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January 21, 2015

John Giardiello Director Town of Orangetown Office of Building, Zoning, Planning, Administration & Enforcement 20 Greenbush Road Orangeburg, New York 10962

# *RE:* Air Quality Review of Anellotech Zoning Board of Appeals Application for Proposed Addition to Building 123

Dear Mr. Giardiello:

Trinity Consultants (Trinity) has reviewed the air quality impacts associated with Anellotech Inc. (Anellotech)'s proposed addition to Building 123. According to the Zoning Board of Appeals application submitted by Anellotech, the addition will house a Research and Development facility to develop processes for the production of organic chemicals from sustainable and renewable biomass. The air quality review is outlined in the following sections.

### BACKGROUND

Anellotech submitted an application to the Zoning Board of Appeals for the Town of Orangetown on September 30, 2014 for the construction of a new building to house a skid-mounted pilot reactor to be built on the premises of their existing facility located at 401 N. Middletown Road in Pearl River, New York. The reactor will be used to study the conversion of biomass to green chemicals for use in renewable plastics. Anellotech submitted documentation regarding the project to NYSDEC, and NYSDEC issued a response to air quality and materials management related to the project on January 15, 2015.<sup>1,2</sup>

The Town of Orangetown Planning Board issued a Negative Declaration regarding the zoning application indicating that the project has no negative impacts to the environment on September 10, 2014. Condon & Associates, PLLC, representing STOP ANELLOTECH and the members of the Orangetown and Clarkstown communities requested that the Negative Declaration be rescinded in a letter on December 22, 2014. The letter requests that environmental studies be completed by independent environmental engineers. The letter also states that the local communities would be adversely impacted by the chemicals emitted from the proposed Anellotech smokestack.

The Town of Orangetown has requested that Trinity conduct an air quality review of the available information for the proposed project by January 21, 2015, when the Zoning Board of Appeals will next meet on the issue.

<sup>&</sup>lt;sup>1</sup> Letter from Joseph R. Murray, Environmental Analyst, Division of Environmental Permits, NYSDEC, to John Giardiello, Director, Town of Orangetown ZBA on January 15, 2015.

<sup>&</sup>lt;sup>2</sup> Materials management and solid waste permitting were not included in the scope of Trinity's review.

Mr. John Giardiello - Page 2 January 21, 2015

# AIR QUALITY REVIEW

The Town of Orangetown provided information submitted by Anellotech in support of the Zoning Board of Appeals application.<sup>3</sup> Trinity also received additional information directly from Anellotech including the information and documentation that was submitted to the New York State Department of Environmental Conservation (NYSDEC).<sup>4</sup>

Trinity reviewed the information provided by both Town of Orangetown and Anellotech regarding the potential impacts to air quality related to the operation of the proposed pilot-scale reactor. Our review is summarized in the following sections.

# Compliance with Applicable State and Federal Air Quality Requirements

Research and development activities are exempt from air permitting under the NYSDEC in accordance Title 6 of the New York Codes, Rules, and Regulations (NYCRR), subpart 201-3.2(c)(44). Research and development activities under the State Air regulations are defined under 6 NYCRR 201-2.1(b)(27) as:

The primary purpose of such activities is to conduct research and development into processes and products, where such activities are conducted under the close supervision of technically trained personnel. Research and development activities do not include activities whose primary purposes is to produce commercial quantities of materials.

Based on conversations with Anellotech, the operation of the pilot-scale reactor will meet the definition of a research and development activity and is therefore exempt from permitting. This determination was confirmed by NYSDEC in the letter dated January 15, 2015.<sup>5</sup> As noted in the letter from NYSDEC, Anellotech is required to maintain all records necessary for demonstrating the exemption for a period of five years.

The project was also reviewed under 6 NYCRR 212, which provides requirements for General Process Emission Sources. This regulation requires that toxic ambient contaminants are reviewed for new or modified emission sources under Policy DAR-1, which requires an Ambient Air Quality Impact Screening Analysis. Anellotech conducted an air impact analysis. Trinity reviewed the analysis (see separate section) and determined that the impact from the project meet the requirements of 6 NYCRR 212.

No other state or federal air quality requirements apply to the proposed project.

# **Air Emissions Controls**

Air pollutants from the proposed pilot-scale reactor will be controlled using a catalytic oxidizer. Catalytic oxidizers control volatile organic compounds (VOC) and volatile hazardous air pollutants (HAP) emissions, which include benzene, toluene and xylene. Catalytic oxidizers use a catalyst to promote the oxidation of VOCs and volatile HAP to carbon dioxide ( $CO_2$ ) and water ( $H_2O$ ). The catalyst has the effect of increasing the oxidation reaction rate, enabling conversion at lower reaction temperatures. The simplified chemical equation for oxidation is as follows:

Hydrocarbons (including VOC and volatile HAPs) +  $O_2 \rightarrow CO_2 + H_2O$ 

<sup>&</sup>lt;sup>3</sup> December 30, 2014 emails from Debbie Arbolino, Orangetown, to Liz Gorman, Trinity Consultants, including the Zone Board of Appeals application, chemical usage information and Material Safety Data Sheets, floor plans, catalytic oxidizer spec sheets, and the Condon & Associates, PLLC letter.

<sup>&</sup>lt;sup>4</sup> January 12-13, 2014 emails from Chuck Sorenson, Anellotech, to Liz Gorman, Trinity Consultants, including AERSCREEN modeling files and emission calculation spreadsheet.

<sup>&</sup>lt;sup>5</sup> Letter from Joseph R. Murray, Environmental Analyst, Division of Environmental Permits, NYSDEC, to John Giardiello, Director, Town of Orangetown ZBA on January 15, 2015.

Mr. John Giardiello - Page 3 January 21, 2015

The catalytic oxidizer proposed to be installed on the pilot-scale reactor will reduce emissions by oxidizing or combusting the VOCs and volatile HAPs in the exhaust stream before the stream enters the atmosphere. The catalytic oxidizer to be used to control emissions from the pilot-scale reactor is Falmouth Products' FALCO 300.<sup>6</sup> The spec sheet indicates that the destruction efficiency is up to 99.5%. This means that up to 99.5% of the VOCs and volatile HAPs generated by the proposed pilot-scale reactor will be destroyed by the catalytic oxidizer.

EPA's fact sheet for Catalytic Incinerators indicates that control efficiencies of 98-99% are achievable for catalytic incinerators, depending on site-specific design.<sup>7</sup> Based on this information, the destruction efficiency proposed by Falmouth meets or exceeds expectations for catalytic oxidizers.

Anellotech is not subject to any regulatory requirements to control emissions with a control device.<sup>8</sup> Instead, the catalytic oxidizer is being installed voluntarily to limit emissions from the proposed pilot-scale reactor.

Anellotech proposes to monitor the catalytic oxidizer's performance by continuously monitoring the change in temperature across the unit as well as the signal from the oxidizer's air blower. The two measurements will tell if the oxidizer is mechanically working and that the hydrocarbon oxidation reaction is occurring. The facility will commence shutdown procedures if these measurements show that the oxidizer is not working properly.

### **Emission Calculations Prepared by Anellotech**

Biomass enters the reactor and is converted into products that may be used to produce renewable plastics. The emissions from all sources are routed to the catalytic oxidizer.

Detailed emission calculation information is considered confidential by Anellotech; however, Trinity can provide the following analysis:

- Emissions are calculated using chemical process simulation software and based on intimate knowledge of the streams entering the reactor and the reactions occurring with the reactor. Energy and mass balances are utilized in determining emissions resulting from the reaction.
- Emissions are calculated based maximum design throughput of the reactor. This ensures that calculated emissions represent worst-case potential emissions from the reactor. It is expected that the throughput will be lower during actual operation of the reactor.
- Annual potential emissions are calculated assuming continuous operation (i.e., assuming the unit will operate 24 hours per day and 365 days per year). This also ensures that calculated emissions are worst-case potential emissions from the reactor. It is expected that actual operation of the reactor will be less than continuous.
- Emissions are calculated based on 98% control of volatile organic compounds, including benzene, toluene, and xylene. The spec sheet provided by the catalytic oxidation manufacturer indicates that the control efficiency is up to 99.5%.<sup>9</sup> This also ensures that calculated emissions are worst-case potential emissions from the reactor.

<sup>&</sup>lt;sup>6</sup> "FALCO 300 with VFD controlled 10hp dilution blower," Rev 10-08-14, Falmouth Products (www.falmouthproducts.com).

<sup>&</sup>lt;sup>7</sup> U.S. EPA Air Pollution Control Technology Fact Sheet, "Catalytic Incinerator." EPA-452/F-03-018 (http://www.epa.gov/ttn/catc/dir1/fcataly.pdf).

<sup>&</sup>lt;sup>8</sup> Letter from Joseph R. Murray, Environmental Analyst, Division of Environmental Permits, NYSDEC, to John Giardiello, Director, Town of Orangetown ZBA on January 15, 2015.

<sup>&</sup>lt;sup>9</sup> "FALCO 300 with VFD controlled 10hp dilution blower," Rev 10-08-14, Falmouth Products (www.falmouthproducts.com).

Mr. John Giardiello - Page 4 January 21, 2015

Potential to emit on a mass basis calculated by Anellotech are much lower than any regulatory thresholds. Based on Trinity's review of the calculation methodology, the potential to emit values calculated provide a conservative assessment of maximum emissions and meets NYSDEC's definition of potential to emit:<sup>10</sup>

The maximum capacity of an air contamination source to emit any regulated air pollutant under its physical and operational design.

Potential emissions are calculated in accordance with the methodologies that Trinity would use to calculate potential emissions. The emissions calculated are conservative, and actual emissions are expected to be significantly lower.

# **Air Testing Requirements**

Anellotech is not subject to any regulatory requirements to conduct air testing. As confirmed in the January 15, 2015 letter from the NYSDEC, the proposed pilot-scale reactor is exempt from air permitting.<sup>11</sup>

### **AERSCREEN Dispersion Modeling Conducted by Anellotech**

The NYSDEC has promulgated state-specific health-effect based annual guideline concentrations (AGCs) and short-term (1-hour) guideline concentrations (SGCs) for toxic air contaminants. These AGCs and SGCs provide maximum air quality concentrations (in micrograms per cubic meter or ug/m<sup>3</sup>) that are not to be exceeded at any location in the state. SGCs are chosen to protect the general population from adverse acute one-hour exposures. The SGCs for benzene, toluene, and xylene were developed by the NYSDEC. Some of these limits are derived independently by the NYSDEC and others are based upon exposure data published by other agencies such as the California Environmental Protection Agency (CalEPA). AGCs are chosen to protect against adverse chronic exposure and are based upon the most conservative carcinogenic or non-carcinogenic annual exposure limit. The AGCs for benzene, toluene, and xylene were derived by the U.S. EPA.<sup>12</sup> Relevant AGCs and SGCs are provided in the table below.

Pollutant	Short-Term Guideline Concentration (SGC) <sup>a</sup> (ug/m <sup>3</sup> )	Annual Guideline Concentration (AGC) <sup>a</sup> (ug/m <sup>3</sup> )
Benzene	1,300	0.13
Toluene	37,000	5,000
Xylene	22,000	100

#### Table 1 AGCs and SGCs for Benzene, Toluene, and Xylene

<sup>a</sup> NYSDEC AGC/SGC Reference Assignments, http://www.dec.ny.gov/docs/air\_pdf/agcsgc14.pdf.

An Ambient Air Quality Impact Screening Analysis must be conducted for new and modified emission sources in accordance with 6 NYCRR 212 and Policy DAR-1 to determine that no ambient impacts exceed the AGCs and SGCs. Anellotech conducted an air quality screening analysis to compare the maximum impacts of benzene to the AGC and SGC.

Anellotech's screening analysis used U.S. EPA's AERSCREEN model. AERSCREEN is a screening dispersion model approved by the EPA for evaluating preliminary ambient air impacts and for determining a conservative, maximum impact of an emission source. AERSCREEN results are generally expected to be more conservative than results from more robust dispersion models such as EPA's AERMOD which allow for more refined

<sup>10 6</sup> NYCRR 200.1(bl)

<sup>&</sup>lt;sup>11</sup> Letter from Joseph R. Murray, Environmental Analyst, Division of Environmental Permits, NYSDEC, to John Giardiello, Director, Town of Orangetown ZBA on January 15, 2015.

<sup>&</sup>lt;sup>12</sup> NYSDEC AGC/SGC Reference Assignments, http://www.dec.ny.gov/docs/air\_pdf/agcsgc14.pdf.

Mr. John Giardiello - Page 5 January 21, 2015

modeling.<sup>13</sup> Since AERSCEEN is a simplified model intended to be used for screening purposes, the model uses some conservative or "worst-case" assumptions to simplify the inputs required and the model runtime required where refined models require actual, detailed inputs.

Trinity reviewed the modeling analysis conducted by Anellotech and determined that the analysis was conducted correctly to predict maximum ambient impacts from the proposed project, based on the available information on stack parameters and emission rates. Trinity confirmed that the modeling analysis used EPA's conservative screening model, AERSCREEN, and used the conservative, maximum potential to emit values described in a previous section. As such, the results of the modeling analysis represent a worst-case assessment, and the actual impacts are expected to be significantly lower.

The impacts predicted by AERSCREEN demonstrate that the maximum ambient benzene impact from the proposed project will not exceed the AGC or SGC established by the NYSDEC. The maximum benzene impact is approximately 5% of the AGC and is well below 1% of the SGC. Since toluene and xylene are present in considerably lower concentrations in the exhaust stream from the proposed reactor, the maximum impacts of these pollutants would be even lower than the maximum impacts modeled for benzene. As such, the maximum ambient toluene and xylene impacts are also less than the AGC and SGCs established by the NYSDEC.

NYSDEC confirms that ambient impacts from the proposed project are in compliance with requirements in a letter dated January 15, 2015.<sup>14</sup>

### **SUMMARY**

In summary, the proposed pilot-scale reactor complies with all state and federal air quality requirements. The project is not subject to air permitting under the NYSDEC. The project is not subject to any requirements to install a control devices or conduct testing; however, Anellotech is voluntarily proposing to control emissions from the reactor using a catalytic oxidizer, which will control emissions by up to 99.5%. Emissions from the proposed project are less than all regulatory thresholds, and the ambient air quality impact screening analysis conducted by Anellotech and reviewed by NYSDEC and Trinity demonstrates that the ambient impacts of the emissions from the project are well below health-based acute or chronic exposure limits published by the NYSDEC.

<sup>&</sup>lt;sup>13</sup> AERSCREEN User's Guide. Section 1. U.S. EPA, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Air Quality Modeling Group. EPA-454/B-11-001.

http://www.epa.gov/scram001/models/screen/aerscreen\_userguide.pdf

<sup>&</sup>lt;sup>14</sup> Letter from Joseph R. Murray, Environmental Analyst, Division of Environmental Permits, NYSDEC, to John Giardiello, Director, Town of Orangetown ZBA on January 15, 2015.

Mr. John Giardiello - Page 6 January 21, 2015

Trinity appreciates this opportunity to assist the Town of Orangetown with this project. If you have any questions or comments about the information presented in this review, please contact me at (610) 280-3902 x302.

Sincerely,

TRINITY CONSULTANTS

Clizabak Gorman

Elizabeth Gorman Senior Consultant

cc: Ms. Wendy Merz – Trinity Mr. Mike Trupin – Trinity Ms. Debbie Arbolino – Town of Orangetown