# Appendix 4-A: Modeling Protocol and Agency Correspondence

**Appendix 4-A**

**Modeling Protocol and Agency Correspondence**

**List of Contents**

Protocol Document

- Cricket Valley Energy Dispersion Modeling Protocol, September 2009

Agency Correspondence

- NYSDEC protocol review letter, November 19, 2009
- USEPA protocol review letter, December 15, 2009
- USEPA additional protocol comment letter, January 26, 2010
- Revisions to Cricket Valley Energy Dispersion Modeling Protocol, January 27, 2010
- Request for Preconstruction Monitoring Waiver, February 25, 2010
- USEPA Preconstruction Monitoring Waiver Response, March 24, 2010
- Request for Applicability of Class I Modeling Analysis
- Federal Land Manager response letter, November 12, 2009
- Modeling inventory request letter – New York, January 19, 2010
- Modeling inventory request letter – Massachusetts, January 19, 2010
- Modeling inventory request letter – Connecticut, January 19, 2010
- Request for USFWS review, June 2, 2009
- USFWS response letter, July 20, 2009
- Follow-up correspondence with USFWS, August 17, 2010
- USFWS response letter, September 21, 2009
- $NO_x$ Inventory Request Letter to NYSDEC, November 10, 2010
- $NO_x$ Inventory Request Letter to MADEP, November 10, 2010
- $NO_x$ Inventory Request Letter to CTDEP, November 10, 2010
- MADEP Response to Inventory Request, November 16, 2010
- CTDEP Response to Inventory Request, November 19, 2010
- $NO_2$ Modeling Procedures with PVMRM, November 30, 2010

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# Cricket Valley Energy Dispersion Modeling Protocol

Dover, Dutchess County, New York

September 2009

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**Cricket Valley Energy**
**Dispersion Modeling Protocol**

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## 1.0 Introduction

The purpose of this report is to document the dispersion modeling protocol proposed for the air quality impact analyses to be undertaken in support of the Cricket Valley Energy project's Prevention of Significant Deterioration (PSD) permit application and Part 201 air permit application to the United States Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC), respectively. It also discusses additional air quality impact analyses that will be undertaken as part of the State Environmental Quality Review (SEQR) Environmental Impact Statement (EIS). The protocol follows USEPA and NYSDEC guidelines on dispersion modeling procedures (USEPA, 2005; NYSDEC, 2006).

Cricket Valley Energy Center LLC (CVE) is proposing to construct an approximately 1,000 megawatt (MW) combined cycle electric generating facility, firing natural gas as its sole fuel. The project is comprised of three units capable of operating independently to respond to energy demand. Each unit consists of one F-Class Technology combustion turbine, one steam turbine, one heat recovery steam generator (HRSG) with supplemental duct firing, and an associated air cooled condenser (ACC). The project is intended to operate as a base load facility and will be permitted to operate 8,760 hours per year, incorporating a range of load conditions.

The following information is provided in this report:

- A description of facility equipment and configuration; emissions, stack and exhaust parameters; and good engineering practice (GEP) stack height.

- A discussion of federal and state regulatory requirements applicable to the modeling analyses to be undertaken for the project.

- Details of the proposed modeling, including the selected dispersion model and its supporting tools, meteorological data, and the receptor grid.

- Evaluation of pre-construction monitoring requirements and presentation of the proposed background ambient air quality data to be used in the air quality impact analyses.

- A discussion of the potential need for PSD Class I Area impact analysis.

- A review of additional impact analyses to be provided in the air permit applications and/or the SEQR EIS, including: accidental ammonia release modeling; acid deposition analysis; assessment of impacts on regional growth; assessment of impacts on Environmental Justice areas; visibility impairment assessment; and assessment of impacts to soils and vegetation.

The report is intended to establish consensus on the dispersion modeling procedures for the air quality impact analyses to be undertaken in support of the air permit applications and the SEQR EIS.

## 2.0 Facility Description

This section provides information with regard to the proposed facility characteristics in order to establish appropriate modeling inputs.

### *2.1 General Description*

CVE proposes development of a nominal 1,000 MW electric generating facility at a previously developed industrial site in Dover, Dutchess County, New York (Figure 1). The facility will be comprised of three independent units, exclusively firing natural gas. Each unit is a 1x1x1 configuration consists of one F-Class Technology combustion turbine, one steam turbine, one HRSG with supplemental duct firing, and an associated ACC. In addition to the proposed three units, major project equipment will include:

- Selective catalytic reduction (SCR) and oxidation catalyst systems;
- Continuous emissions monitoring systems (CEMS);
- Two 30,000-gallon aqueous ammonia (19 percent) storage tanks;
- One 1 million-gallon raw water storage tank;
- One 250,000-gallon demineralized water storage tank;
- One natural gas-fired auxiliary boiler;
- One emergency diesel generator and associated 500-gallon distillate oil tank (integrated with the unit);
- One diesel fire pump and associated 650-gallon distillate oil tank;
- Three diesel black-start generators, each with an associated 1,000-gallon distillate oil tank (integrated with the unit); and
- A water treatment system including a proposed zero-liquid-discharge system.

Natural gas will be delivered via an interconnection with the Iroquois interstate pipeline. Electrical interconnection will be to the Consolidated Edison of New York (ConEd) 345 kilovolt (kV) transmission system. The Iroquois pipeline and ConEd transmission line rights-of-way abut the site's northern property line.

### *2.2 Site Location*

CVE proposes to construct the project within an approximately 25-acre footprint located within a 131.6-acre industrially zoned site off of Route 22 in Dover, Dutchess County, New York. The project will be constructed in the location of existing abandoned industrial buildings on the site and can take advantage, to a great degree, of that previously disturbed footprint. Building demolition will be a component of early-stage project construction. The address of the project site is 2241 NY Route 22, Dover, New York.

The site is bounded to the east by State Route 22 and to the north by the existing ConEd 345-kV transmission line. An active commuter rail line, owned and operated by Metro-North Railroad, transects the site in a north-south direction; the proposed development footprint is located entirely to the east of the rail line (Figure 2). The property extends further west to the Swamp River. As the property extends south, a portion is located on the west side of the Swamp River; no work is proposed on property between the Metro-North Railroad and the river. The property east of the railroad is bordered to the south by existing industrial structures associated with Rasco Materials (formerly TT Materials), a petroleum-contaminated soils processing facility.

Dutchess County is in attainment of all National Ambient Air Quality Standards (NAAQS) and New York Ambient Air Quality Standards (NYAAQS) except for ozone. Dutchess County is included in the Mid-Hudson Ozone Nonattainment Area, which is classified as moderate nonattainment with respect to the 8-hour ozone standard; the entire state and most of the Northeast are within the designated Ozone Transport Region, which is also treated as a moderate nonattainment area. The project will be classified as a major source for: nitrogen oxides ($NO_x$); carbon monoxide (CO); volatile organic compounds (VOC); and particulate matter with diameters equal to or less than 10 micrometers ($PM_{10}$) and 2.5 micrometers ($PM_{2.5}$) under New York State and federal air permitting regulations. As such, it will be subject to both PSD review and Nonattainment New Source Review (NNSR).

The closest PSD Class I areas are the Lye Brook Wilderness Area located 167 kilometers (km) to the north-northeast, in southern Vermont, and the Brigantine

Division of the Edwin B. Forsythe National Wildlife Refuge in New Jersey, 216 km south-southwest of the project site.

### *2.3 Emissions Data*

The main sources of emissions at the facility will be the combustion turbines. However, there will also be emissions from ancillary equipment including an auxiliary boiler, emergency generator, emergency fire pump, and black-start generators. The sections below present proposed emissions from these sources.

*Combustion Turbines*

Climatological data for the Poughkeepsie-Dutchess County Airport (KPOU) indicate an annual average temperature of 59.8 degrees Fahrenheit (ºF), mean winter low temperatures of 15ºF to 20ºF, and mean summer maximum temperatures of 80ºF to 84ºF. Additionally, extreme minimum and maximum temperatures at KPOU are -30ºF and 103ºF, respectively. Performance data available from the combustion turbine vendor relating to the more extreme temperatures and International Standards Organization (ISO) conditions were used in this analysis (-8ºF, 59ºF and 105ºF).

Based on the combustion turbine operating performance data at 100 percent and 50 percent loads, hourly and annual emission rates, as well as exhaust characteristics, were calculated for dispersion modeling input. Hourly emissions rates for $PM_{10}$, $PM_{2.5}$, sulfur dioxide ($SO_2$), $NO_x$, CO, and VOC for each turbine are provided in Table 1.

**Table 1. Hourly Emissions per Unit for Cricket Valley Energy Project**

| Pollutant | Emissions per Unit (without Duct Firing) (lb/hr)[a] | Emissions per Unit from Duct Firing (lb/hr)[a] | Total Emissions Per Unit (with Duct Firing) (lb/hr)[a] |
|---|---|---|---|
| $PM_{10}$/$PM_{2.5}$ | 10 | 4.8 | 14.8 |
| $SO_2$ | 3.1 | 0.7 | 3.8 |
| $NO_x$ | 14.5 | 3.7 | 18.2 |
| CO | 8.8 | 2.2 | 11 |
| VOC | 2.5 | 3.0 | 5.5 |

a Emissions at 100% load and 59°F ambient temperature

Table 2 presents the stack parameters and emission rates that will be modeled for each of the project's combustion turbines. Exhaust from each unit will be ducted to a common stack location and vented through its own dedicated flue at a GEP stack height of 272.5 feet and an inside diameter of 19 feet. Figure 2 shows the common location of the three stacks on the plot plan.

Following is a summary of the assumptions used to develop the model input data:

- $NO_x$ emissions are controlled to 2.0 parts per million (ppm) using SCR;
- CO emissions are controlled to 2.0 ppm with an oxidation catalyst;
- All $PM_{10}$ emissions were assumed to also be $PM_{2.5}$; and
- Stack exit temperatures and volumetric flow rates were based on vendor supplied data.

Table 3 presents the emissions and downtimes (minimum number of hours the turbines would be off before a re-start) associated with startup and shutdown events for the combined cycle turbines. In most cases, emissions from these events are "self correcting" on an annual basis. In other words, the average hourly emissions for each startup event are less than the corresponding steady state emission rate for the minimum downtime that would precede a start. Table 3 identifies the pollutants that are self-correcting for each event. Permitted annual emission limits for the facility will incorporate those conditions that are not considered self-correcting. Table 4 presents the short term emission rates associated with each startup event that will be used in modeling. Due to the short duration and lower emissions of a shutdown compared to the startup cases, shutdowns are not proposed to be modeled. Stack parameters reflecting the 50 percent load case at ISO conditions will be used in the modeling of startup scenarios.

**Table 2. Stack Parameters and Emission Rates for a Single Combustion Turbine**

| | | Design Cases | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Units** | **Case 1A** | **Case 3** | **Case 6** | **Case 7** | **Case 9** | **Case 12** | **Case 19** | **Case 21** | **Case 24** | **Case 36/36A** | **Case 37** | **Case 39** |
| Fuel Type | -- | Gas | Gas | Gas | Gas | Gas | Gas | Gas | Gas | Gas | Gas | Gas | Gas |
| Ambient Temperature | $^oF$ | 105 | 59 | -8 | 105 | 59 | -8 | 105 | 59 | -8 | -8 | 105 | 59 |
| Percent Load Rate | % | 100% | 100% | 100% | 100% | 100% | 100% | 75% | 75% | 75% | 50% | 50% | 50% |
| Duct Burner Operation | -- | Y | Y | Y | N | N | N | N | N | N | N | N | N |
| Stack Temperature | $^oK$ | 385.9 | 377.6 | 379.8 | 382.6 | 378.2 | 379.8 | 379.8 | 375.4 | 377.6 | 378.7 | 378.7 | 378.7 |
| Stack Exit Velocity | m/s | 19.4 | 21.0 | 23.3 | 19.0 | 20.9 | 23.1 | 15.8 | 17.1 | 18.6 | 15.6 | 14.4 | 15.0 |
| $NO_x$ | g/s | 2.21 | 2.29 | 2.47 | 1.63 | 1.82 | 2.04 | 1.31 | 1.45 | 1.61 | 1.25 | 1.01 | 1.12 |
| CO | g/s | 1.34 | 1.39 | 1.50 | 0.99 | 1.11 | 1.24 | 0.80 | 0.88 | 0.98 | 0.76 | 0.62 | 0.68 |
| VOC | g/s | 0.78 | 0.69 | 0.69 | 0.28 | 0.32 | 0.35 | 0.23 | 0.25 | 0.28 | 0.22 | 0.18 | 0.19 |
| $SO_2$ | g/s | 0.46 | 0.47 | 0.50 | 0.34 | 0.38 | 0.42 | 0.28 | 0.31 | 0.33 | 0.26 | 0.20 | 0.22 |
| Total $PM_{10}$ | g/s | 2.01 | 1.87 | 1.94 | 1.26 | 1.26 | 1.39 | 1.26 | 1.26 | 1.26 | 1.01 | 1.01 | 1.01 |

**Table 3. Emissions and Downtimes Associated with Startup and Shutdown Events**

| | Cold Startup | Hot Startup | Warm Startup | Shutdown |
|---|---|---|---|---|
| **Number of Events per Year** | 50 | 10 | 200 | 260 |
| **Minimum Downtime Preceding Event (hours)** | 72 | 0 | 8 | 0 |
| **Duration of Event (hours)** | 4 | 1.83 | 2.17 | 0.75 |
| | **Emissions Per Event (lb)** | | | |
| **$PM_{10}/PM_{2.5}$** | 80 | 20 | 40 | 12 |
| **$SO_2$** | 2.75 | 0.81 | 1.41 | 0.42 |
| **$NO_x$** | 420 | 130 | 180 | 55 |
| **CO** | 1400 | 700 | 800 | 300 |
| **VOC** | 180 | 80 | 100 | 60 |
| | **Self-Correcting?** | | | |
| **$PM_{10}/PM_{2.5}$** | yes | yes | yes | no |
| **$SO_2$** | yes | yes | yes | yes |
| **$NO_x$** | yes | no | yes | no |
| **CO** | no | no | no | no |
| **VOC** | yes | no | no | no |

**Table 4. Short-Term Emissions for Startup and Shutdown Events (g/s)**

| Pollutant | Cold Startup | Hot Startup | Warm Startup | Shutdown |
|---|---|---|---|---|
| $PM_{10}/PM_{2.5}$ | 2.5 | 1.4 | 2.2 | 2.0 |
| $SO_2$ | 0.087 | 0.056 | 0.076 | 0.071 |
| $NO_x$ | 13.2 | 9.0 | 9.2 | 9.2 |
| CO | 31.5 | 34.5 | 92.0 | 35.3 |
| VOC | 4.7 | 6.5 | 6.2 | 4.2 |

*Ancillary Equipment*

Auxiliary Boiler

The auxiliary boiler will only burn natural gas. The maximum heat input will be 48.63 million British thermal units per hour (MMBtu/hr). Operation of the auxiliary boiler will be limited to 4,500 hours per year. Stack height and inside diameter will be 50 feet and 36 inches, respectively. The exhaust gas temperature will be 300ºF, and the exit exhaust flow will be 14,369 actual cubic feet per minute (acfm). Emissions at the stack outlet are as shown in Table 5.

**Table 5. Auxiliary Boiler Emissions**

| Pollutant | Emission Rate | |
|---|---|---|
| | lb/MMBtu | g/s |
| $NO_x$ | 0.036 | 0.22 |
| CO | 0.037 | 0.23 |
| VOC | 0.005 | 0.03 |
| $PM_{10}/PM_{2.5}$ | 0.005 | 0.03 |
| $SO_2$ [a] | 0.0016 | 0.01 |

a Emissions based on a natural gas sulfur content of 0.5 gr/100 scf.

Emergency Diesel Generator

One emergency diesel generator with an approximately 750 kilowatt (kW) standby rating will be provided to supply all essential safe standby loads of the plant when all other normal power sources fail. Operation of the emergency diesel generator will be limited to 500 hours per year. Stack height and diameter will be 12 feet and 8 inches, respectively. The exhaust stack gas temperature will be 949.9ºF, and the exit exhaust flow will be 5,646.8 acfm. Emissions at the stack outlet are as shown in Table 6.

**Table 6. Emergency Diesel Generator Emissions**

| Pollutant | Emission Rate | |
|---|---|---|
| | g/bhp hr | g/s |
| $NO_x$ | 5.32 | 1.49 |
| CO | 0.24 | 0.07 |
| VOC | 0.03 | 0.01 |
| $PM_{10}/PM_{2.5}$ | 0.022 | 0.01 |
| $SO_2$ [a] | 0.0048 | 0.0013 |
| Lead (Pb) | $4.5 \times 10^{-5}$ | $1.24 \times 10^{-5}$ |

a Emissions based on Ultra Low Sulfur Diesel fuel (15 $ppm_w$ sulfur)

Fire Pump

The fire pump is part of the plant fire protection system and delivers fire water from the service/fire water tank to the various buildings and areas of the project. A diesel engine-driven fire pump serves as a backup standby fire pump. The maximum engine power of the fire pump will be 420 horsepower (hp), and will consume 22 gallons per hour of fuel. Operation of the fire pump will be limited to 500 hours per year. Stack height and exit diameter are 12 feet and 8 inches, respectively. The exhaust temperature is 907ºF, and the exhaust flow is 2,064 acfm. Emissions at the stack outlet are provided in Table 7.

**Table 7. Emergency Fire Pump Emissions**

| Pollutant | Emission Rate | |
|---|---|---|
| | g/hp-hr | g/s |
| $NO_x$ | 6.74 | 0.79 |
| CO | 0.49 | 0.06 |
| VOC | 1.00 | 0.12 |
| $PM_{10}/PM_{2.5}$ | 0.06 | 0.01 |
| $SO_2$ [a] | 0.0048 | $6.0 \times 10^{-4}$ |
| Pb | $4.5 \times 10^{-5}$ | $5.2 \times 10^{-6}$ |

a Emissions based on Ultra Low Sulfur Diesel fuel (15 $ppm_w$ sulfur)

Black-Start Generator

Three black-start diesel generators will be used to start the plant on the rare occasion when there is no power available from the electric grid and the grid must be brought back into service. Maximum engine power for each black-start generator will be 2.8 MW. The generators will be vented through a common stack; stack height and diameter are 75 feet and 12 inches, respectively. Operation of the black-start generators will be limited to 500 hours per year for testing. Exhaust temperature is 750ºF, and exhaust gas flow is 73,697 acfm. Emissions at the stack outlet are presented in Table 8.

**Table 8. Black Start Generator Emissions (per unit)**

| Pollutant | Emission Rate | |
|---|---|---|
| | g/hp hr or lb/MMBtu | g/s |
| $NO_x$ | 5.19 g/hp hr | 5.80 |
| CO | 0.63 g/hp hr | 0.70 |
| $PM_{10}/PM_{2.5}$ | 0.03 g/hp hr | 0.11 |
| VOC | 0.1 g/hp hr | 0.01 |
| $SO_2$ [a] | 0.0015 lb/MMBtu | 0.03 |
| Pb | $1.45 \times 10^{-5}$ lb/MMBtu | 0.0001 |

a Emissions based on Ultra Low Sulfur Diesel fuel (15 $ppm_w$ sulfur)

*Summary of Potential Emissions*

Potential annual emissions for the project assuming steady state operation of the combustion turbines are presented in Table 9.

**Table 9. Potential to Emit for Cricket Valley Energy (Steady State)**

| Pollutant | Combustion Turbine Emissions (tpy)[a] | Ancillary Equipment (tpy) | Total Project Potential to Emit (tpy) |
|---|---|---|---|
| $PM_{10}/PM_{2.5}$ | 194.4 | 0.8 | 195.2 |
| $SO_2$ | 49.9 | 0.2 | 50.1 |
| $NO_x$ | 239.2 | 42.9 | 282.1 |
| CO | 144.5 | 8.5 | 153 |
| VOC | 72.2 | 1.5 | 73.7 |

a Assumes 3 units with 8,760 hours per year of duct firing per unit. Combustion turbine emissions at 100% load and 59°F ambient temperature.

### *2.4 Good Engineering Practice Stack Height Analysis*

A GEP stack height analysis was conducted to evaluate whether the plumes emitted from the turbine stacks would be subject to building wake effects. If a stack is sufficiently close to a large building or other structure, the plume can be entrained in the building's wake. The resulting "downwash" reduces the effective release height and leads to increased ground-level ambient concentrations. Building downwash effects must be evaluated when a stack is less than "formula" GEP stack height. Formula GEP stack height is defined as:

$H_{GEP} = H_B + 1.5L_B$ where:

- $H_{GEP}$ = formula GEP stack height;
- $H_B$ = the building's height above stack base; and
- $L_B$ = the lesser of the building's height or maximum projected width.

A second definition of GEP stack height is "regulatory" GEP stack height. Regulatory GEP stack height is either 65 meters (m) or formula GEP stack height, whichever is greater. Sources are not allowed to take credit for ambient air concentrations that result from stacks that are higher than regulatory GEP stack height.

The USEPA Building Profile Input Program (BPIP) (USEPA, 1995) produces the model input information necessary to account for building wake effects, based on the dimensions of buildings in the vicinity of the stacks. The "PRIME" version of BPIP (BPIPPRM) (Schulman, et al., 1997) is used with AERMOD. BPIP requires a digitized blueprint of the facility's buildings and stacks as well as other nearby structures. The position and height of buildings relative to the stack positions must be evaluated in the GEP analysis. The building positions were obtained from the site plan provided in Figure 2. Coordinates for each building tier corner were identified using a digitized geo-referenced AutoCAD survey. Tier heights for the various project elements are shown on Figure 3. The base elevation of the site is 435 feet above mean sea level (msl).

The results of the analysis for the turbine stacks indicate that structures on the top of the ACCs, with a tier height of 109 feet, are the "controlling" structures for the turbine stacks. The projected width of the controlling structure exceeds the height, so the GEP formula height is 272.5 feet (83 m), which translates to a stack-top elevation of 707.5 feet msl. The design calls for the turbine stacks to be built to GEP height. All of the auxiliary units (boiler, generators and fire pump) will have shorter stacks and will be modeled with inputs to account for building wake downwash. BPIPPRM input and output files will be provided with the modeling report.

## 3.0 Regulatory Requirements

State and federal regulatory requirements that pertain to the ambient air quality modeling analyses to be undertaken for the project are described below.

### *3.1 New York State Construction and Operation Permits*

State air quality permitting requirements are spelled out in 6 NYCRR Part 201. The project will apply for a permit to construct under Part 201-5. Within one year of the commencement of operation of the facility, the project will apply for a Title V operating permit under Part 201-6.

### *3.2 Nonattainment New Source Review*

The project will be subject to NNSR as a major source of ozone precursors, $NO_x$ and VOC. NNSR permitting requirements are spelled out in 6 NYCRR Part 231. These include the need to apply Lowest Achievable Emission Rate (LAER) technology and obtain $NO_x$ and VOC offsets. There are no specific ambient air quality modeling requirements with respect to NNSR for ozone.

### *3.3 PSD Review*

Since annual emissions of at least one criteria pollutant will exceed 100 tons per year (tpy), the project will be subject to PSD review. PSD review requirements include application of Best Available Control Technology (BACT), an ambient air quality modeling analysis that includes a demonstration of compliance with NAAQS/NYAAQS and PSD increments, and an additional impacts analysis, for those pollutants which exceed significant emission rates defined in the regulations. PSD review will be required for $NO_x$, CO, VOC, $SO_2$, $PM_{10}$/$PM_{2.5}$, and sulfuric acid mist ($H_2SO_4$).

The air quality modeling analyses to be conducted are described in detail in the following sections of this protocol document.

### *3.4 Ambient Air Quality Standards*

An air quality impact analysis must be performed to demonstrate compliance with NAAQS, NYAAQS, and PSD increments. NAAQS, NYAAQS, PSD increments, Significant Impact Levels (SILs) and Significant Monitoring Concentrations (SMCs) are shown in Table 10.

**Table 10. Ambient Air Quality Standards, PSD Increments, Significant Impact Levels, and Significant Monitoring Concentrations**

| Pollutant | Averaging Period | Ambient Air Quality Standards NAAQS (µg/m³) | Ambient Air Quality Standards NYAAQS (µg/m³) | PSD Increment Class II (µg/m³) | SIL (µg/m³) | SMC (µg/m³) |
|---|---|---|---|---|---|---|
| $SO_2$ | 3-hour | 1,300 | 1,300 | 512 | 25 | none |
| | 24-hour | 365 | 365 | 91 | 5 | 13 |
| | Annual | 80 | 80 | 20 | 1 | none |
| $PM_{10}$ | 24-hour | 150 | none | 30 | 5 | 10 |
| | Annual | revoked | none | 17 | 1 | none |
| $PM_{2.5}$ | 24-hour | 35 | none | pending | pending | pending |
| | Annual | 15 | none | pending | pending | pending |
| TSP | 24-hour | none | 250 | none | none | none |
| | Annual | none | 45 | none | none | none |
| CO | 1-hour | 40,000 | 40,000 | none | 2,000 | none |
| | 8-hour | 10,000 | 10,000 | none | 500 | 575 |
| $NO_2$ | Annual | 100 | 100 | 25 | 1 | 14 |
| Pb | 3-month | 1.5 | none | none | none | 0.1 |

As shown in Table 10, New York has adopted the NAAQS as NYAAQS. In addition, NYAAQS have been established for total suspended particulates (TSP), gaseous fluoride ($F^-$), beryllium (Be), and hydrogen sulfide ($H_2S$). The NYAAQS for TSP are provided in Table 10. The pollutants Pb, $F^-$, Be or $H_2S$ are listed in *Policy DAR-1: Guidelines for the Control of Toxic Ambient Air Contaminants* (NYSDEC, 1997) and will be addressed in the air toxics (DAR-1) impact analysis.

## 4.0 Modeling Procedures

This section provides the modeling protocol including model selection, land use classification, receptor grid design, and meteorological data.

### *4.1 Model Selection*

AERMOD (version 07026; USEPA, 2004a) was selected to predict ambient concentrations in simple, complex and intermediate terrain. The AERMOD Modeling System includes preprocessor programs (AERMET, AERSURFACE, and AERMAP) to create the required input files for meteorology and receptor terrain elevations. AERMOD is the recommended model in USEPA's *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) (USEPA, 2005). The regulatory default option will be used. This option commands AERMOD to use:

- The elevated terrain algorithms requiring input of terrain height data for receptors and emission sources;
- Stack tip downwash (building downwash automatically overrides);
- The calms processing routines;
- Buoyancy-induced dispersion; and
- The missing meteorological data processing routines.

### *4.2 Land Use*

The potential effect of the project on air quality is dependent on the existing air quality characteristics of both land and air resources. Although the project is located on industrially zoned land that was formerly used for industrial purposes, the land use in the vicinity of the site is primarily rural.

Selection of the appropriate dispersion coefficients for air quality modeling is determined using the USEPA-preferred land use classification technique in 40 CFR 51, Appendix W (also known as the "Auer" technique). This classification technique involves assessing land use for Auer's categories within a 3-km radius of the site (Auer, 1978). USEPA recommends using urban dispersion coefficients and mixing heights if greater than 50 percent of the area is urban; otherwise, rural coefficients and mixing heights apply. Based on an evaluation of land use in the vicinity of the site (depicted in Figure 4), less than 10 percent of the area within a 3-km radius is urban, less than 10 percent is water, and more than 80 percent is rural. Therefore, rural dispersion coefficients and mixing heights were confirmed to be appropriate for use in the modeling analysis.

### *4.3 Receptors*

A receptor grid consisting of 1,646 receptors contained within five nested Cartesian grids is proposed for the analysis. The grid has a total coverage of 8 km by 8 km. Receptor spacing is as follows:

- Inner grid = 25 m spacing out to a distance of 200 m;
- Second grid = 50 m spacing out to a distance of 400 m;
- Third grid = 100 m spacing from X = -2,400 to +800 m, and from Y = -800 to +1,600 m;
- Fourth grid = 500 m spacing out to a distance of 4 km;
- Outer grid = 1,000 m spacing out to a distance of 8 km.

The 100 m receptor spacing was extended to provide higher resolution in an area with steeply rising terrain northwest of the project site. Receptor resolution will be increased in other areas if warranted, based on model predictions.

Receptor elevations are assigned using the USEPA's AERMAP software tool (version 06341; USEPA, 2004b), which is designed to extract elevations from United States Geological Survey (USGS) National Elevation Dataset (NED) data at 1 degree (approximately 30 m) resolution in GeoTIFF format (USGS, 2002).

AERMAP, the terrain preprocessor for AERMOD, uses interpolation procedures to assign elevations to a receptor:

- For each receptor, the program searches through the NED data index files to determine the two profiles (longitudes or eastings) that straddle the receptor.

- For each of these two profiles, the program then searches through the nodes in the index file to determine which two rows (latitudes or northings) straddle the receptor.

- The program then reads the elevations for these four points. A two-dimensional distance-weighted interpolation is then used to determine the elevation at the receptor location based on the elevations at the four nodes determined above.

A summary of AERMAP files is provided on the CDROM in Appendix A. Using Lakes AERMOD View® software, a topographic map of the model region was generated from AERMAP elevations; this map was compared with the actual USGS 7.5-minute topographic maps to ensure accurate representation of terrain features.

Surveyed topographic information was available for the site. The developed base elevation of the site will be 435 feet msl, which includes consideration of site grading as provided by the design engineers. The nearest terrain at or above stack height is about 1.4 km (4,600 feet) to the west of the project site.

### *4.4 Meteorological Data*

NYSDEC and USEPA recommend using a five-year data set in order to capture typical and atypical meteorological characteristics (e.g., inversions, high wind scenarios) that could impact dispersion. Careful consideration was given to selecting a location from which to obtain meteorological data that was representative of site conditions and had appropriately collected data.

The Cricket Valley Energy site is located along Route 22 south of Dover Furnace, New York, in the Ten Mile River Valley. The site base elevation is at 435 feet msl. The valley is about 5 km (3 miles) wide and oriented north-south (N-S), with a ridge of elevated terrain rising steeply within 1.5 km west of the site, including Bald Mountain (1,266 feet msl), West Mountain (1,286 feet msl), and Dobar Mountain (1,086 feet msl) and a parallel ridge beginning almost 4 km east-northeast of the site, including Schaghticoke Mountain (1,325 feet msl) and continuing to the north. Compared to the surrounding area, near surface winds in this terrain setting would be channeled along the valley, toward N-S transport directions.

The Poughkeepsie-Dutchess County Airport (KPOU) is situated in the Hudson River Valley, about 16 miles west of the Cricket Valley Energy site (as shown in Figure 5).

The Hudson River Valley is somewhat broader than the Ten Mile River Valley, but has a very similar N-S orientation. Base elevation at KPOU is 165 feet msl. An N-S ridge about 6 miles to the west of KPOU is approximately 800 feet msl, with a similar ridge 8 miles to the east of KPOU.

The influence of local topography on channeling of the winds diminishes with height above the surface, as well as with the width of the valley. With stack height and plume rise, the Cricket Valley Energy emissions will be transported 500 feet or more above the ground, based on a stack height of 272.5 feet. The channeling influence of local topography on winds 300-500 feet above the surface is considerably less than the influence on winds closer to the surface. Both the near-surface wind directions in the broader valley at KPOU (wind measurement height on the meteorological tower is 26 feet above ground level) and the winds at 500 feet above the narrower Ten Mile River Valley at the Cricket Valley Energy site will be dominated by the synoptic (regional-scale) wind flow. The secondary influence of channeling due to local topography is oriented N-S at both locations.

Based upon a review of the most recent data available and consultation with NYSDEC and USEPA, it was determined that processing of the raw meteorological data, using methods still under development by USEPA, would be preferable to use of available hourly average data. An analysis of the National Climatic Data Center (NCDC) hourly surface data for the KPOU location for 2004-2008 showed a high number of “calm” observations and lower than expected average wind speed. These findings are consistent with (but somewhat more extreme than) trends seen at other Automated Surface Observing Systems (ASOS) stations. After discussing this matter with NYSDEC and with USEPA, ARCADIS developed software for calculating hourly average winds based on one-minute ASOS data collected at the KPOU site. This approach greatly reduced the frequency of calms and also increased the average wind speed.

Given the above factors, the meteorological data selected for the sequential modeling consist of hourly surface observations calculated for one-minute ASOS data collected at KPOU from March 20, 2005 through March 19, 2009. (The NCDC archive of one-minute ASOS data from KPOU starts in March of 2005; only the less-refined hourly data are available prior to that time.) Upper air radiosonde data concurrent with the surface meteorological data were obtained from NCDC for Albany, New York. A wind rose for the four year period 2005-2008 is provided in Figure 6. The prevailing wind directions are southwest and north, each 8 percent of the time. Lighter winds (below 4 knots) are most frequently from the southeast quadrant, while higher wind speeds (above 11 knots) are most often associated with west winds. By averaging the one-minute wind observations, calms were reduced from about 40 percent of hours to about 10 percent. See Appendix B for details.

USEPA modeling guidance calls for a five-year modeling period when using NWS meteorological data. Since the one-minute data are not available for five years, peak short-term impacts will be evaluated based on maximum predicted concentrations, rather than on the highest, second-highest value, for standards not to be exceeded more than once per year. For the 24-hour $PM_{2.5}$ standard, which is based on the three-year average of $98^{th}$ percentile value, compliance will be evaluated based on the highest $98^{th}$ percentile value predicted for any year.

Following the averaging procedure to compute hourly-average winds, as described in Appendix B, surface and upper air input files for AERMOD will be prepared using the AERMET processor programs. The inputs to AERMET for surface characteristics (surface roughness, Albedo and Bowen ratio) are determined using the AERSURFACE preprocessor, based on land use in the area surrounding the airport anemometer site. To assess the representativeness of the airport data for the proposed model application, the land use distribution and estimated values of surface roughness ($z_0$), Bowen ratio and Albedo for the area surrounding the project site were compared to surface parameters for the area surrounding the airport.

Table 11 summarizes the land use distribution within 1 km from the airport anemometer and from the location of the turbine stacks. The largest differences between the sites are seen for Low Intensity Residential, Commercial/Industrial/Transport, and Urban/Recreational Grasses (all higher at KPOU) and Forests and Woody Wetlands (which total almost 90 percent of the area around the project site). Table 12 provides the comparison of estimated values of surface roughness ($z_0$), Albedo, and Bowen ratio by month. Surface roughness around the project site ranges from 0.6 to 0.95 m, consistently higher than the roughness around the airport, which ranges from 0.10 to 0.17 m. These differences reflect the higher roughness associated with forest in the project vicinity. Albedo and Bowen ratio estimates are comparable between the two sites.

**Table 11. Comparison of Land Use within 1 Kilometer of the Project Site and the Airport (KPOU) Anemometer Site**

| Class | Land Use Category | Project Site | KPOU |
|---|---|---|---|
| 11 | Open Water | 0.4% | 0.7% |
| 21 | Low Intensity Residential | 0.7% | 18.2% |
| 22 | High Intensity Residential | 0.0% | 0.8% |
| 23 | Commercial/Industrial/Transportation | 2.8% | 9.6% |
| 31 | Bare Rock/Sand/Clay | 0.0% | 0.0% |
| 32 | Quarries/Strip Mines/Gravel | 0.0% | 0.0% |
| 41 | Deciduous Forest | 23.5% | 18.8% |
| 42 | Evergreen Forest | 17.7% | 0.9% |
| 43 | Mixed Forest | 26.6% | 23.7% |
| 81 | Pasture/Hay | 6.8% | 5.4% |
| 82 | Row Crops | 1.8% | 2.3% |
| 85 | Urban/Recreational Grasses | 0.1% | 19.6% |
| 91 | Woody Wetlands | 19.7% | 0.0% |
| 92 | Emergent Herbaceous Wetlands | 0.0% | 0.0% |

**Table 12. Comparison of Surface Parameters for the Project Site and the Airport (KPOU) Anemometer Site (based on Land Use within 1 km)**

| | Project Site | | | KPOU | | |
|---|---|---|---|---|---|---|
| Month | $Z_0$ (m) | Albedo | Bowen ratio | $Z_0$ (m) | Albedo | Bowen ratio |
| 1 | 0.61 | 0.16 | 0.85 | 0.097 | 0.17 | 0.87 |
| 2 | 0.61 | 0.16 | 0.85 | 0.097 | 0.17 | 0.87 |
| 3 | 0.61 | 0.16 | 0.85 | 0.097 | 0.17 | 0.87 |
| 4 | 0.778 | 0.15 | 0.6 | 0.128 | 0.15 | 0.64 |
| 5 | 0.778 | 0.15 | 0.6 | 0.128 | 0.15 | 0.64 |
| 6 | 0.953 | 0.15 | 0.32 | 0.165 | 0.16 | 0.5 |
| 7 | 0.953 | 0.15 | 0.32 | 0.165 | 0.16 | 0.5 |
| 8 | 0.953 | 0.15 | 0.32 | 0.165 | 0.16 | 0.5 |
| 9 | 0.953 | 0.15 | 0.32 | 0.165 | 0.16 | 0.5 |
| 10 | 0.952 | 0.15 | 0.84 | 0.149 | 0.16 | 0.86 |
| 11 | 0.952 | 0.15 | 0.84 | 0.149 | 0.16 | 0.86 |
| 12 | 0.61 | 0.16 | 0.85 | 0.097 | 0.17 | 0.87 |

The meteorological observations at KPOU are judged to be representative and suitable for modeling the air quality impacts of the proposed Cricket Valley Energy facility. Comparison of the airport and project sites supports the following conclusions:

- The proximity of KPOU to the project site (within 16 miles) ensures that the information will be regionally representative.

- The similar N-S orientation of the Ten Mile River Valley project location and Hudson River Valley airport location ensures that local topographic channeling effects will have similar orientation.

- Albedo and Bowen ratio estimates are nearly identical for the two sites.

- Land use around both sites is predominantly rural. Differences in surface roughness were noted, but such differences are not expected to influence dispersion conditions at or above stack-top elevation. Use of wind profiles that reflect airport surface conditions should provide a reliable basis for computing wind speeds at stack-top elevation.

- The effect of inversions (which can result as colder air settles in the valley, typically during the night under conditions with few clouds and light winds) can strongly influence near-surface conditions at the project site. Strong local inversions will generally be confined to within 100-200 feet of the ground surface. Under these conditions, the turbine stacks will be above the inversion layer, and the inversion will prevent the plumes from mixing down to ground level. KPOU data will provide regionally representative wind speed and cloud cover observations. Dispersion conditions at plume height, 500 feet above the ground surface, should be characterized well by observed conditions at KPOU.

## 5.0 Single Source Modeling Analysis

The purpose of this significant impact modeling analysis is to assess the need for interactive source modeling. NYSDEC and USEPA modeling guidelines require evaluation of various operating loads, to ensure that the conditions leading to predicted worst-case impacts are identified. For the turbines, we propose to evaluate impacts for 12 operating scenarios: three temperatures (-8$^{o}$F, 59$^{o}$F, 105$^{o}$F) for 100 percent load, 75 percent load and 50 percent load, all without duct firing, plus the three 100 percent load cases with duct firing. Cold, warm and hot startup scenarios will also be modeled, to assess potential peak short-term impacts. Operation of ancillary equipment will be modeled consistent with anticipated usage; the black start generator, for example, will never operate at the same time as other emission sources, aside from periodic test firing.

Single source modeling results will be evaluated relative to SILs (shown on Table 10), to determine whether interactive modeling is warranted, and if so, for which pollutants. At the conclusion of single source modeling, a report will be prepared documenting the results. If the results demonstrate that all predicted impacts are insignificant, this report will accompany the permit application. If impacts exceed the SILs, the Significant Impact Area will be defined, in preparation for interactive modeling.

For $PM_{2.5}$, for which SILs have not yet been established, project impacts will be added to existing background levels (discussed in the next section) and the sum compared to the appropriate NAAQS.

Project impacts will also be evaluated for toxic air contaminants. Impacts will be compared to the health-effect based annual and short-term guideline concentrations (AGCs and SGCs) as defined in NYSDEC Policy DAR-1 (NYSDEC, 1997). A spreadsheet will be used to scale AERMOD-predicted impacts based on the estimated emissions of individual contaminants.

## 6.0 Background Air Quality Monitoring Data

It is anticipated that modeled project impacts will be demonstrated to be below the SMCs (shown on Table 10). As such, the project would qualify for a waiver from PSD pre-construction monitoring requirements. Background air quality levels for the air quality impact analysis will be based on existing monitoring data, as discussed below.

Based on review of available data, ambient monitors located in Dutchess County and adjacent counties were selected for the determination of background ambient air quality concentrations to be used in the NAAQS assessment. The only NYSDEC monitoring station in Dutchess County, in Millbrook, measures ozone, but does not monitor criteria pollutants of direct concern for modeling. The nearest monitor for $SO_2$ and $PM_{10}$ is the Mt. Ninham site (3951-01), located in Carmel (Putnam County), 20 miles south of the project site. For $PM_{2.5}$, monitors are located in Newburgh (Orange County), 26 miles southwest of the project site; Cornwall, Connecticut (Litchfield County), 17.5 miles northeast of the project site; and Thomaston, Connecticut (Litchfield County), 26 miles east of the project site. For $NO_2$ and for CO, the nearest monitor is located in Thomaston, Connecticut. Three of these sites are rural, consistent with the project site; the Newburgh site is located in a more heavily developed area. Table 13 provides identification and location information for the monitoring sites.

**Table 13. Background Air Quality Monitoring Sites**

| Monitor | USEPA AIRS ID | Address | Pollutants |
|---|---|---|---|
| Mt. Ninham | 36-079-0005 | Gypsy Trail Rd, Carmel, NY | $SO_2$, $PM_{10}$ |
| Newburgh | 36-071-0002 | 55 Broadway, Newburgh, NY | $PM_{2.5}$ |
| Mohawk Mt | 09-005-0005 | Cornwall, CT | $PM_{2.5}$ |
| Thomaston | 09-005-0004 | Old Waterbury Rd, Thomaston, CT | $PM_{2.5}$, CO, $NO_2$, $SO_2$ |

Table 14 summarizes the most recent available ambient air quality monitoring data for $SO_2$, $PM_{10}$, $PM_{2.5}$, CO, and $NO_2$. As shown in that table, all measured concentrations for these pollutants are less than their respective NAAQS. The listed short-term concentrations represent the second-highest measurement recorded by the monitor during each year, except for $PM_{2.5}$, where the $98^{th}$ percentile value is given. As such, these data provide a conservative representation of background air quality in the region.

**Table 14. Regional Ambient Air Quality Data**

| Monitor Location | Pollutant | Averaging Period | Concentration (µg/m³) | | | | NAAQS (µg/m³) |
|---|---|---|---|---|---|---|---|
| | | | Year | Year | year | | |
| | | | **2007** | **2006** | **2005** | | |
| Mt. Ninham | $SO_2$ | 3-hour | 44.2 | 48.1 | 44.2 | | 1,300 |
| | | 24-hour | 23.4 | 28.0 | 25.7 | | 365 |
| | | Annual | 3.9 | 4.4 | 5.7 | | 80 |
| | | | **1998** | **1997** | **1996** | | |
| Mt. Ninham | $PM_{10}$ | Annual | 14 | 14 | 14 | | 50* |
| | | 24-hour | 39 | - | - | | 150 |
| | | | **2008** | **2007** | **2006** | | |
| Thomaston | $NO_2$ | Annual | 14.2 | 17.0 | 23.0 | | 100 |
| | | | **2008** | **2007** | **2006** | | |
| Thomaston | CO | 1-hour | 1200 | 1100 | 1650 | | 40,000 |
| | | 8-hour | 1000 | 900 | 1200 | | 10,000 |
| | | | **2007** | **2006** | **2005** | **3-yr avg** | |
| Newburgh | $PM_{2.5}$ | 24-hour | 30.4 | 27.5 | 29.6 | 29 | 35 |
| | | Annual | 10.6 | 9.6 | 12.1 | 10.8 | 15 |
| | | | **2008** | **2007** | **2006** | **3-yr avg** | |
| Thomaston | $PM_{2.5}$ | 24-hour | 25.0 | 29.3 | 24.2 | 26 | 35 |
| | | Annual | 9.6 | 10.2 | 8.7 | 9.5 | 15 |
| | | | **2008** | **2007** | **2006** | **3-yr avg** | |
| Mohawk Mt | $PM_{2.5}$ | 24-hour | 23.0 | 31.0 | 25.1 | 26 | 35 |
| | | Annual | 7.6 | 8.1 | 7.2 | 7.6 | 15 |

*Revoked.

A summary of selected background air quality concentrations is provided in Table 15. For $PM_{10}$, $NO_2$, and CO, the highest value from Table 12 was selected for each averaging time. For $PM_{2.5}$, the 3-year average observed values for Thomaston, Connecticut were selected. The Thomaston and Mohawk Mountain sites were judged to be more representative of air quality at the project site than the Newburgh monitor, which is in a more densely populated location.

**Table 15. Background Air Quality Levels for the Cricket Valley Energy Project**

| Pollutant | Averaging Period | Background Air Quality (μg/m$^3$) |
|---|---|---|
| $SO_2$ | 3-hour | 48.1 |
| | 24-hour | 28.0 |
| | Annual | 5.7 |
| $PM_{10}$ | 24-hour | 39 |
| | Annual | 14 |
| $PM_{2.5}$ | 24-hour | 26 |
| | Annual | 9.5 |
| CO | 1-hour | 1650 |
| | 8-hour | 1200 |
| $NO_2$ | Annual | 23.0 |

## 7.0 PSD Class I Area Impact Analyses

PSD Class I areas are designed in 40 CFR Part 81, and are areas of special national or regional value from a natural, scenic, recreational or historic perspective. The PSD Class I areas that are most proximate to the project site are mandatory Federal Class I areas, which include the following areas in existence on August 7, 1977:

- International parks;
- National wilderness areas which exceed 5,000 acres in size;
- National memorial parks which exceed 5,000 acres in size; and
- National parks which exceed 6,000 acres in size.

These areas are administered by the National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), or the U.S. Forest Service (USFS). These Federal Land Managers (FLMs) are responsible for evaluating proposed projects' air quality impacts in the Class I areas and may make recommendations to the permitting agency to approve or deny permit applications.

The closest designated PSD Class I areas are the Lye Brook Wilderness Area, located 167 km north-northeast of the site in southern Vermont, and the Brigantine Division of the Edwin B. Forsythe National Wildlife Refuge in New Jersey, 216 km south-southwest of the site. Class I area impact analyses consist of:

- An air quality impact analysis;
- A visibility impairment analysis; and
- An analysis of impacts on other air quality related values (AQRVs) such as impacts to flora and fauna, water, and cultural resources.

Based on the distances from the project site and the quantity of project emissions, it is expected that the FLMs will not require Class I modeling analyses for the project.

## 8.0 Additional Impacts Analyses

Additional impacts analyses consist of: an accidental release assessment of impacts from a hypothetical failure of the ammonia storage tank; an assessment of potential acidic deposition on sensitive receptors; an assessment of impacts resulting from the project on community growth; impacts on Environmental Justice areas; an assessment of visibility impairment; and impacts to soils and vegetation.

### *8.1 Aqueous Ammonia Release*

Aqueous ammonia will be stored on site for use in the SCR emissions control system for $NO_x$. An aqueous solution of 19 percent by weight will be stored in two 30,000 gallon tanks. The tanks will be located within an impermeable containment area, surrounded by a wall. The floor of the containment area will be covered with plastic balls designed to float on the liquid surface in the event of a spill. The plastic balls would reduce the surface area of the exposed liquid and thereby reduce the rate of evaporation of ammonia to the atmosphere in the event of an accidental release of aqueous ammonia from the tank.

Facilities that store aqueous ammonia solutions containing less than 20 percent ammonia by weight are not subject to the USEPA Risk Management Planning (RMP) Rule. However, an analysis of potential impacts from a hypothetical ammonia tank failure will be conducted. The assessment will use the most recent version of the Areal Locations of Hazardous Atmosphere (ALOHA) model (version 5.6.1). ALOHA was developed by USEPA and the National Oceanic and Atmospheric Administration (NOAA) and is designed for use for emergency response to chemical releases and for emergency planning and training.

Consistent with RMP Rule guidance, worst-case and alternate scenarios will be modeled. In each case, the total failure of the ammonia tank resulting in the spilling of tank contents into the containment area will be assumed. The worst-case scenario will assume class F atmospheric stability and a wind speed of 1.5 meters per second. The alternate scenario will assume class D atmospheric stability and a wind speed of 3.0 meters per second. Ambient temperatures for the worst-case and alternate scenarios will be selected based on an analysis of data from KPOU. ALOHA will be used to determine the downwind distances at which the ammonia concentration resulting from the hypothetical accidental releases would decrease to less than the Emergency Response Planning Guideline Level 2 (ERPG-2) threshold defined by the American Industrial Hygiene Association (AIHA). The ERPG-2 for ammonia is 150 ppm. The predicted endpoint distances will be compared to the distance to the nearest “public receptor.”

### *8.2 Acidic Deposition*

An assessment of potential acidic deposition on sensitive receptors will be conducted, following the procedures outlined in the March 1993 memorandum by Leon Sedefian (NYSDEC, 1993). The specified source location will be Dutchess County. Impacts will be estimated at the 18 sensitive receptors identified in the State Acid Deposition Control Act (SADCA). Impacts will be calculated using the proposed annual project emissions of $NO_x$ and $SO_2$, and the impact ratios tabulated in the 1993 memorandum. Project impacts will be summarized and compared to the total estimated New York state acidic deposition.

### *8.3 Growth Analysis*

CVE anticipates that 25-30 new employees will be hired to operate the proposed facility, working in shifts, which will increase long-term jobs within the community. There will be additional short-term local employment during the construction phase of the proposed project. Short-term employment is expected to reach 750 workers over a short period of time (5 months).

Work Force

During the anticipated construction period associated with the proposed project, the majority of construction jobs will be filled by local area workers. Due to the large available labor pool in the region, supplemental short-term labor is not likely to require a significant influx of temporary workers relocating to the Dutchess County area during the construction phase. CVE anticipates that the additional temporary workers during the construction phase will have minimal effect on the environment, but will have a positive effect on the local economy.

For daily operation and maintenance of the project, CVE anticipates that the required full time staff will be mostly comprised of nearby Dutchess County residents, and the project will not result in a significant increase in residential housing demand.

During the construction phase of the project, there will be a temporary increase in truck traffic. Once in operation, it is anticipated that less than 25 trucks per week will be needed to provide the facility with supplies.

The resulting increase in employment is not anticipated to significantly impact the air quality of the area because the increase represents a small fraction of the regional population. Thus, construction and operation of the proposed project will have a positive impact on the work force in Dutchess County and the surrounding areas, but its net impact on the environment and to residential resource consumption is anticipated to be minimal.

Industry

Because much of the growth from the project will be filled by local labor and resources and the project is intended to support existing energy needs throughout the regional electricity grid area, CVE does not anticipate any significant corresponding commercial or industrial growth. Because the commercial and industrial growth resulting from the project is anticipated to be minimal, air quality impacts resulting from such commercial and industrial growth are also expected to be minimal.

### *8.4 Environmental Justice Areas*

NYSDEC has identified potential Environmental Justice Areas (EJAs) of concern relating to impacts on communities or facilities housing disadvantaged population groups. The map of potential EJA areas in Dutchess County was reviewed; the only potential EJA in the eastern portion of Dutchess County is the location of a former state hospital (Harlem Valley). That property has been sold for private development. With no EJA in the project vicinity, no impact analysis is planned.

### *8.5 Visibility Impairment Analysis*

The visibility impairment analysis addressed here is distinct from the analysis required for Class I areas. NPS guidance addresses the need for visibility analysis in “Class II floor areas,” although no specific guidance is provided that quantifies visibility impairment for these areas. Class II floor areas include the following areas in existence on August 7, 1977 that exceed 10,000 acres in size:

- National monuments;
- National primitive areas;
- National preserves;

- National recreational areas;
- National wild and scenic rivers;
- National wildlife refuges; and
- National lakeshores and seashores.

These Class II floor areas also include the following areas established after August 7, 1977 that exceed 10,000 acres in size:

- National parks; and
- National wilderness areas.

No areas meeting these Class II floor criteria were identified within 80 km (50 miles) of the project site. Therefore, no assessment of visibility impairment is proposed.

### *8.6 Soils and Vegetation Analysis*

Ambient air quality screening levels are provided for soils and vegetation in USEPA guidance (USEPA, 1980). Table 16 summarizes the relevant screening levels. USEPA has not published screening values for $PM_{10}$ (or $PM_{2.5}$).

**Table 16. Soils and Vegetation Screening Modeling**

| Parameter | Averaging Period | USEPA Screening Level (μg/m$^3$) |
|---|---|---|
| $SO_2$ | 1-hour | 917 |
| | 3-hour | 786 |
| | Annual | 18 |
| $NO_2$ | 4-hour | 3,760 |
| | 8-hour | 3,760 |
| | 1-month | 564 |
| | Annual | 94 |

Maximum predicted concentrations for $SO_2$ and $NO_2$ will be compared to the screening levels shown in Table 16. If modeling results are less than the concentrations shown in Table 16, impacts to soils and vegetation will be considered negligible.

## 9.0 References

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USEPA, 2005. Guideline on Air Quality Models. November 2005.

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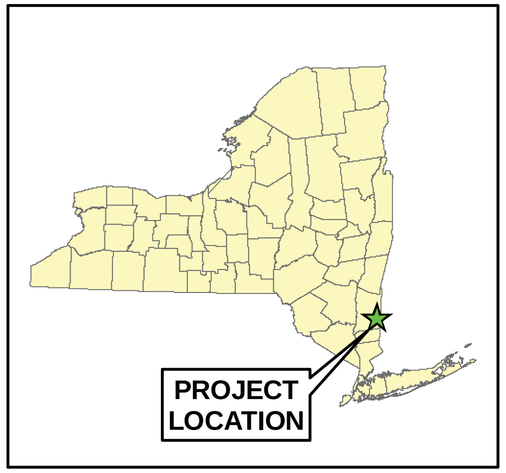
# FIGURES


**Legend**

Site Boundary

SOURCE:
U.S. Geological Survey, 7.5 x 15 Minute Quadrangle, Dover Plains, NY/CT, Verbank, NY

0 2,000 4,000 Feet
GRAPHIC SCALE

ARCADIS

**CRICKET VALLEY ENERGY**

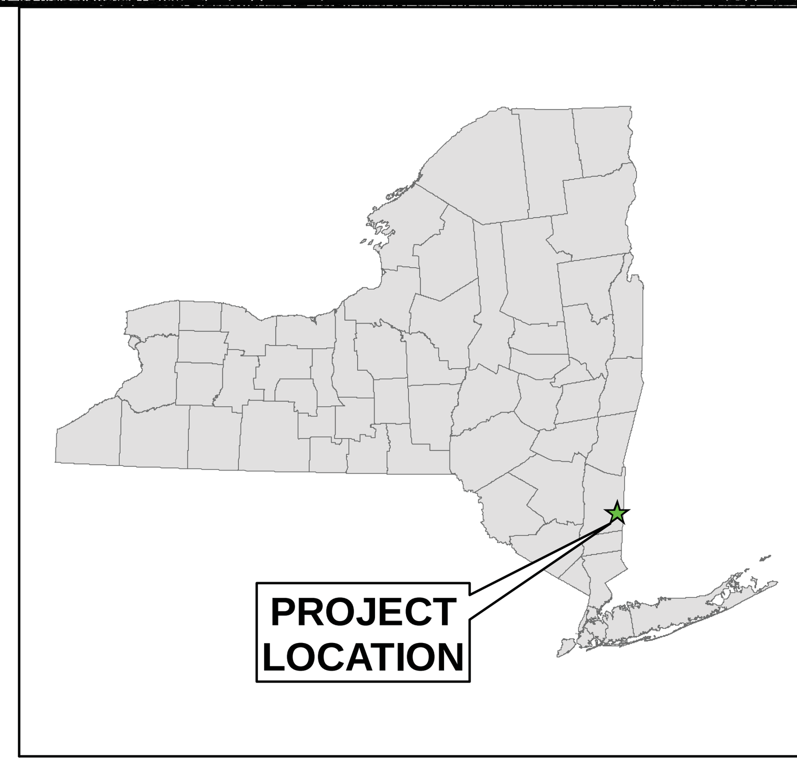
***FIGURE 1***
***SITE LOCATION***

Dutchess County, New York


CRICKET VALLEY ENERGY

*FIGURE 2*
*SITE PLAN*

Dutchess County, New York





UNIT 3
ELEVATION LOOKING NORTH

GRAPHIC SCALE

0 10' 20' 40' 60'

1" =20.0'

PRELIMINARY

NOTES:

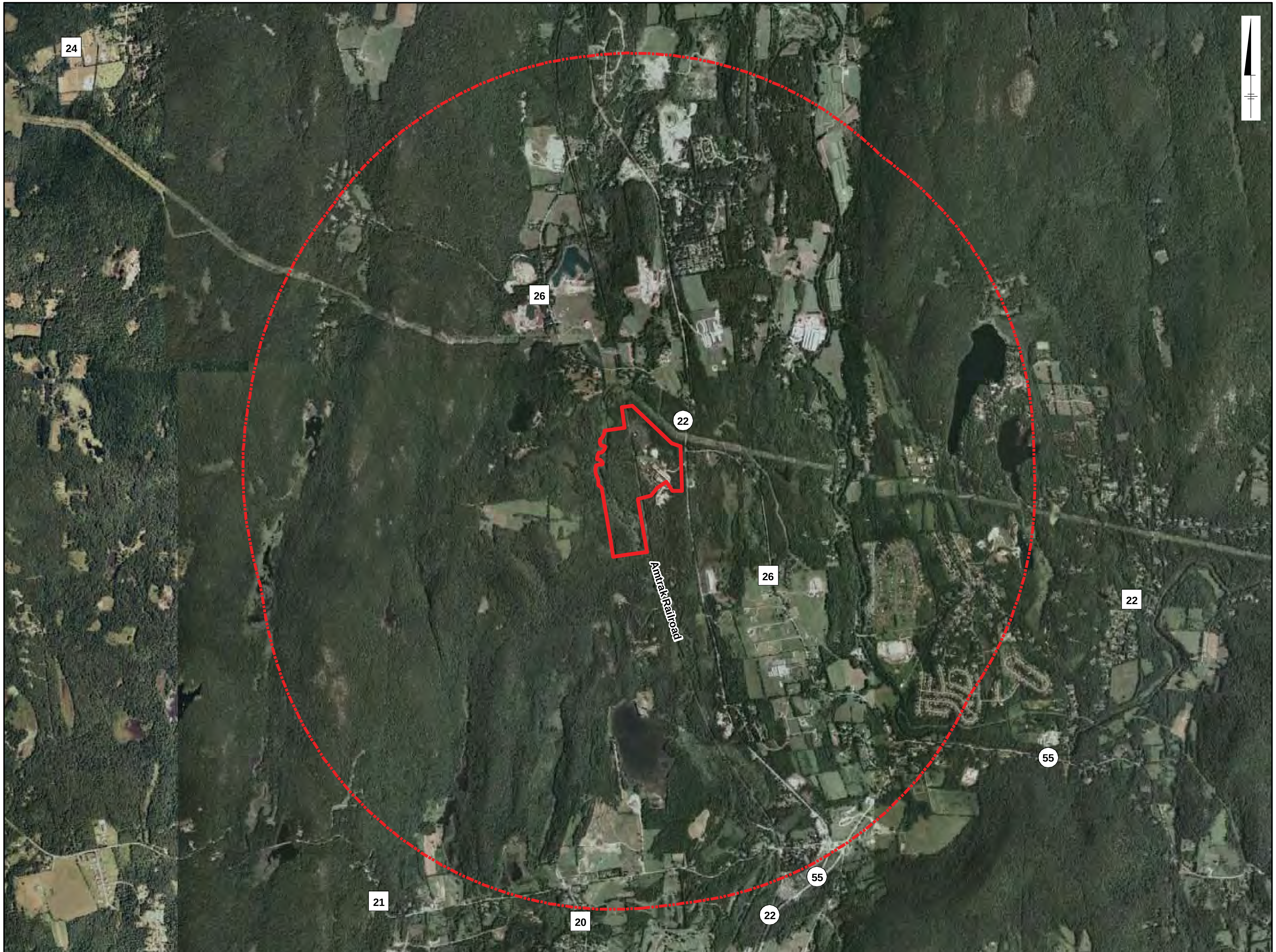
1. ALL ELEVATIONS ARE PRELIMINARY

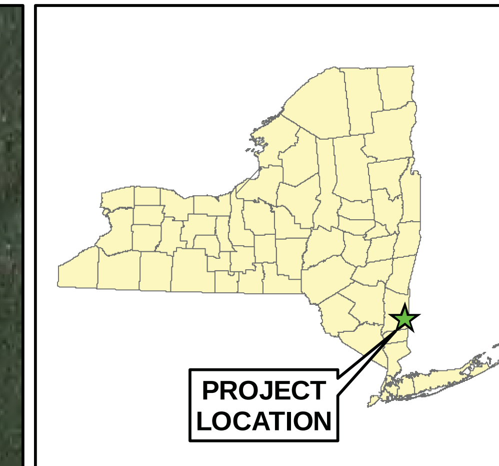
ARCADIS

CRICKET VALLEY ENERGY

***FIGURE 3***
***SITE ELEVATIONS***

Dutchess County, New York




**Legend**

- Site Boundary
- 3-km Radius

0 2,000 4,000 Feet

GRAPHIC SCALE

ARCADIS

**CRICKET VALLEY ENERGY**

***FIGURE 4***
***LAND USE WITHIN 3KM OF THE SITE***

Dutchess County, New York

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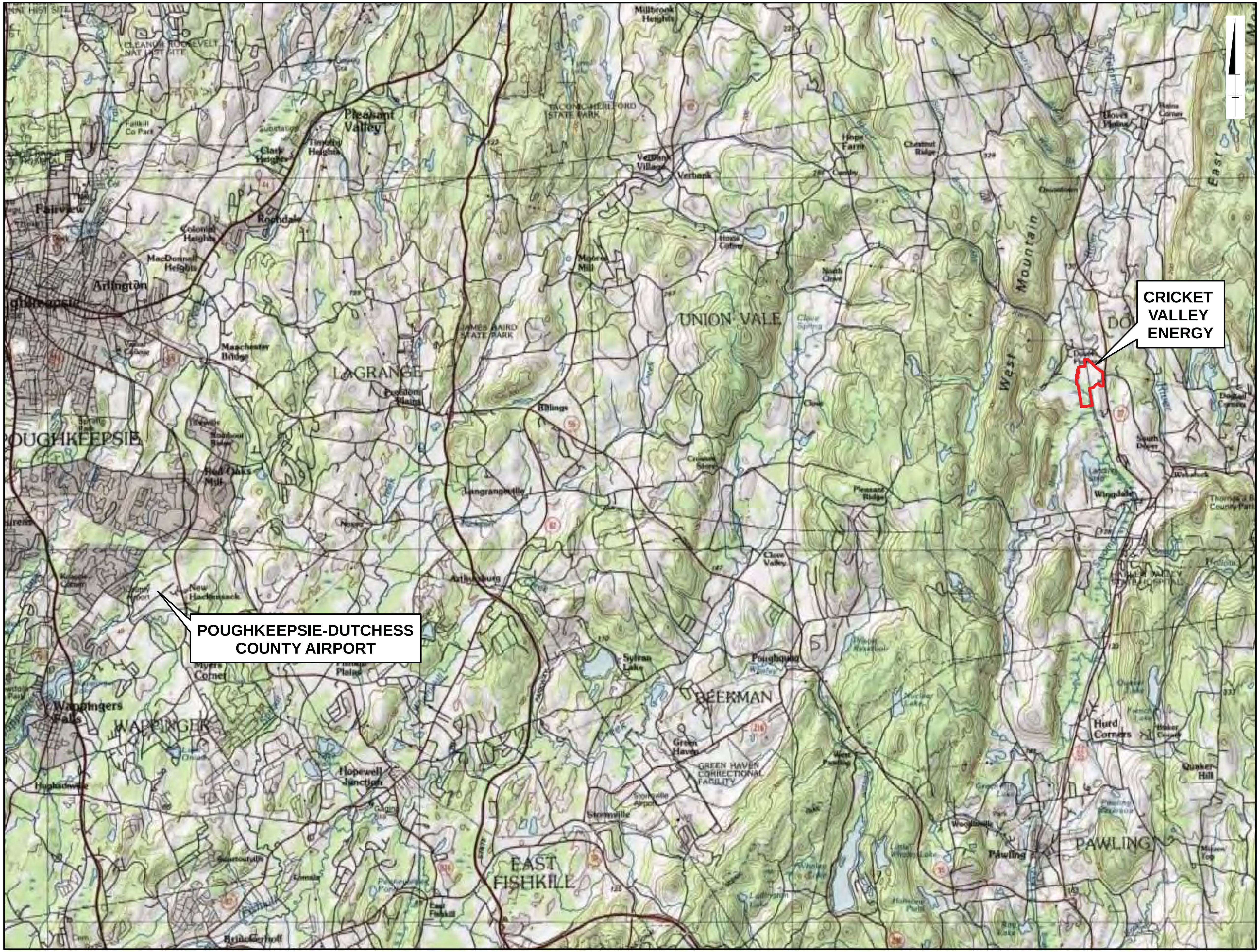


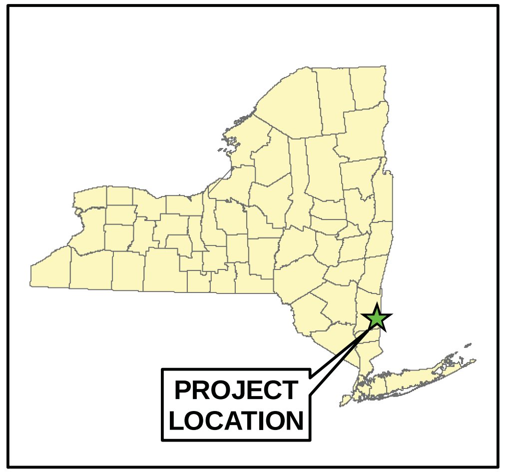


0 1 2 3 Miles

GRAPHIC SCALE

ARCADIS

**CRICKET HILL ENERGY CENTER**

*FIGURE 5*
***LOCATION OF POUGHKEEPSIE-DUTCHESS COUNTY AIRPORT***

Dutchess County, New York

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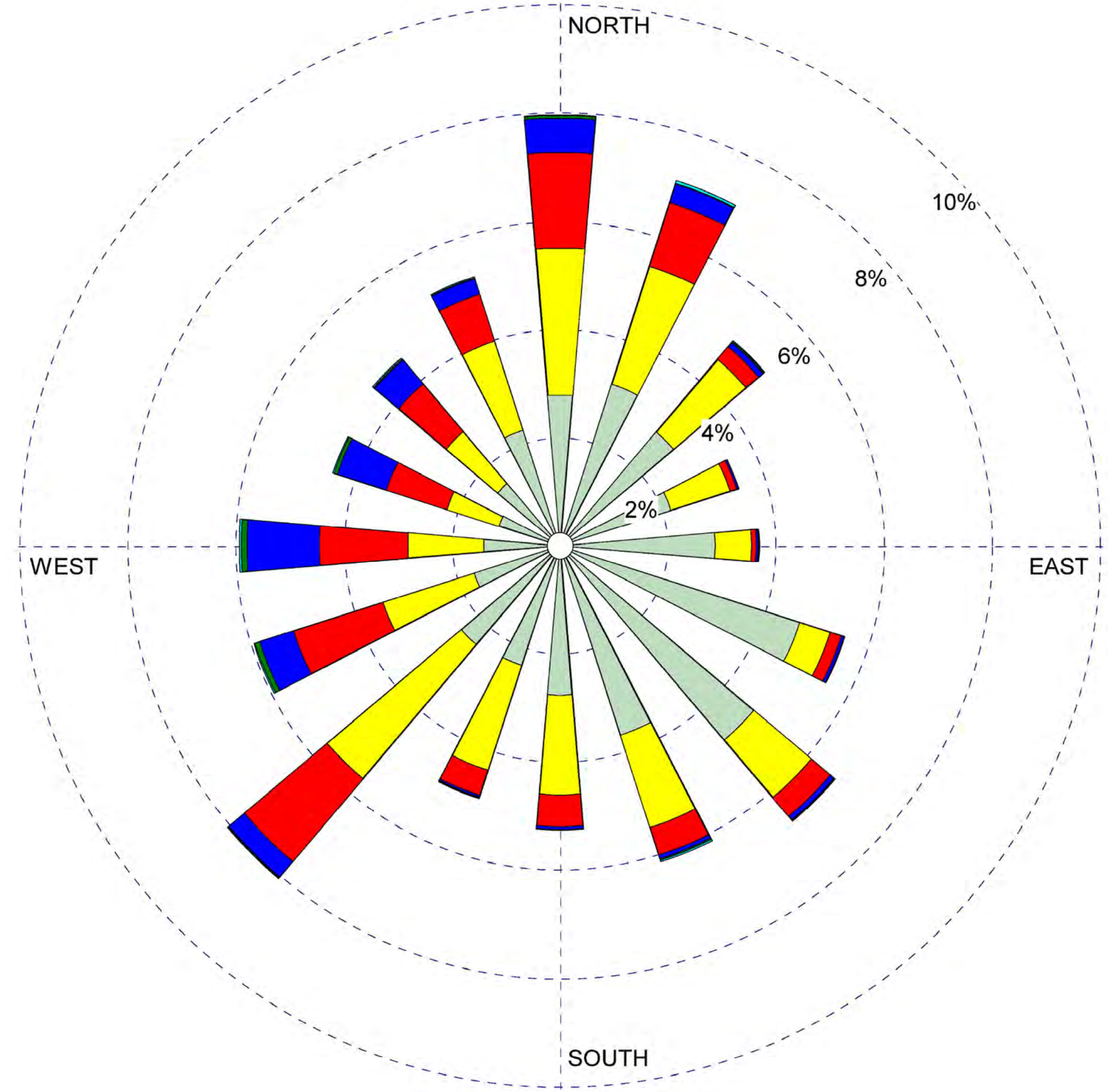


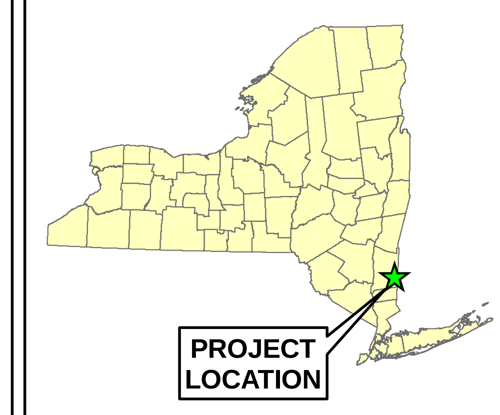


**Station # 14757 - Poughkeepsie**
**Dutchess, NY**

**Wind Speed (Knots)**

- >= 22
- 17 - 21
- 11 - 17
- 7 - 11
- 4 - 7
- 1 - 4

| |
|---|
| DATA PERIOD:<br>2005 2008 2006 2007<br>Jan 1 - Dec 1<br>00:00 - 23:00 |
| CALM WINDS:<br>10.35% |
| AVG. WIND SPEED:<br>4.93 knots |
| TOTAL COUNT:<br>33,924 hrs. |
| DATE:<br>9/18/2009 |

ARCADIS

**CRICKET VALLEY ENERGY**

***FIGURE 6***
***WIND ROSE***

Dutchess County, New York