Municipal Boundary
- VT 3-Phase-Power (Generalized) for Planning
- Prime Solar: Areas with high solar potential and no state/local known + possible constraints
- Base Solar: Areas with high solar potential + a presence of state/ local possible constraints
- VELCO Transmission
- Municipal Boundary

0 0.1 0.2 0.4 Miles

Chittenden County, VT



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Sources:
Solar Energy-VCGI,CCRPC 2023
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Date: 5/1/2025

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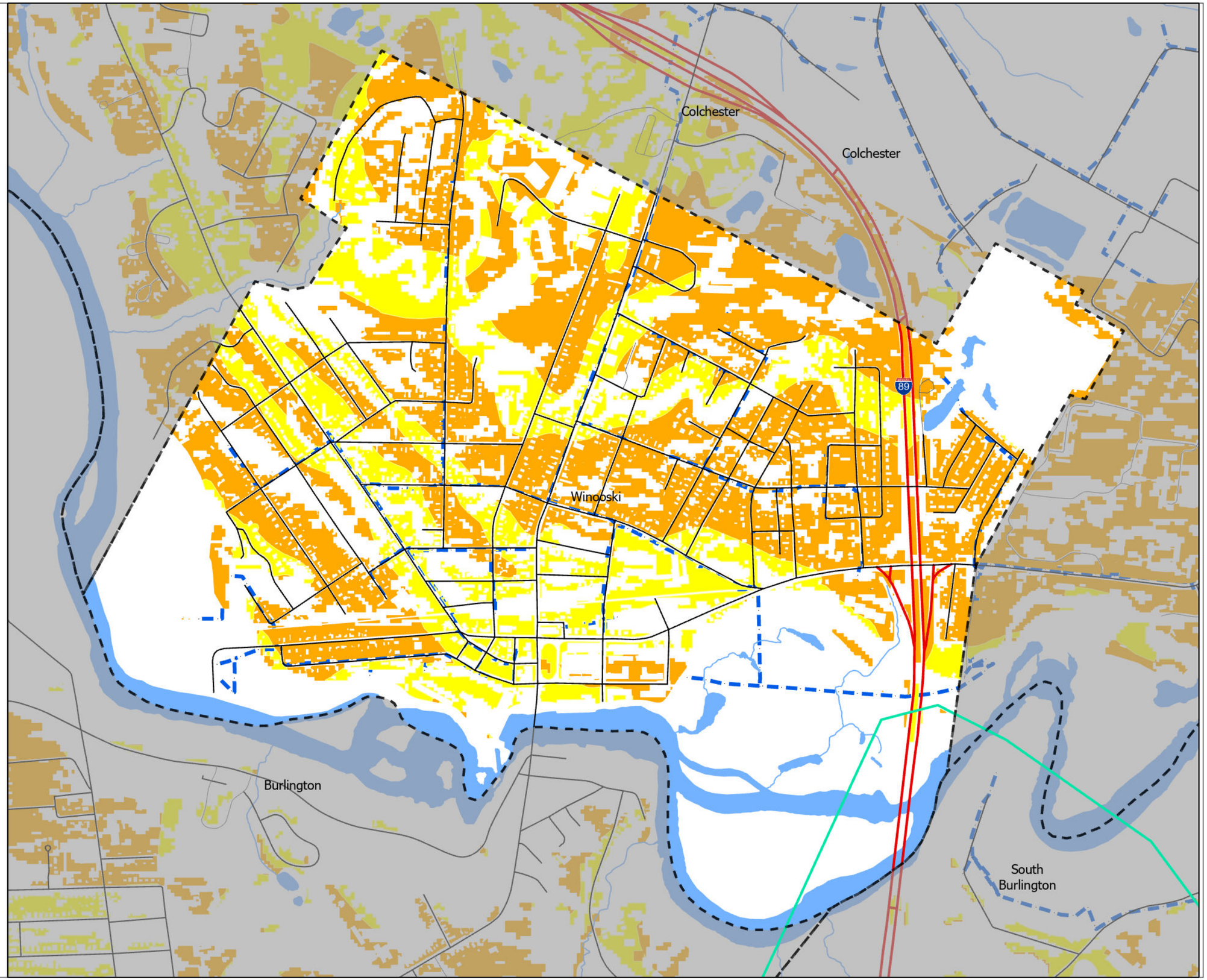


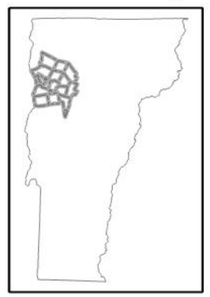
Wind Energy Resources

Winooski, Vermont
Act 174 - The Energy Development Improvement Act of 2016

- Stream or River Centerline
- Lake or Pond
- VT 3-Phase-Power (Generalized) for Planning
- Transmission Lines
- Municipal Boundary
- VELCO Transmission
- Base Wind: Areas with high wind potential and a presence of state/ local possible constraints
- Prime Wind: Areas with high wind potential and no state/local known or possible constraints

0 0.1 0.2 0.4 Miles

Chittenden County, VT



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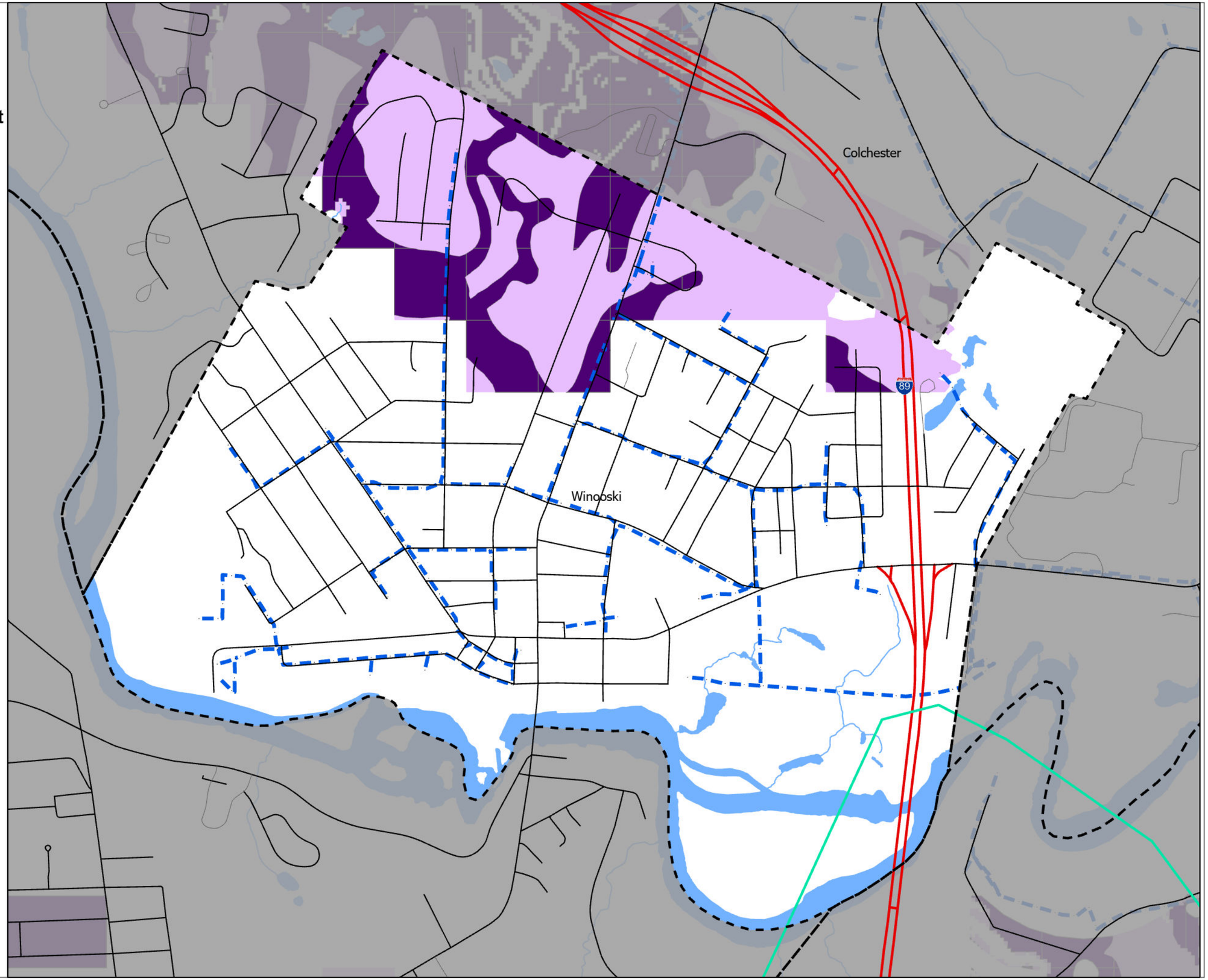
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