Iroquois Gas Transmission System
Athens Compressor Station

NYSDEC Air Dispersion Modeling Report

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1. INTRODUCTION

Iroquois Gas Transmission System, LP (Iroquois) is submitting this modeling report to seek authorization from the New York State Department of Conservation (NYSDEC) to upgrade its existing compressor station (Athens Compressor Station, “project”) at 915 Schoharie Turnpike, Town of Athens, Greene County, New York. Iroquois has proposed the following:

- Installation and operation of one (1) approximately 12,000 horsepower (hp) simple cycle natural gas-fired combustion turbine with dry low-NO_X burners.

In addition, the facility’s existing Air State Facility Permit currently includes one (1) approximately 11,000 hp natural gas-fired turbine. The facility also includes several exempt or trivial ancillary sources including one (1) approximately 800 horsepower natural-gas fired four-stroke lean-burn reciprocating emergency generator engine and several small natural gas-fired water and space heaters that have maximum heat input rates of less than the 10 million British thermal units (BTU) per hour air permitting threshold.

The modeling protocol was submitted on January 7, 2020 and approved on January 27, 2020. This modeling report outlines the methodologies used to conduct the air dispersion modeling analysis required by the NYSDEC for this project. Air dispersion modeling is utilized as a tool to demonstrate that the facility complies with the National Ambient Air Quality Standards (NAAQS).

The modeling is consistent with the procedures proposed in the approved protocol and is completed in a manner that conforms to the applicable rules, guidance, and requirements in the following guidance documents:

- U.S. Environmental Protection Agency’s (U.S. EPA’s) Guideline on Air Quality Models, 40 CFR Part 51 - Appendix W (latest rule update, effective May 2017),
- U.S. EPA’s AERMOD Implementation Guide (Updated August 2019),
- U.S. EPA: User’s Guide for the AMS/EPA Regulatory Model – AERMOD (August 2019), and
- NYSDEC Guidelines on Dispersion Modeling Procedures for Air Quality Impact Analysis (DAR-10) (May 2006),

The remainder of this modeling report is organized as follows:

- Section 2: Modeling Procedures;
- Section 3: Modeling Methodology; and
- Section 4: Modeling Results.

Iroquois has included, as Attachment B to this modeling report, a CD containing all the files associated with the NYSDEC air dispersion modeling analysis of the Project. This CD includes those files associated with importing terrain elevations, analyzing building downwash, meteorological data, and AERMOD.

1.1. FACILITY BACKGROUND

The Athens Compressor Station is located in Greene County, New York at approximately 595.1 kilometers east and 4,681.7 kilometers north, Universal Transverse Mercator (UTM) Zone 18. Figure 1-1 provides an area map which shows the location of the facility relative to surrounding terrain and other features, such as roads and rivers. Figure 1-2 provides a 3D rendering of the facility layout.

Figure 1-1. Aerial Image

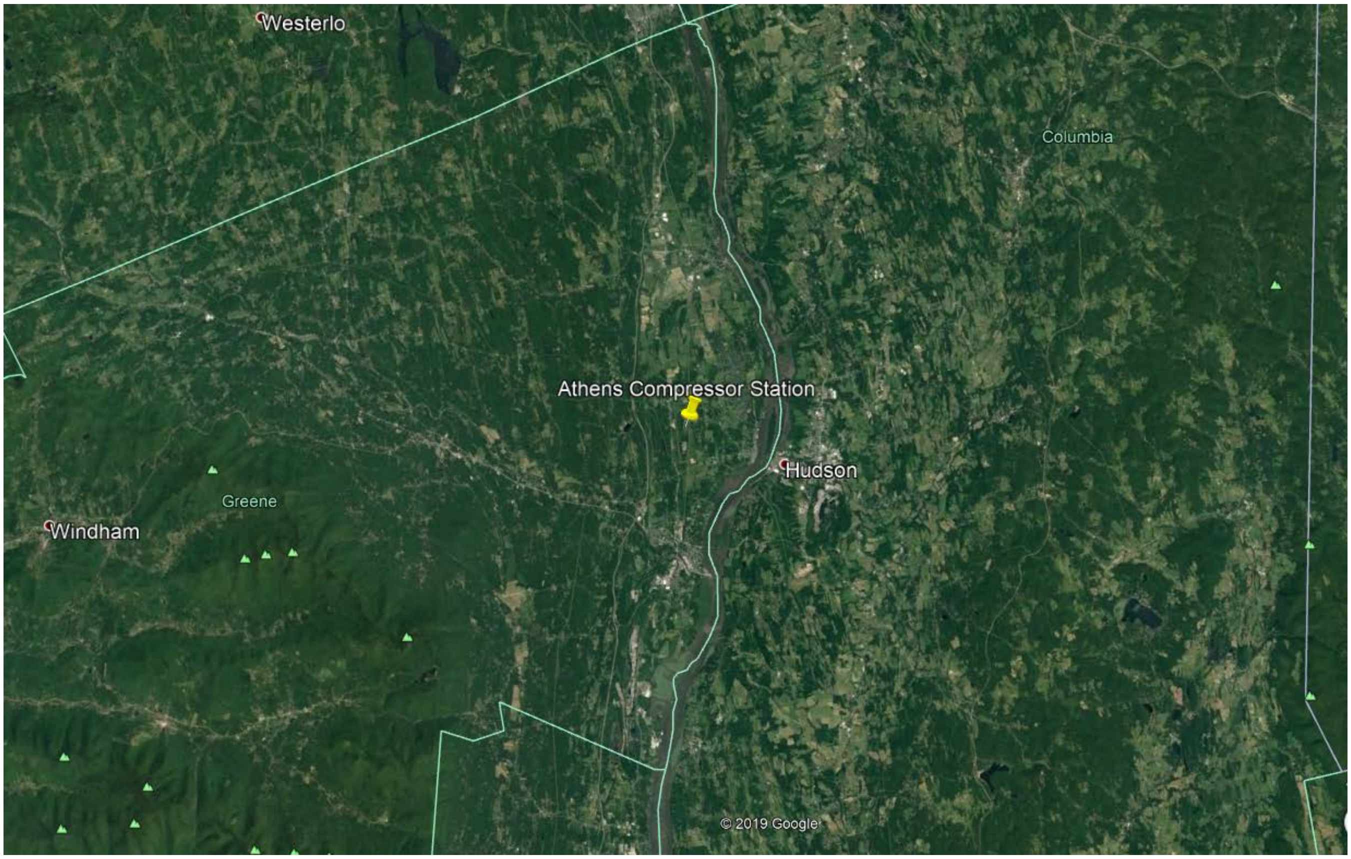
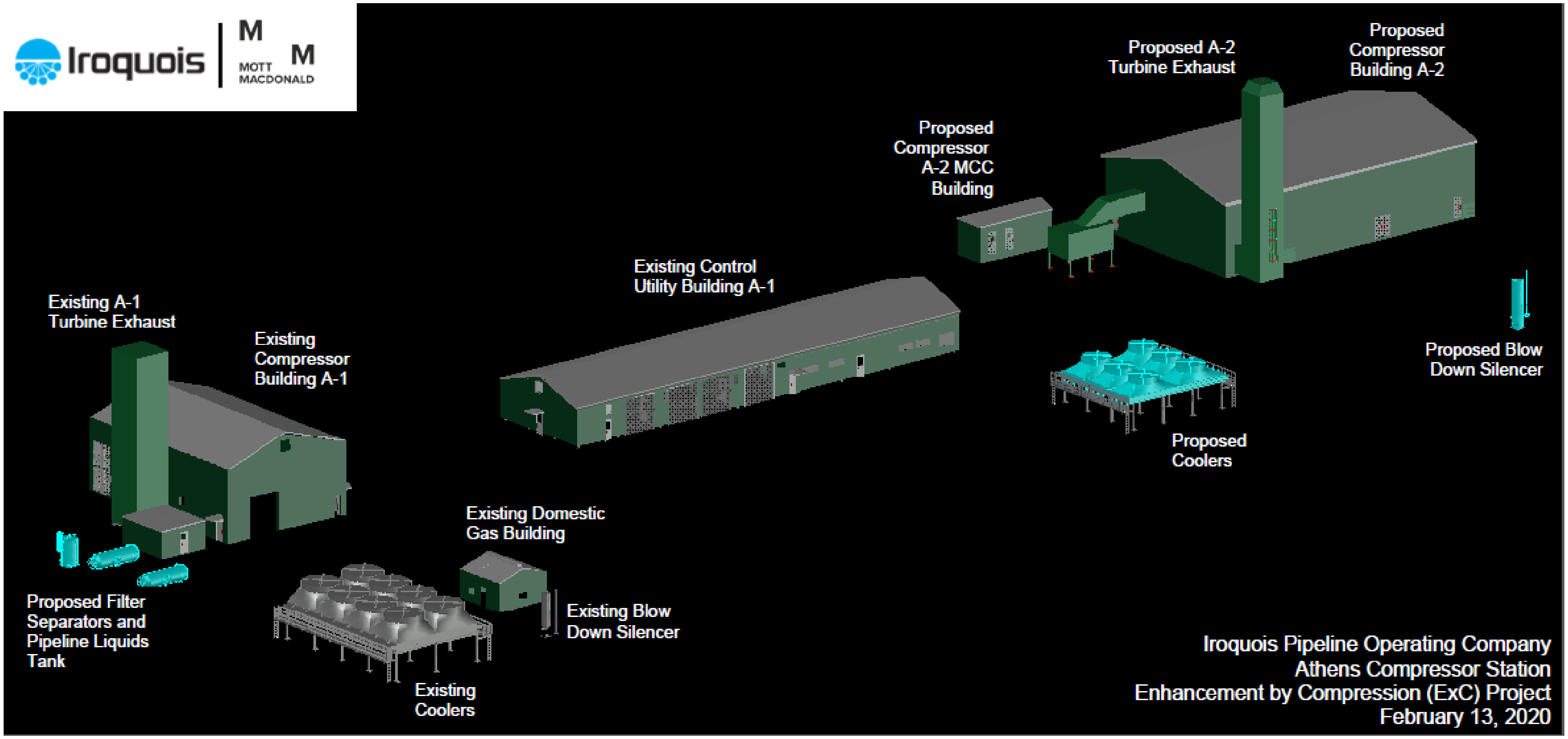


Figure 1-2. 3D Facility Schematic



2.1. NAAQS AND SIL ANALYSIS

Air emissions associated with the operation of the Athens Compressor Station were evaluated relative to the NAAQS to assess the potential air quality impacts.

As is standard modeling procedure, the first step in the modeling to demonstrate compliance with the NAAQS is to determine the maximum ambient air quality impacts of the project for comparison to the Environmental Protection Agency (EPA) Significant Impact Levels (SILs). If modeled concentrations are less than the applicable SIL(s), then compliance with the NAAQS is demonstrated with no further analysis required. However, if a modeled impact exceeds the SIL, then a cumulative modeling analysis, accounting for other emission sources in the project area and regionally (if applicable), is performed to demonstrate compliance with the NAAQS.

Non-modeled sources in the NAAQS cumulative analysis will be represented by representative background monitored concentrations that are summed with modeled concentrations. Additionally, the total concentrations (modeled plus monitored) will then be evaluated through comparison to the NAAQS for the compliance demonstration.

If any modeled concentrations exceed the SIL, the corresponding Significant Impact Areas (SIA) is identified. The SIA will be defined by the maximum distance to where modeled impacts exceed a SIL (e.g., 7.5 $\mu g/m^3$ for 1-hour NO_2). As discussed in Section 4, the maximum modeled concentrations for all pollutants are below the SILs, and therefore demonstrate compliance with NAAQS without further analysis.

For this project, a significance analysis was performed for each pollutant and averaging period with an established Significant Impact Level (SIL) as follows (Table 2-1):

- Nitrogen Dioxide (NO_2): 1-hour and Annual
- Particulate Matter with a diameter less than 2.5 microns ($PM_{2.5}$): 24-hour and Annual
- Particulate Matter with a diameter less than 10 microns (PM_{10}): 24-hour and Annual
- Carbon Monoxide (CO): 1-hour and 8-hour
- Sulfur Dioxide (SO_2): 1-hour, 3-hour, 24-hour, and Annual

The results of the significance analysis are outlined in Section 4.

Table 2-1. SILs

Pollutant	Averaging Period	SIL ($\mu g/m^3$)	Evaluation Form
PM_{10}	24-hour	5	High first high 24-hour average concentration
	Annual	1	3-year average of the annual arithmetic mean
$PM_{2.5}$	24-hour	1.2	Maximum 5-year average of the high 1st high 24-hour average concentrations
	Annual	0.2	3-year average of the annual arithmetic mean
SO_2	1-hour	7.8	Maximum 5-year average of the maximum modeled 1-hour concentrations
	3-hour	25	High first high 3-hour average concentration

	24-hour	5	High first high 3-hour average concentration
	Annual	1	Annual arithmetic mean
NO_2	1-hour	7.5	Maximum 5-year average of the maximum modeled 1-hour concentrations
	Annual	1	Annual arithmetic mean
CO	1-hour	2,000	High first high 1-hour average concentration
	8-hour	500	High first high 8-hour average concentration

Table 2-2. Primary and Secondary NAAQS

Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)	Form of Standard
PM_{10}	24-hour	150	150	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	24-hour	35	35	3-year average of the 98th percentile 24-hour average concentrations
	Annual	12.0	15.0	3-year average of the annual arithmetic mean
SO_2	1-hour	196 (75 ppb)	--	3-year average of the 99th percentile of daily maximum 1-hour concentrations
	3-hour	--	1,300 (500 ppb)	Not to be exceeded more than once per year
NO_2	1-hour	188 (100 ppb)	--	3-year average of the 98th percentile of daily maximum 1-hour concentrations
	Annual	100 (53 ppb)	100 (53 ppb)	Annual arithmetic mean
CO	1-hour	40,000 (35 ppm)	--	Not to be exceeded more than once per year
	8-hour	10,000 (9 ppm)	--	Not to be exceeded more than once per year

2.2. FORMALDEHYDE MODELING

Trivial and exempt sources as per 6 CRR-NY Subpart 201-3.2 and Subpart 201-3.3 are excluded from applicability to 6 CRR-NY Part 212 (Part 212) per Subsection 212-1.4(a). Additionally, combustion installations[1] including Iroquois' combustion turbines, are not included in the definition of "process operations" per the definition in Subsection 212-1.2(18) and are also not subject to Part 212. NYSDEC requested during the pre-application meeting on November 14, 2019, that Iroquois model formaldehyde (HCHO) emissions. As such, for informational purposes only, the existing and proposed combustion turbine emissions have been modeled. The HCHO model input and output files are provided in Attachment B (Model CD). The resulting model concentrations are less than the annual and short-term guideline concentrations tabulated in the Division of Air Resources Guidelines for the Evaluation and Control of Ambient Air Contaminants (DAR-1).

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[1] 6 CRR-NY 200.1(l)

3. MODELING METHODOLOGY

This section of the modeling report describes the procedures and data resources utilized in the air dispersion modeling analyses.

3.1. DISPERSION MODEL SELECTION AND BUILDING DOWNWASH ANALYSIS

Dispersion models predict ambient pollutant concentrations by simulating the evolution of the pollutant plume over time and space given data inputs including the quantity of emissions, stack exhaust parameters (e.g., velocity, flow rate, and temperature) and weather data. Building structures that obstruct wind flow near emission points may cause stack discharges to become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. These effects generally cause higher ground-level pollutant concentrations since building downwash inhibits dispersion from elevated stack discharges. For this reason, building downwash algorithms are considered an integral component of the selected air dispersion model.

The latest version of the AERMOD model, v19191 was used to estimate maximum ground-level concentrations in the air pollutant analyses conducted. AERMOD is a refined, steady-state, multiple source dispersion model that was promulgated in December 2005 as the EPA-preferred model to use for industrial sources in this type of air dispersion modeling analysis.[2] The AERMOD modeling was performed using regulatory default options except as otherwise noted in this report. The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as input were determined by the Building Profile Input Program, PRIME version (BPIP PRIME), version 04274.[3] BPIP PRIME is designed to incorporate the concepts and procedures expressed in the Good Engineering Practice (GEP) Technical Support document, the Building Downwash Guidance document, and other related documents,[4] while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities and wake regions. Table 3-1 summarizes the model control options that were utilized in this analysis.

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[2] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD).

[3] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model*, Concord, MA.

[4] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised)*, Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

Table 3-1. Model Selection Options

Control Option	Option Selected	Justification
Pollutant ID	CO, NO_2, PM_{10}, $PM_{2.5}$, SO_2, Other	Other was selected for HCHO modeling.
Terrain	Elevated, Meters	The receptor grid covers varying terrain elevations; as such, the elevated option was selected.
Flagpole Receptors	N/A	--
Run or Not	Run	--
Averaging Times	1-hour, 3-hour, 8-hour, 24-hour, month, and annual	NAAQS dictates the appropriate averaging periods for each pollutant.
Model	PRIME	The PRIME algorithms are default.
Dispersion	Concentration, Rural, Regulatory Default Option	This modeling analysis is assessing compliance with concentration standards. The Athens Compressor Station is located in a predominantly rural area. The regulatory default option was selected.
NO_2 Model Options	ARM2	The regulatory option, ambient ratio method (ARM2), was utilized in AERMOD.
Particulate Model Options	N/A	Iroquois did not utilize particle deposition or depletion options for particulate modeling.
Output Files	.aml	Model output file from Breeze User Interface (contained in zip files [.amz])

3.2. METEOROLOGICAL DATA

Site-specific dispersion models require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, readily available data from the closest and most representative National Weather Service (NWS) station are commonly used. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data that includes hourly records of the following parameters:

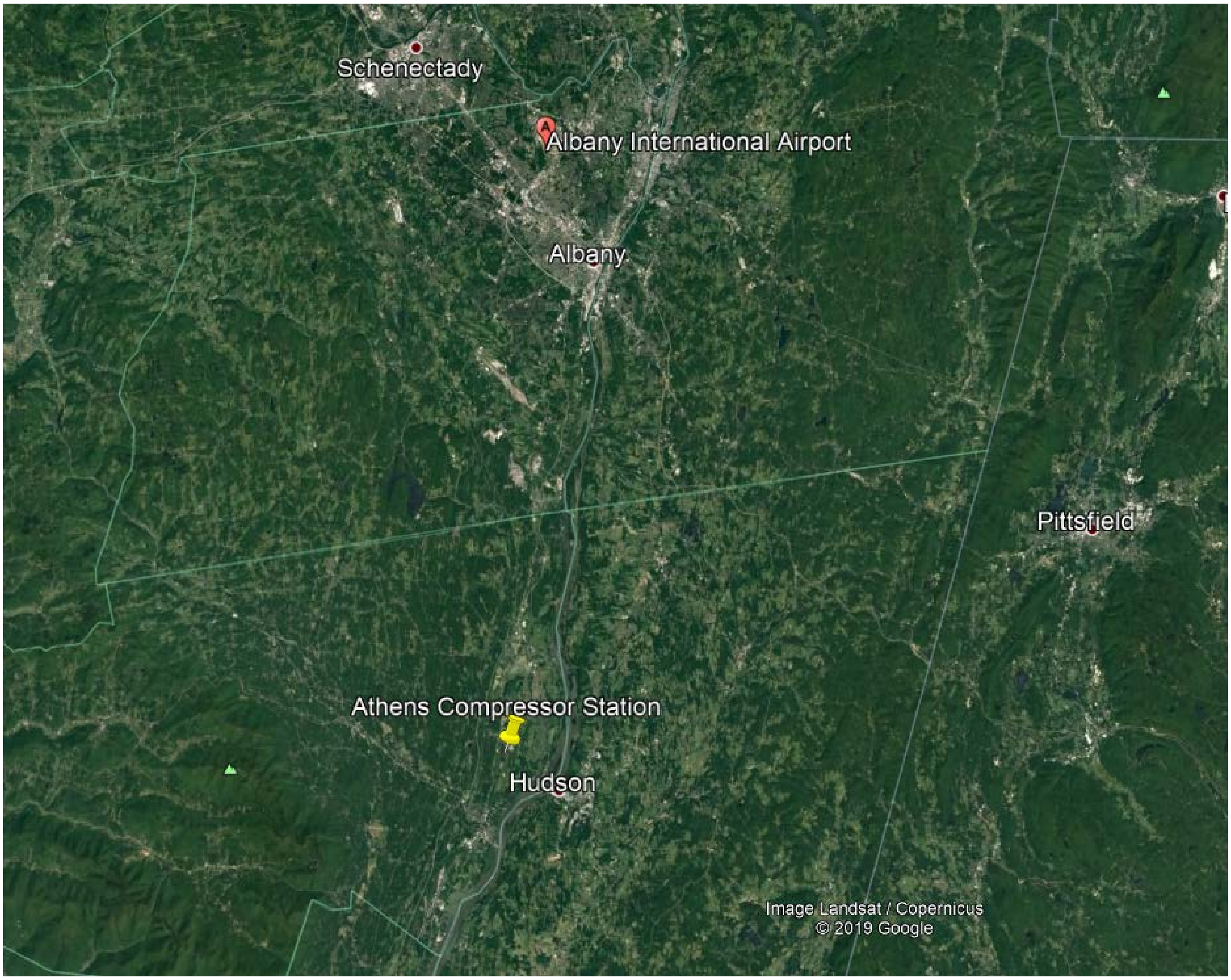
- Wind speed;
- Wind direction;
- Air temperature;
- Micrometeorological parameters (e.g., friction velocity, Monin-Obukhov length);
- Mechanical mixing height; and
- Convective mixing height.

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insulation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network, are almost always found at airports, and are typically operated by the NWS. Upper air stations are fewer in number than surface observing points since the upper atmosphere is less vulnerable to local effects caused by terrain or other land influences and is, therefore, less variable. The NWS operates virtually all available upper air measurement stations in the United States.

3.2.1. Site Location and Surface Characteristics

Iroquois utilized 2014 to 2018 meteorological data from the meteorological tower at the Albany International Airport (KALB), located roughly 50 km north of the Athens Compressor Station. Figure 3-1 shows the relative location of KALB to the Athens Compressor Station.

Figure 3-1. Location of Albany International Airport Meteorological Tower



The meteorological tower at KALB airport is the closest tower to the Athens Compressor Station that has quality data for all necessary parameters. Given its proximity to the station, the KALB airport is ideally situated for use in this analysis.

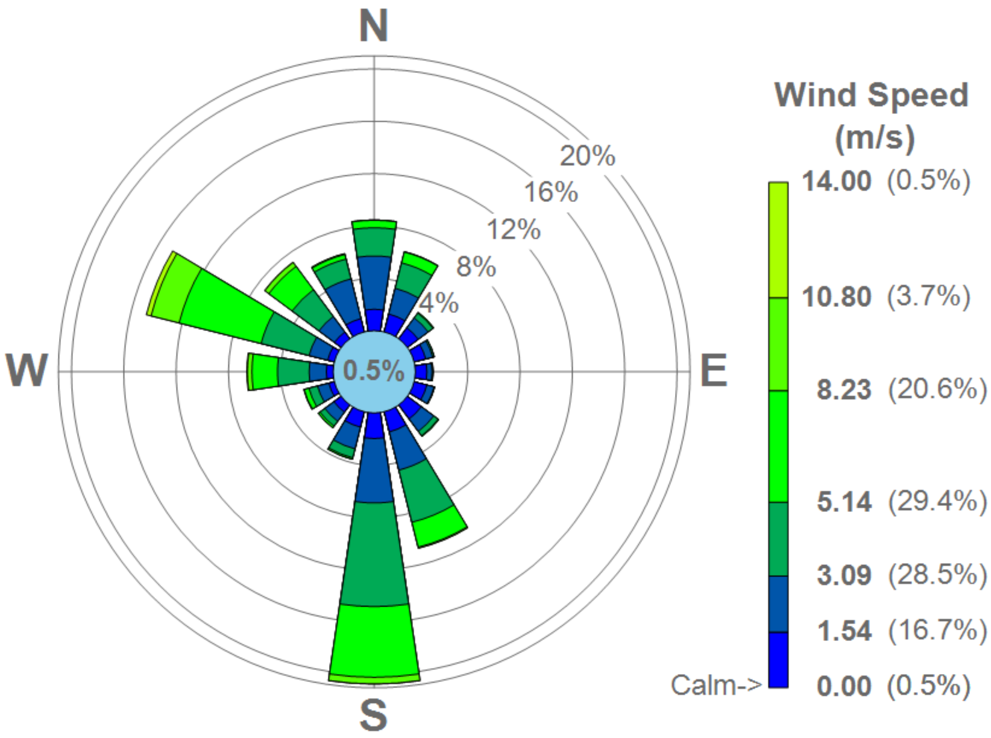
AERMOD ready data available from NYSDEC was used for this modeling analysis. The dataset consists of five years (2014–2018) of pre-processed meteorological data representing the winds, temperature, and atmospheric turbulence around the KALB airport (WBAN No. 14735) Automated Surface Observing System (ASOS) monitoring station located in Colonie, NY. Upper air data is collected from the NWS station in Albany, NY (WBAN No. 54775). The meteorological data sets were generated from National Weather Service (NWS) 1-minute ASOS stations. The raw hourly surface data format is Integrated Surface Hourly Data (ISHD), and the upper air data format is the Forecast Systems Laboratory (FSL) that are used and processed by the latest version of AERMET. NYSDEC has incorporated Adjust U* as a regulatory option in the AERMOD processed ready meteorological data for all the ASOS sites in New York. A base elevation of 82 meters was used for the meteorological tower in the modeling analysis. The meteorological data files are included in the modeling CD.

3.2.2. Topographic Setting

The complexity of the terrain is another consideration in determining data representativeness. The elevation differences between the Athens Compressor Station (Base Elevation approximately 44 meters) and the Albany International Airport (Base Elevation 82 meters) are present, but orientation to the Hudson River Valley is relative to each other. Although there are terrain features between the site and the airport, the topographical setting is very similar between the two sites.

Figure 3-2 provides a wind rose for KALB airport for the data period of 2014 to 2018.

Figure 3-2. Albany International Airport Wind Rose



3.3. TREATMENT OF TERRAIN

Through the use of the AERMOD terrain preprocessor (AERMAP), AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor that could lead to plume recirculation and other terrain interaction.[5]

Receptor terrain elevations input to the model were those interpolated from 1/3 arc-second National Elevation Dataset (NED) data obtained from the U.S. Geological Survey (USGS). Similarly, AERMAP was used to define base elevations for stacks and buildings.

3.4. RECEPTOR GRIDS

For this air dispersion modeling analysis, ground-level concentrations were calculated along the facility boundary and also within a cartesian receptor grid outside the fenceline. The boundary receptors are spaced 25 meters apart starting at an arbitrary point on the boundary. The grid consists of the following receptor spacing:

- 50 meter-spaced receptors from the boundary out to 1 kilometer;
- 100 meter-spaced receptors from 1 to 2.5 kilometers; and,
- 250 meter-spaced receptors from 2.5 to 5 kilometers.

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[5] EPA, *Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, Research Triangle Park, NC, EPA-454/B-03-003, October 2004.

In general, the receptors covered a region extending from all edges of the Athens Compressor Station fenceline to the point where impacts from the Project are no longer expected to be measurable.

Receptor elevations required by AERMOD were determined using the AERMAP terrain preprocessor (version 18081). Figure 3-3 shows the variable density of the receptor grid and Figure 3-4 shows a closer view of the receptors at the facility.

Figure 3-3. Receptor Grid

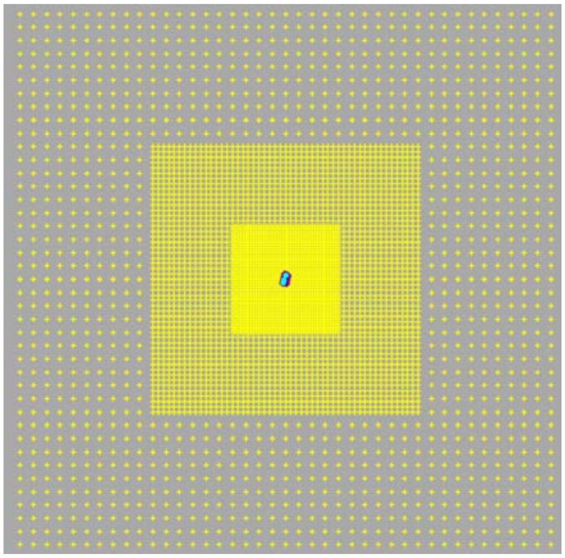
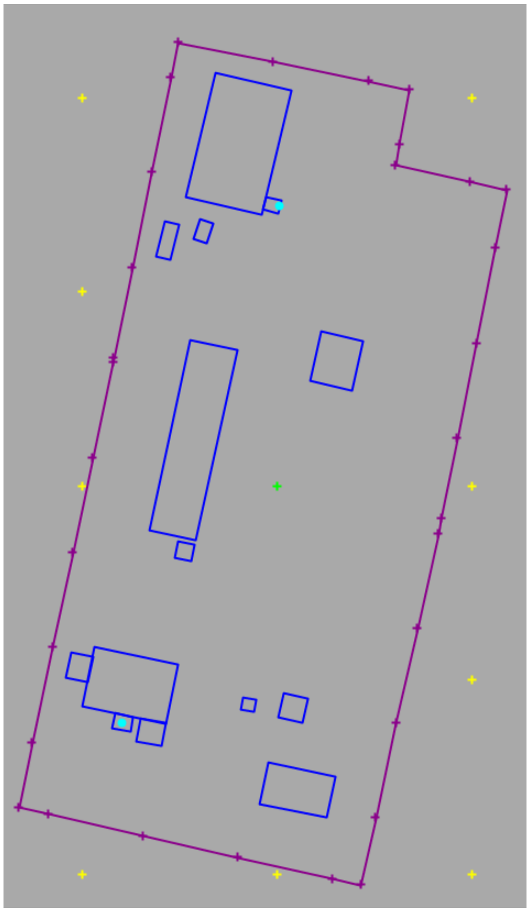


Figure 3-4. Receptor Grid (Zoomed In)



3.5. GEP STACK HEIGHT ANALYSIS

Stack height regulations restrict the use of stack heights in excess of GEP in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

H_{GEP} = H + 1.5L, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or projected width).

The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP PRIME. In general, the lowest GEP stack height for any source is 65 meters by default.[6] A source may construct a stack that exceeds GEP but is limited to the GEP stack height in the air quality analysis demonstration. All modeled source stacks at the Athens Compressor Station are less than 65 meters tall and therefore meet the requirements of GEP and require modeling the effects of downwash.

3.6. REPRESENTATION OF EMISSION SOURCES

3.6.1. Coordinate System

In all modeling analysis data files, the location of emission sources, structures, and receptors are represented in the UTM coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The datum for this modeling analysis is based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all reside within UTM Zone 18.

3.6.2. Source Types

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. In these air dispersions modeling analyses, Iroquois utilized point sources for all modeled emission sources. There were no area or volumes sources used in this modeling analysis.

For point sources with unobstructed vertical releases, it is appropriate to use actual stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) in the modeling analyses. All emission sources at the Athens Compressor Station have unobstructed vertical releases and were therefore modeled as point sources. Stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) used in the modeling analyses were based on design values.

3.6.3. Source Parameters and Emission Rates

In general, a dispersion modeling analysis should contain sufficient detail to determine the maximum ambient concentration of the pollutant under consideration. Based on the types of equipment considered in this analysis, modeling was performed assuming that the turbines operate concurrently at maximum (i.e., 100 percent) load and 50% load for the following six (6) scenarios:

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[6] 40 CFR §51.100(ii).

- **Scenario 1** – Maximum Hourly “High Temperature” Operation at 100% load;
- **Scenario 2** – Maximum Hourly “Normal Temperature” Operation at 100% load;
- **Scenario 3** – Maximum Hourly “Low Temperature” Operation at 100% load;
- **Scenario 4** – Maximum Hourly “High Temperature” Operation at 50% load;
- **Scenario 5** – Maximum Hourly “Normal Temperature” Operation at 50% load; and
- **Scenario 6** – Maximum Hourly “Low Temperature” Operation at 50% load;

In this analysis, the “normal temperature” operating condition represents an ambient air temperature of 47degrees Fahrenheit (°F) which represents the annual average temperature at the Athens Compressor Station, “low temperature” operating conditions include an ambient air temperature of 0 °F and “high temperature” operating conditions include an ambient air temperature of 100 °F.

Startup and shutdown emissions are included in the modeled emission rates used in Scenarios 1-6. The startup and shutdown emissions are assumed to last 10 minutes, based on the turbine manufacturer’s product information. Therefore, the hourly emission rate is calculated to account for 50 minutes of normal operation and 10 minutes of average startup and shutdown operations.

The source parameters and emissions utilized in this analysis are included in Attachment A.

Following the procedures and methods discussed in this report, the tables below summarize the results from the conducted SIL and HCHO modeling analyses. As shown in the tables below, the results of the modeling analyses indicate that the project is insignificant for all pollutants and averaging periods. Dispersion modeling therefore demonstrates compliance with NAAQS without further analysis.

Electronic input and output files for all AERMOD model runs are included with the CD included as Attachment B to this report.

Table 4-1. SIL Analysis Results – 100% Load

Pollutant	Averaging Period	Class II Modeling Significance Level (µg/m³)	Scenario -1 Maximum Modeled Concentration for SIL Analysis (µg/m³)	Scenario -2 Maximum Modeled Concentration for SIL Analysis (µg/m³)	Scenario -3 Maximum Modeled Concentration for SIL Analysis (µg/m³)	Significant Impact Area[1] (km)
NO_2	1-hour	7.5	2.30E+00	2.46E+00	2.57E+00	N/A
	Annual	1	4.88E-02	5.07E-02	5.30E-02	N/A
CO	1-hour	2,000	4.77E+00	4.47E+00	4.53E+00	N/A
	8-hour	500	1.70E+00	1.57E+00	1.60E+00	N/A
PM_{10}	24-hour	5	1.91E-01	1.95E-01	2.02E-01	N/A
	Annual	1	1.79E-02	1.80E-02	1.87E-02	N/A
$PM_{2.5}$	24-hour	1.2	1.45E-01	1.45E-01	1.51E-01	N/A
	Annual	0.2	1.67E-02	1.68E-02	1.75E-02	N/A
SO_2	1-hour	7.8	7.40E-03	6.98E-03	7.12E-03	N/A
	3-hour	25	4.30E-03	4.10E-03	4.18E-03	N/A
	24-hour	5	1.68E-03	1.56E-03	1.59E-03	N/A
	Annual	1	1.60E-04	1.40E-04	1.50E-04	N/A

[1] Maximum SIA calculated from all six scenarios modeled.

Table 4-2. SIL Analysis Results – 50% Load

Pollutant	**Averaging Period**	**Class II Modeling Significance Level ($\mu g/m^3$)**	**<u>Scenario -4</u> Maximum Modeled Concentration for SIL Analysis ($\mu g/m^3$)**	**<u>Scenario -5</u> Maximum Modeled Concentration for SIL Analysis ($\mu g/m^3$)**	**<u>Scenario -6</u> Maximum Modeled Concentration for SIL Analysis ($\mu g/m^3$)**	**Significant Impact Area[1] (km)**
NO_2	1-hour	7.5	4.93E+00	2.26E+00	2.31E+00	N/A
	Annual	1	4.82E-02	4.98E-02	4.98E-02	N/A
CO	1-hour	2,000	2.90E+01	5.17E+00	5.01E+00	N/A
	8-hour	500	1.01E+01	1.89E+00	1.80E+00	N/A
PM_{10}	24-hour	5	5.36E-01	1.92E-01	1.92E-01	N/A
	Annual	1	1.81E-02	1.83E-02	1.81E-02	N/A
$PM_{2.5}$	24-hour	1.2	1.49E-01	1.48E-01	1.47E-01	N/A
	Annual	0.2	1.70E-02	1.71E-02	1.69E-02	N/A
SO_2	1-hour	7.8	1.92E-02	7.89E-03	7.69E-03	N/A
	3-hour	25	3.03E-02	4.59E-03	4.46E-03	N/A
	24-hour	5	5.55E-03	1.83E-03	1.76E-03	N/A
	Annual	1	1.90E-04	1.70E-04	1.70E-04	N/A

[1] Maximum SIA calculated from all six scenarios modeled.

Attachment A. Athens Compressor Station - Modeled Source Inventory
NAAQS Modeling Analysis

AERMOD ID	Description	X Coordinate	Y Coordinate	Elevation[1]	Stack Height	Stack Diameter
		(m)	(m)	(m)	(m)	(m)
(Refer to Table below)	Existing Turbine A1	595018.4	4681533.50	43.87	19.02	3.26
(Refer to Table below)	Proposed Turbine A2	595059.1	4681666.4	44.18	21.11	1.83

1. Modeled elevations were defined using AERMAP using National Elevation Dataset (NED) data obtained from the U.S. Geological Survey

AERMOD ID	Description	Stack Temperature	Flow Rate	NOx Emission Rate	CO Emission Rate	$PM_{10}/PM_{2.5}$ Emission Rate	SO_2 Emission Rate	HCHO Emission Rate
		(K)	(m/s)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
A1_H	Existing Turbine A1 - 100F 100% load	796.48	14.28	--	--	--	--	0.046
A1_N	Existing Turbine A1 - 49F 100% load	760.37	16.18	--	--	--	--	0.056
A1_L	Existing Turbine A1 - 0F 100% load	742.04	17.85	--	--	--	--	0.064
A2_H	Proposed Turbine A2 - 100F 100% load	810.37	34.71	2.99	5.14	0.99	8.65E-03	0.048
A2_N	Proposed Turbine A2 - 49F 100% load	770.93	39.22	3.46	5.17	1.10	8.82E-03	0.058
A2_L	Proposed Turbine A2 - 0F 100% load	729.82	39.74	3.56	5.17	1.13	8.86E-03	0.060
A1_H5	Existing Turbine A1 - 100F 50% load	812.59	11.82	--	--	--	--	0.033
A1_N5	Existing Turbine A1 - 49F 50% load	777.04	13.39	--	--	--	--	0.040
A1_L5	Existing Turbine A1 - 0F 50% load	750.93	14.75	--	--	--	--	0.045
A2_H5	Proposed Turbine A2 - 100F 50% load	819.82	28.28	2.39	5.09	0.81	8.37E-03	0.033
A2_N5	Proposed Turbine A2 - 49F 50% load	780.93	31.59	2.71	5.12	0.89	8.50E-03	0.041
A2_L5	Proposed Turbine A2 - 0F 50% load	747.04	33.95	2.86	5.13	0.93	8.56E-03	0.044