1000 Vermont Avenue, NW
Suite 1100
Washington, DC 20005
Main: 202-296-8800
Fax: 202-296-8822
www.environmentalintegrity.org

May 9, 2017

Via E-mail
George (Tad) Aburn
Director
Air & Radiation Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230
george.aburn@maryland.gov

RE: Public Stakeholder Process for Setting Reasonably Available Control Technology Limits for Nitrogen Oxides Emissions from Large Municipal Waste Combustors

Dear Mr. Aburn:

The Environmental Integrity Project ("EIP") submits the following comments as part of the public stakeholder process on the Maryland Department of the Environment's ("MDE's") development of new Reasonably Available Control Technology ("RACT") limits for the pollutant nitrogen oxides ("NO_x") from Maryland's two large municipal waste combustors ("incinerators"). Time constraints prevented us from sending these comments to the environmental, health, and community groups that signed onto EIP's October 26, 2017 letter regarding this rulemaking. However, we expect that these groups will adopt this set of comments, or similar comments, in the future. We know that our partner groups remain very concerned about the emissions from the Baltimore Resource Energy Systems Company ("BRESCO") incinerator operated by Wheelabrator Baltimore, L.P. and committed to participating in this rulemaking process.

The NO_x emissions from the BRESCO incinerator are extremely high for the amount of energy and steam that is produced by this plant. EIP is concerned about the health impacts of these emissions, discussed in more detail below, on residents living in the area immediately surrounding the incinerator and elsewhere in the Baltimore area. It is critical that MDE require significant NO_x reductions at this facility. At MDE's January 17, 2017 stakeholder meeting, Wheelabrator proposed to reduce its short-term (24-hour) emissions limit to 170 ppm,[1] which would reduce its NO_x pollution by a paltry 60 tons per year.[2] In 2016, this plant emitted 1,146 tons of NOx, and a reduction of 60 tons from this level is woefully inadequate.

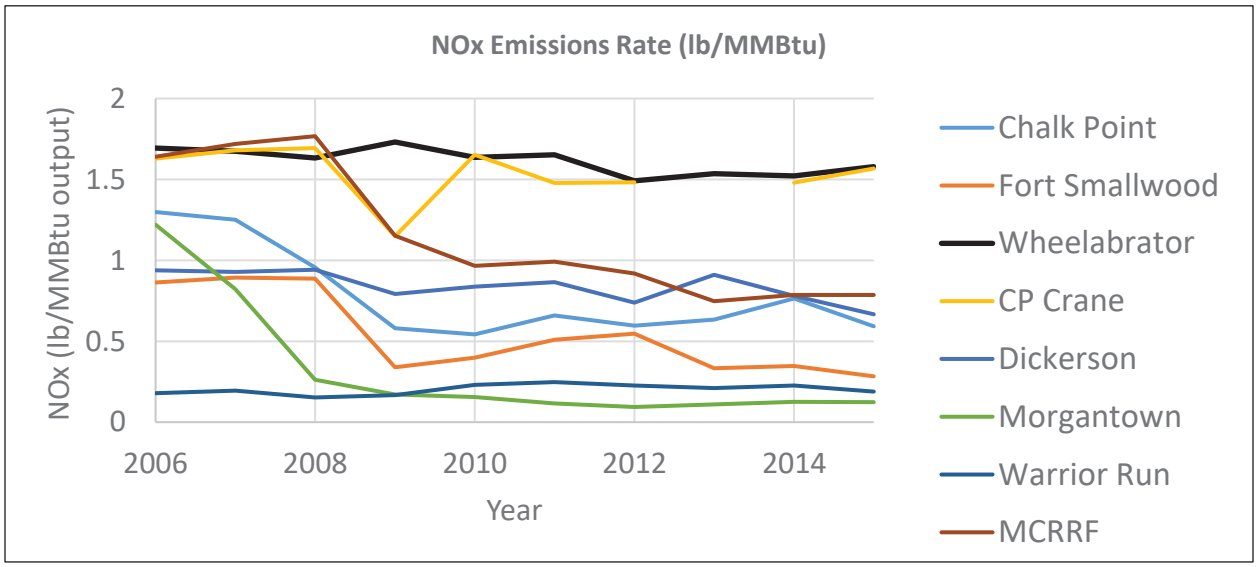
[1] In these comments, "ppm" is used as shorthand for parts per million by volume dry at 7% oxygen.
[2] MDE PowerPoint Presentation, NOx RACT for Municipal Waste Combustors (MWCs), Stakeholder Meeting - January 17, 2017, p. 26 *at* http://www.mde.state.md.us/programs/regulations/air/Documents/SHMeetings/MunicipalWasteCombustors/MWCNOxRACTPresentation.pdf

As discussed in more detail below, Connecticut and New Jersey have each adopted a short-term NO_x RACT limit for incinerators of 150 ppm, and Wheelabrator incinerators in those states that are very similar to the Baltimore plant are subject that limit. However, a 150 ppm limit would reduce annual emissions by only about 200 tons per year at the Baltimore incinerator, which still falls short of what MDE should be seeking. MDE should set a much lower 24-hour limit, using its legal authority to require reductions beyond the RACT standard if necessary.

I. Introduction

In 2015, the BRESCO incinerator was the sixth highest NO_x-emitting facility in the State of Maryland, and it emitted more NO_x per useful output (energy plus steam) that year than any of the other large power plants in the state. As shown in Figure 1 below, [3] the BRESCO facility is also one of only three large power plants in Maryland that has *not* significantly reduced its NO_x emissions over the last decade (one of the three – the Warrior Run coal plant - started out with relatively low NO_x rates and simply maintained them).

Figure 1: NOx Emissions Per Unit of Useful Output (energy + steam) from Maryland's top 7 electrical generating stations: 2006-2015



[3] EIP calculated Wheelabrator's NOx rate per unit useful output in order to account for the value of the steam that the facility provides for heating nearby buildings. If we had calculated this rate based on NOx per unit of energy produced, Wheelabrator's NOx rate would have been even higher compared to that of the other electrical generators in Maryland. NOx emissions data were taken from the Maryland Emissions inventory, expressed in tons per year. For a typical electrical generating unit (EGU), Net Generation (in MWH) was taken from the U.S. Energy Information Administration (EIA) Form 923 data, and converted to MMBtu using the conversion factor of 1 MWH=3.412 MMBtu. For combined heat and power (CHP) facilities, total output (combination of electric generation and useful thermal output) was estimated using EIA CHP efficiency factors, which represent the ratio of total output to total input, multiplied by Total Fuel Consumption (MMBtu). Annual NOx emissions were then divided by total output (net generation for EGU, combination of electric and useful thermal output for CHP) to produce a ton NOx/total output value.

In addition, BRESCO emitted 1,146 tons of NO_x in 2016, according to the PowerPoint presentation given on January 17, 2017 by Wheelabrator,[4] which is actually an increase from its 2015 emissions of 1,123 tons of NO_x. These high NO_x rates are especially troubling in light of the fact that the Wheelabrator incinerator is treated as a Tier 1 source of renewable energy under Maryland's Renewable Portfolio Standard ("RPS"), which ostensibly encourages the use of clean, non-polluting energy. In fact, according to data provided in the most recent report on the RPS released by the Maryland Public Service Commission ("PSC"), it appears that Wheelabrator received about $3.5 million in 2015 for its Tier 1 renewable energy credits.[5] If the company did, in fact, receive this amount of money for producing "clean" energy, it is imperative that it invest in pollution control upgrades to protect the lungs of the ratepayers who subsidize these renewable energy credits.

A. Health Impacts of BRESCO's NO_x Emissions

i. Nitrogen dioxide (NO_2)

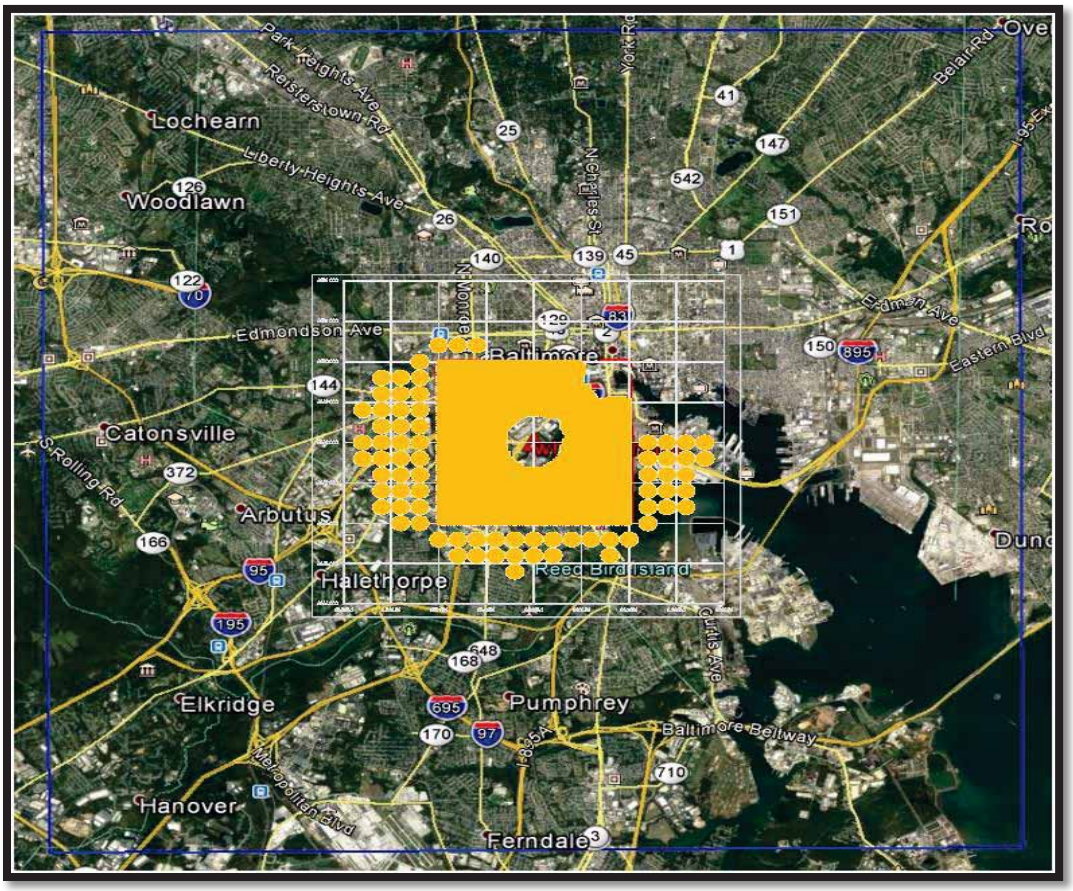
As discussed in detail in the report of Dr. H. Andrew Gray of Gray Sky Solutions dated May 9, 2017 (hereinafter "Gray Modeling Report")[6], modeling has been performed of the impact of BRESCO's NO_x emissions on levels of nitrogen dioxide (NO_2) in the ambient (outdoor) air. A full description of the methodology and data used in the report, as well as all findings, can be found in that report, and one of the maps produced by Dr. Gray is reproduced as Figure 2 below.

[4]Timothy Porter, Director Air Quality Management, Wheelabrator Baltimore NOx RACT Review PowerPoint Presentation (hereinafter "Wheelabrator Jan. 17 PowerPoint Presentation") (Jan. 17, 2017), p.13 *at* http://mde.maryland.gov/programs/regulations/air/Documents/SHMeetings/MunicipalWasteCombustors/MWCWheelabratorNOxRACTPresentation.pdf.

[5] In 2015, 248,377 Tier 1 renewable energy credits were retired from Wheelabrator, and the average cost of a non-solar Tier 1 credit was $13.87, indicating that Wheelabrator likely received around $3.5 million that year for its renewable credits. Public Service Commission of Maryland, Renewable Energy Portfolio Standard Report, With Data for Calendar Year 2015 (January 2017), pp. 7, 19, *at* http://www.psc.state.md.us/wp-content/uploads/RPS-Report-2017.pdf.

[6] The Gray Modeling Report is Attachment A to the May 9, 2017 comments submitted by the Chesapeake Bay Foundation on MDE's MWC NO_x RACT rulemaking.

Figure 2. Maximum 1-Hour NO2 Concentrations from BRESCO above 40 µg/m3 (21.3 ppb)
Modeled concentrations – fine grid + course grid



Dr. Gray modeled and mapped concentrations of nitrogen dioxide (NO_2) in the ambient air using two metrics: (1) NO_2 concentrations caused solely by BRESCO's NO_x emissions and (2) NO_2 concentrations caused by BRESCO's emissions added to regional background NO_2 concentrations. NO_2 is a pollutant for which short-term exposure can cause serious adverse respiratory effects, including increased risk of hospitalization due to asthma. To limit these effects, the U.S. EPA has set a federal health-based standard to limit exposure to NO_2 on a 1-hour basis. EPA's 1-hour limit is 100 parts per billion ("ppb"), measured based on the 98th percentile of hourly readings each year averaged over three years.[7]

However, studies have shown that adverse respiratory impacts can occur even in concentrations below the EPA standard. Increases of 30 ppb (which is the same as 56.4 micrograms per cubic meter ("µg/m^3)) using 1-hour maximum values[8] "indicate[d] a 2–20% increase in risks for emergency department visits and hospital admissions and higher risks for respiratory symptoms" in "effect estimates from epidemiologic studies conducted in the United

[7] EPA, National Ambient Air Quality Standards, at https://www.epa.gov/criteria-air-pollutants/naaqs-table.
[8] Values were standardized to 30 ppb for 1-hour maximum readings or 20 ppb over 24 hours.

States and Canada," according to EPA. [9] For example, one study conducted in Atlanta, Georgia from 1992 to 2000, found that an increase of 30 ppb in 1-hour maximum NO_2 concentrations was associated with a 2.4 % increase in respiratory emergency department visits and "4.1% increase in asthma visits in individuals 2 to 18 years of age."[10]

Dr. Gray modeled emissions from BRESCO using two different sets of meteorological data, one from 2005-2009 and one from 2006-2010. Under each scenario, the model estimated that BRESCO's emissions alone caused peak 1-hour concentrations over 30 ppb.[11] In addition, the model "predicted that elevated peak concentrations [of NO_2] occur over a large area surrounding the Wheelabrator facility."[12] For the 2005-2009 meteorological data, the model estimated that BRESCO's emissions alone (without the addition of background concentrations) resulted in maximum 1-hour ambient NO_2 levels of over 21.3 ppb (40 $\mu g/m^3$) across about 26 square kilometers (10 square miles) near the facility. This is illustrated above in Figure 2. BRESCO's emissions alone also caused modeled ambient NO_2 concentrations of over 26.6 ppb (50 $\mu g/m^3$) in the ambient air over 11.4 square kilometers (about 5.5 miles) near the plant, again looking at maximum 1-hour NO_2 levels.

While these maximum modeled impacts extend across a fairly sizeable geographic area, it is noteworthy that they do not reach the location of MDE's NO_2 monitor located in downtown Baltimore (the Oldtown site at 1100 Hillen Street, Baltimore, MD 21202).[13] Thus, it appears entirely possible that MDE's NO_2 monitor, which has not measured any exceedance of EPA's 1-hour air quality standard for NO_2 for many years, is not capturing the maximum NO_2 levels caused by BRESCO. As stated in Dr. Gray's report, his modeling also did not estimate any exceedances of EPA's 1-hour air quality standard (100 ppb). However, Dr. Gray modeled only (1) ambient NO_2 levels caused solely by BRESCO; and (2) ambient NO_2 levels caused by BRESCO plus background NO_2 concentrations. The background concentrations did not include

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[9] EPA, Proposed Rule for Primary National Ambient Air Quality Standard for Nitrogen Dioxide, 74 Fed. Reg. 34404, 33413 (July 15, 2009), available at https://www.gpo.gov/fdsys/pkg/FR-2009-07-15/pdf/E9-15944.pdf. This is based on a robust set of literature. EPA states:

> Temporal associations between respiratory emergency department visits or hospital admissions and ambient levels of NO2 have been the subject of over 50 peer-reviewed research publications since the review of the NO2 NAAQS that was completed in 1996. These studies have examined morbidity in different age groups and have often utilized multi-pollutant models to evaluate potential confounding effects of co-pollutants. Associations are particularly consistent among children (< 14 years) and older adults (> 65 years) when all respiratory outcomes are analyzed together . . . . and among children and subjects of all ages for asthma admissions . . . . When examined with copollutant models, associations of NO2 with respiratory emergency department visits and hospital admissions were generally robust and independent of the effects of co-pollutants (i.e., magnitude of effect estimates remained relatively unchanged) . . . . The plausibility and coherence of these effects are supported by experimental (i.e., toxicologic and controlled human exposure) studies that evaluate host defense and immune system changes, airway inflammation, and airway responsiveness . . . .

Id. (internal citations omitted).

[10] *Id.*

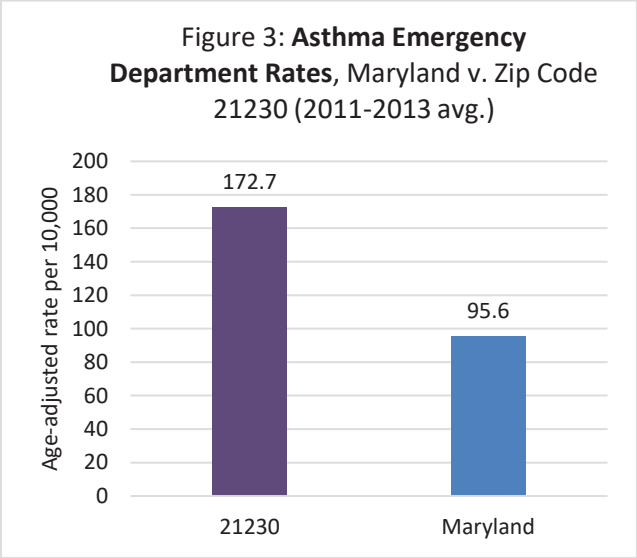
[11] Gray Modeling Report p. 5.

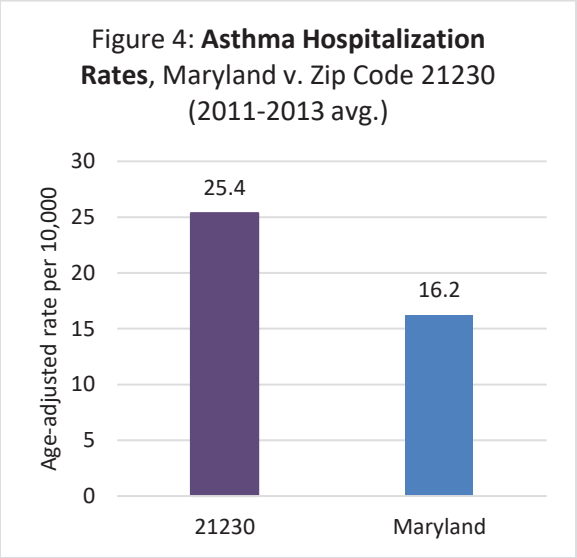
[12] Gray Modeling Report p. 4.

[13] The fact that this monitor is outside of the modeling receptor grid is shown in the first map in Appendix A to the Gray Modeling Report.

nearby industrial facilities or emissions from local road traffic, which is likely the greater contributor in South Baltimore.[14] Thus, it is possible that exceedances of EPA's 1-hour NO_2 standard are occurring and are not being captured by MDE's Oldtown monitor.

Lastly, it is important to reiterate that adverse health (respiratory) impacts can be caused by NO_2 at levels significantly below 100 ppb. The areas immediately around BRESCO, which have the highest modeled ambient NO_2 contributions from the incinerator, all have high asthma rates compared to Maryland as a whole. Air pollution is likely not the main contributor to asthma rates in these areas and traffic emissions also contribute to ambient NO_2 levels. Nevertheless, a dramatic reduction in BRESCO's NO_x emissions could have significant benefits for these communities.





Figures 3 and 4 above compare asthma rates– using different measures of acute asthma events –in Maryland as a whole to asthma rates in zip code 21230, which is the zip code most affected by BRESCO's emissions according to Dr. Gray's modeling.[15] Using an average over 2011-2013 (the most recent three years for which data is available), the asthma emergency room visit rate in zip code 21230 is about 80% higher than the state-wide rate, and the asthma hospitalization rate in zip code 21230 is approximately 57% higher the state rate.[16] Again, air pollution is likely not the main driver of these rates, but significantly reducing NO_x emissions from BRESCO could help to reduce acute asthma events in these communities.

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[14] Gray Modeling Report p. 7.

[15] These rates are based on age-adjusted rates per 10,000 people provided by the Maryland Department of Health and Mental Hygiene's ("DHMH's") Environmental Public Health Tracking service, at https://maps.dhmh.maryland.gov/epht/query.aspx (last visited May 7, 2017).

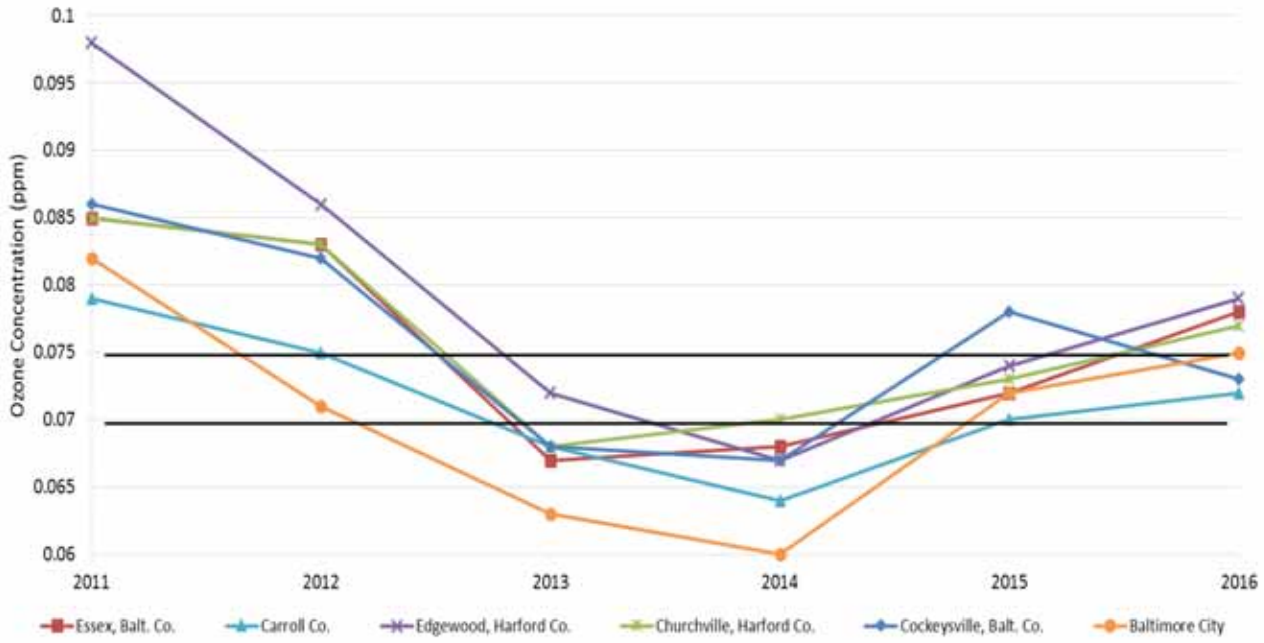
[16] Asthma hospitalization rates accounts for discharges of persons who are admitted to the hospital (inpatients) for asthma including those admitted through the hospital emergency department. It does not cover persons who visit the emergency department for asthma and are treated and released (outpatients). Emergency room visits cover all persons who visit the emergency room for asthma but not those who are admitted to a hospital in other ways, such as through physician appointments.

ii. Ozone

NO_x is also the primary pollutant that contributes to the formation of ground-level ozone, which has been shown to worsen the effects of asthma. A study of children ages 5-17 in New York City between 2005 and 2011 found that an increase of 13 ppb in ground-level ozone concentrations was associated with an increased risk of 2.9-8.4% of asthma emergency department visits for boys and 5.4-6.5% for girls. For girls, the same increase in ozone concentrations was also associated with an 8.2% increase in risk of asthma hospitalizations.[17]

We were not able to obtain modeling of the impacts of BRESCO's NO_x emissions on ozone levels in the Baltimore area because ozone is not emitted directly but rather forms in the ambient air when NO_x and volatile organic compounds (VOCs) combine with heat and sunlight. Ozone monitoring in the Baltimore area has historically shown the highest ozone levels in Harford and Baltimore Counties, although the one monitor located in Baltimore City has been increasing relative to other monitors, as show in Figure 5 below.

Figure 5: Baltimore Area Ozone Trends by Year (4th Highest 8-Hour Max for Each Year)[18]



The most recent monitoring data available shows that the Baltimore area does not meet EPA's 2015 health-based air quality standard for ozone (70 ppb) and that ozone levels have been increasing in the Baltimore area between 2014 and 2016. This is because the summers of 2013 and 2014 were atypically cool and ozone forms in the greatest amounts in hot, sunny weather.

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[17] Sheffield et al., Ambient ozone exposure and children's acute asthma in New York City: a case-crossover analysis, *Environmental Health* (2015) 14:25 DOI 10.1186/s12940-015-0010-2, p. 1.

[18] Data used from EPA's Monitor Values Reports *at* https://www.epa.gov/outdoor-air-quality-data/monitor-values-report. Compliance with EPA's ozone standards is assessed by looking at the 4th highest maximum 8-hour reading at each monitor averaged over three years. This chart, which does not show a 3-year average, is presented for the purpose of showing trends.

In addition, recent research by MDE and the University of Maryland College Park indicates that an increase of 100 tons per day of NO_x is associated with a 0.5 to 1.0 ppb increase in ambient ozone levels. In other words, large reductions in NO_x emission are necessary to address Baltimore's ozone problem.[19]

II. Argument: MDE Must Set a NO_x Standard for BRESCO That is No Higher Than 150 ppm and Should Set a Limit That is Much Lower than 150 ppm

MDE must set a new limit for NOx emissions from the BRESCO incinerator that is no higher than 150 ppm under the Reasonably Available Control Technology ("RACT") standard. Other states have adopted a 150 ppm limit for NO_x RACT, and Wheelabrator incinerators similar to the Baltimore plant are subject to that limit. A limit of 150 ppm will result in NO_x reductions from the facility of about only 200 tons per year, allowing the incinerator to continue emitting about 940 tons per year of NO_x, a high amount especially when compared with Maryland's other incinerator. For this reason, it is criticacl that MDE require significant additional reductions at the Baltimore incinerator and that it use legal authority to go beyond the RACT standard if necessary to obtain such reductions. In addition, MDE should require Wheelabrator to provide important additional information by (1) responding to EIP's questions about the analysis performed in 2016 of the incinerator's current controls; and (2) conducting computational fluid dynamics modeling of NO_x generation in the incinerator's boilers.

A. MDE Must Set a RACT Limit No Higher Than 150 ppm on a 24-hour average

MDE must set a RACT limit for the BRESCO incinerator that is no higher than 150 ppm on a 24-hour basis. A 150 ppm RACT standard on a 24-hour basis has been adopted by other states in the Ozone Control Region, and Wheelabrator incinerators similar to the Baltimore plant are subject to this limit. RACT is defined as "the lowest emissions limit that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[20] EPA has described this standard as "technology forcing" and stated that "[i]n determining RACT for an individual source or group of sources, the control agency, using the available guidance, should select the best available

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[19] Specifically, MDE has stated the following relating to research conducted for a 2014 white paper:

> Based on data obtained from the NASA DISCOVER-AQ field campaign over Maryland, it was observed that there was 4 to 8 ppb O3 produced per ppb NOx consumed, well within the range of 24 1-20 for other observations over the continental US (Jacob, 2004). This means that for each 100 tons/d increase in NOx emissions we can expect ~0.5 to 1.0 ppb increase in ozone [He et al., 2013a; He et al., 2013b].

MDE, Technical Support Document for COMAR 26.11.38 - Control of NOx Emissions from Coal-Fired Electric Generating Units p. 23 (May 25, 2015) *at* http://mde.maryland.gov/programs/Regulations/air/Documents/TSD_Phase1_with_Appendix.pdf.

[20] COMAR 26.11.01.01.B(40); *accord* U.S. EPA, State Implementation Plans; Nitrogen Oxides Supplement to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, 57 Fed. Reg. 55,620, 55,624 (Nov. 25, 1992).

controls, deviating from those controls only where local conditions are such that they cannot be applied there and imposing even tougher controls where conditions allow."[21]

i. Other states have adopted 150 ppm as RACT for NOx emissions from large municipal waste combustors (MWCs)

New Jersey, Connecticut, and Massachusetts have all either adopted or proposed adoption of a 150 ppm standard for NO_x RACT for incinerators like the BRESCO facility. In 2016, Connecticut adopted a 150 ppm limit for mass burn waterwall combustors on a 24-hour daily average. [22] New Jersey adopted a 150 ppm limit for all municipal solid waste incinerators in the state, which became effective in 2009 or 2011, depending on the facility, although the regulations allow incinerators to seek an exception to this rule. [23] Based on a white paper released in February 2017 by the Ozone Transport Commission ("OTC") (hereinafter "OTC NO_x Control White Paper") it appears that all large MWCs in the state are subject to the 150 ppm (no exceptions appear to have been granted).[24] Lastly, in 2013, Massachusetts, proposed a NO_x RACT limit of 150 ppm for mass burn waterwall combustors, but the rule has not been finalized.[25]

ii. Other Wheelabrator incinerators that are similar to the BRESCO plant are subject to a 150 ppm RACT limit

In addition, there are three Wheelabrator incinerators that appear very similar to BRESCO located in other states that are subject to 150 ppm RACT limits for NO_x or may be soon. Those facilities, and their similarities to the BRESCO plant, are described in more detail below.

Facility: Wheelabrator Bridgeport, L.P. (CT)[26]

- Details: 69.5 MW Steam Generation (Combined Heat and Power)

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[21] Memorandum from Roger Strelow, Assistant Admin., Air and Waste Management, U.S. EPA, *Guidance for determining Acceptability of SIP Regulations in Non-attainment Areas*, to Regional Administrators, Regions I-X (Dec. 9, 1976), *available at* https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19761209_strelow_ract.pdf .

[22] Regs. Conn. State Agencies § 22a-174-38(c)(8) Table 32-a.

[23] New Jersey's regulations require compliance by 2009 "if compliance is achieved by optimizing the existing NOx air pollution control system without modifying the . . . incinerator" and by 2011 "if compliance is achieved by installing a new NOx air pollution control system on an existing . . . incinerator or by physical modifying an existing . . . incinerator." New Jersey Department of Environmental Protection ("NJ DEP"), N.J.A.C. 7:27-19.12.

[24] Ozone Transport Commission (OTC) Stationary & Area Sources Committee, *White Paper on Control Technologies and OTC State Regulations for Nitrogen Oxides (NOx) Emissions from Eight Source Categories*, (hereinafter "OTC NO_x Control White Paper"), Appendix D, pp. 1-2 (Feb. 10, 2017, *at* http://www.otcair.org/upload/Documents/Reports/OTC_White_Paper_NOx_Controls_Regs_Eight_Sources_Final_Draft_02152017.pdf. The OTC NOx White Paper is attached hereto as Appendix A.

[25] Massachusetts Department of Environmental Protection, Proposed Amendments to the Clean Air Act Section 111(d), Including the Municipal Waste Combustor Regulation 310 CMR 7.08(2) (May 2013) *at* http://www.mass.gov/eea/docs/dep/service/regulations/310cmr07.pdf.

[26] Connecticut Department of Energy & Environmental Protection ("CT DEEP"), Title V Operating Permit: Wheelabrator Bridgeport, L.P. Permit No. 015-0219-TV (issued Dec. 3, 2014) (hereinafter "Wheelabrator Bridgeport Title V Permit") *at* http://www.ct.gov/deep/lib/deep/air/permits/titlev/wheelabarator_bridgeport/p_015-0219-tv.pdf.

- Installation Year: 1988
- Specifications: Three 750 ton per day Babcock & Wilcox/Von Roll Reciprocating Grate Waterwall Furnaces. Boiler MCR of 325 MMBtu/hr and 196,800 lb/hr of steam.
- NOx Controls: SNCR-NOx Control (urea), with injection rate from 0-35 gal/hr
- Ammonia slip limit: 20 ppm

The design and operation of Wheelabrator Bridgeport appear to be very similar to the BRESCO incinerator in Baltimore, with many of the furnace specifications being identical to the Maryland facility. Both plants use three 750 ton per day Babcock & Wilcox/Von Roll Reciprocating Grate Waterwall Furnaces, which produce steam for heating or for electricity generation. Each combustor has a maximum heat input rate of 325 MMBtu/hr, and similar design steam flow rate (193,600 lb/hr steam for Wheelabrator Baltimore).[27] The air emission controls at both facilities use urea-based SNCR, spray dryer absorbers, and activated carbon injection, while Wheelabrator Bridgeport uses a baghouse instead of an electrostatic precipitator (ESP).

Prior to Connecticut's 2016 adoption of a 150 ppm NO_x RACT limit, the Wheelabrator Bridgeport facility was subject to a NOx limit of 200 ppm.[28] In October 2016, Wheelabrator Bridgeport received a permit modification that allows it to install a flue gas recirculation ("FGR") system by August 1, 2017 to improve SNCR performance.[29]

Facility: Wheelabrator Gloucester County Resource Recovery Facility (NJ)[30]

- Details: 14 MW[31] Electric Generating Unit
- Installation Year: 1990
- Specifications: Two 287.5 ton per day mass burn waterwall MSW combustors, rated at 108 MMBtu/hr with a maximum steam production of 286,664 lbs for any 4-hour block period.
- NOx Controls: SNCR-NOx Control (urea)
- Ammonia slip limit: 20 ppm

Wheelabrator Gloucester operates mass burn waterwall combustors, controlled by urea-based SNCR, spray dryer absorbers, activated carbon injection, and particulate baghouses. According to a permit modification, Wheelabrator met New Jersey's updated NO_x RACT standard of 150 ppm by installing a minimum of four additional SNCR injector ports in each

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[27] Wheelabrator Jan. 17 PowerPoint Presentation, *supra* note 4.
[28] Wheelabrator Bridgeport Title V Permit, *supra* note 26.
[29] CT DEEP, New Source Review Permit: Wheelabrator Bridgeport, L.P. Permit No. 015-0097 (hereinafter "Wheelabrator Bridgeport NSR Permit"),p. 4, Oct. 21, 2016 *at* http://www.ct.gov/deep/lib/deep/air/permits/titlev/wheelabarator_bridgeport/p_015-0097.pdf. This permit is attached hereto as Appendix B.
[30] NJ DEP, Minor Modification Permit: Wheelabrator Gloucester Company, L.P. BOP090001 (Oct. 16, 2009) (hereinafter "Wheelabrator Gloucester Modification"). Excerpts from this permit are attached hereto as Appendix C.
[31] Wheelabrator Technologies, Wheelabrator Gloucester *at* https://www.wtienergy.com/plant-locations/energy-from-waste/wheelabrator-gloucester (last visited May 5, 2017).

furnace at this plant, and increasing SNCR system control via system optimization and temperature profiling.[32]

Facility: Wheelabrator Falls (PA)

- Details: 53 MW Electric Generating Unit
- Installation Year: 1994
- Specifications: Two 750 ton per day Babcock and Wilcox/Von Roll Reciprocating Grate Waterwall Furnaces.
- NOx Controls: SNCR-NOx Control

Wheelabrator Falls appears to have a very similar furnace design to both Wheelabrator Bridgeport and Wheelabrator Baltimore, utilizing 750 ton per day Babcock and Wilcox/Von Roll Reciprocating Grate waterwall furnaces. While Wheelabrator Falls is not in a state that has a 150 ppm RACT limit, MDE has identified that the facility is seeking to reduce its emissions to this level by optimizing its existing SNCR in order to receive renewable energy credits in New Jersey.[33] This facility uses carbon injection, spray dryer absorbers, and fabric filters (baghouses) for pollution control.[34]

The OTC NO_x Control White Paper also identifies two incinerators that are not owned or operated by Wheelabrator, one in New York and one in Pennsylvania, that appear similar to the BRESCO incinerator and are subject to a 150 ppm NO_x limit.[35]

Facility Name	Year Opened	Capacity (TPD)	NOx Limit (ppmvd)	Equipment/Facility Info
Susquehanna Resource Harrisburg (PA)	2005	800	150 (24 hr)	3x 267 TPD mass burn waterwall. Ammonia slip limit of 12 ppmvd.
Covanta Babylon (NY)	1988	750	150 (24 hr)	2x 375 TPD water wall furnaces with Martin reverse-reciprocating grate

[32]Wheelabrator Gloucester Modification, *supra* note 30.
[33] Email from Husain Waheed, MDE Engineer (Feb 2, 2017) received in response to request under the Maryland Public Information Act ("PIA").
[34] Pennsylvania Department of Environmental Protection ("PADEP"), E-Facts, Wheelabrator Falls Major Facility Operating Permit, (Permit No. 09-00013), Authorization Search Details *at* http://www.ahs.dep.pa.gov/eFACTSWeb/searchResults_singleAuth.aspx?AuthID=1093955 (last visited May 7, 2017).
[35] OTC NOx Control White Paper, *supra* note 24, Appendix D, pps 2-3.

iii. ***Wheelabrator should not avoid a RACT limit of 150 ppm simply because of the possibility of ammonia slip from its NOx controls***

The most significant apparent difference between the BRESCO incinerator in Baltimore and each of the three Wheelabrator incinerators described above is that each of the other incinerators has baghouses installed for control of particulate pollution. A baghouse is one of the most, if not *the* most, effective technologies for control of particulate pollution. BRESCO, on the other hand, is equipped with an electrostatic precipitator ("ESP").[36]

Although a baghouse is used primarily for the control of particulates, it appears that installation of baghouses may be necessary to achieve adequate control of NO_x at the BRESCO facility. Wheelabrator has claimed that it cannot use its current pollution controls– Selective Non-Catalytic Reduction ("SNCR") –to comply with a NO_x limit below 170 ppm because increasing the effectiveness of SNCR requires increasing the use of urea. Wheelabrator maintains that this causes ammonia slip, which could cause a violation of the visible emissions limit to which the incinerator is subject. Wheelabrator has stated that "excessive [ammonia] slip cannot be reduced in [an] ESP as in [a] baghouse."[37]

If excess ammonia slip is a problem when additional urea is injected in the SNCR at the BRESCO incinerator, it appears that there are ways to reduce ammonia slip. Some possibilities are:

(1) According to the OTC NO_x White Paper, when ammonia slip from selective catalytic reduction ("SCR") (a more effective form of NOx control than the SNCR currently installed on the BRESCO incinerator) is a problem, "[a[mmonia cleanup catalysts can be installed behind the SCR catalyst to collect any excess ammonia that slips through (converting it into nitrogen and water)."[38]

(2) Installation of the hybrid SNCR/SCR control technology described in detail in the expert report of Dr. Ranajit Sahu dated May 5, 2017, which includes an "opportunistically placed in-duct SCR catalyst [that] can take advantage of the ammonia/urea slip from the SNCR and effect significant additional NOx reductions (i.e., around 50-75%) in the catalyst layer(s), leading to substantially lower NOx at the stack than SNCR alone."[39]

(3) MDE should require that ammonia slip be measured at BRESCO from now on. According to the Sahu Report, continuous emissions monitoring systems ("CEMS") for ammonia are widely available and "EPA's performance specification for ammonia CEMS dates back to 2004."[40] The proposed Energy Answers incinerator, which

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[36] Part 70 Operating Permit Fact Sheet, Wheelabrator Baltimore, L.P., Permit No. 24-510-01186 (2013) p. 1.
[37] Wheelabrator Jan. 17 PowerPoint Presentation, *supra* note 4, p. 7.
[38] OTC NO_x Control White Paper, *supra* note 24, p. 15
[39] The Expert Report on NOx Emissions from the Wheelabrator Baltimore Municipal Waste Incinerator in Baltimore City, owned and operated by Wheelabrator Baltimore, L.P. ("Wheelabrator") by Dr. Ranajit (Ron) Sahu, Consultant, p. 4, May 5, 2017 (hereinafter "Sahu Report"). This report is Attachment B to the May 9, 2017 comments submitted by the Chesapeake Bay Foundation on MDE's MWC NO_x RACT rulemaking.
[40] *Id.*

> would have been located in South Baltimore,[41] was permitted to use a continuous ammonia monitor to measure its ammonia slip upon approval by MDE's Air and Management Administration ("ARMA").[42] MDE has full legal authority to require use of ammonia CEMS at BRESCO.[43]

In addition, if Wheelabrator maintains that there is no other way to achieve a 150 ppm NO_x limit while avoiding excessive ammonia slip, MDE should require installation of baghouses on each of the BRESCO combustor units. All three of the Wheelabrator incinerators described in the section above (Bridgeport, Gloucester, and Wheelabrator Falls) are equipped with baghouses, all are subject (or appear soon to be subject) to a NO_x limit of 150 ppm, and the Bridgeport and Gloucester facilities are subject to an ammonia limit of 20 ppm.

In addition, the proposed Energy Answers incinerator in Baltimore, which was subject to the same visible emissions limit that applies to BRESCO, also had an ammonia slip limit of 20 ppm.[44] Thus, if BRESCO can meet a 20 ppm ammonia slip limit, then it should be able to comply with its visible emission limit, and baghouses should allow the BRESCO facility to meet this ammonia slip limit. It appears that many incinerators can meet such a limit for ammonia. Connecticut requires that all MWCs in the state that use SNCR for NO_x control must comply with a 20 ppm limit on ammonia.[45] According to the OTC NO_x Control White Paper, all of the large MWC units in New Jersey are subject to ammonia slip limits of 20 ppm or 50 ppm.[46]

The fact that all three of the out-of-state Wheelabrator incinerators described above have installed baghouses indicates that it is both technically and economically feasible for Wheelabrator to do so at its Baltimore facility. In the event that Wheelabrator maintains that installation of baghouses is not economically feasible, MDE should consider using authority to require emissions reductions that go beyond the RACT standard in order to ensure that NO_x from the BRESCO incinerator is substantially reduced. Wheelabrator should not be permitted to emit higher rates of NO_x in Baltimore City than at its New Jersey and Connecticut plants simply because it has failed to install particulate controls in Baltimore that are as good as those installed at the Bridgeport, CT and Gloucester, NJ incinerators.

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[41] Energy Answers Certificate of Public Convenience and Necessity ("CPCN"), Condition A-22(b). An excerpt from the Energy Answers CPCN is attached as Appendix D hereto. The Energy Answers CPCN was revoked by the Maryland Public Service Commission in 2016.
[42] *Id*.
[43] COMAR 26.11.01.04(B)(1) states:

> The Department or the control officer may require a person responsible for any installation to install, use, and maintain monitoring equipment or employ other methods as specified by the Department or the control officer to determine the quantity or quality, or both, of emissions discharged into the atmosphere and to maintain records and make reports on these emissions to the Department or the control officer in a manner and on a schedule approved by the Department or the control officer.

[44] Energy Answers CPCN, Condition A-22(a). Energy Answers would also have installed baghouses and Regenerative SCR. Energy Answers CPCN Condition A-3.
[45] Regs. Conn. State Agencies § 22a-174-38(c)(16).
[46] OTC NOx Control White Paper, *supra* note 24, Appendix D, p. 1.

B. MDE Should Require Wheelabrator to Analyze whether BRESCO Can Achieve a NOx Limit Lower Than 150 ppm by Installing Hybrid SCR/SNCR Technology

As noted above, a hybrid SCR/SNCR control technology exists that could substantially reduce NO_x at the BRESCO incinerator at a reduced price compared to an SCR system. This hybrid technology is described in detail in the Sahu Report and the exhibits thereto. Dr. Sahu notes that this technology could reduce emissions from their current levels by 50-75%. The NO_x emission rates that could be achieved with this range of efficiencies, and corresponding estimated limits, are provided below in Table 1 below.

Table 1: NOx Emissions, Reductions, and Limits zAssociated with Hybrid SCR/SNCR

	Average 24-hr NOx (ppm)[47]	**Annual NOx (tpy)[48]**	**NOx Reduction (tpy)[49]**
Hybrid SCR/SNCR (75%)	**56**	**377.5**	**768.5**
Hybrid SCR/SNCR (60%)	**89.6**	**604**	**542**
Hybrid SCR/SNCR (50%)	**112**	**755**	**391**

MDE should require Wheelabrator to analyze the feasibility of installing this system on the BRESCO incinerator as RACT.

C. MDE Should Set a NO_x Limit Well Below 150 ppm and Should Use its Legal Authority to go Beyond RACT if Necessary

MDE is not constrained by the RACT standard and is fully authorized to set a NO_x limit for the BRESCO incinerator that is lower and more protective than the limit required under RACT.[50] Wheelabrator should be required to meet an emission limit that is much lower than 150 ppm because 150 ppm would reduce annual emissions by only about 200 tons per year, achieving an annual emissions level of about 940 tons per year.

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[47] Average ppm calculated by applying reduction efficiency to 2016 average 24-hour NOx rate of 170 ppm, according to Wheelabrator Jan. 17 PowerPoint Presentation, *supra* note 4, p. 12.

[48] Annual NOx emissions were calculated by applying the proportion of average ppm after additional emissions control to 2016 levels (170 ppmvd)and multiplying by the annual NOx emissions in tons per year (1146 tons per year in 2016).

[49] Measured from 2016 actual emissions of 1146.

[50] EPA has stated that "a state has discretion to require beyond-RACT reductions from any source, and has an obligation to demonstrate attainment as expeditiously as practicable. Thus, states may require VOC and NOX reductions that are 'beyond RACT' if such reductions are needed in order to provide for timely attainment of the ozone NAAQS." EPA, Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements, 80 Fed. Reg. 12264,12279 (March 6, 2015).

As discussed in EIP's October 26, 2017 letter to MDE, the Montgomery County Resource Recovery Facility in Maryland reduced its NO_x emissions by 494 tons a year (about 49%) around 2009 by installing "Low NO_x" technology. The hybrid SCR/SNCR technology discussed above may be capable of reducing NO_x emissions at BRESCO from current levels by 390-770 tons per year. If baghouses or an ammonia catalyst are installed, the current SNCR controls at BRESCO might be capable of achieving much higher reduction efficiencies without contributing to excess ammonia slip. In addition, the Wheelabrator Bridgeport facility in Connecticut appears to be using a flue gas recirculation ("FGR") system to improve SNCR performance.[51]

If any of these controls is capable of reducing NO_x by a substantial amount and does not satisfy every element of the RACT standard, then MDE should use its legal authority to require "beyond RACT" NO_x reductions at the Baltimore incinerator.

D. MDE Should Require Wheelabrator to Conduct Computational Fluid Dynamics Modeling of the Incinerator's NO_x Generation and MDE has Full Legal Authority to Require Such an Analysis

The SNCR optimization analysis performed by Wheelabrator in early 2016 leaves many information gaps, as described in the Sahu Report.[52] EIP submitted questions to MDE requesting more information about this analysis by email dated April 4, 2017.[53] MDE should require Wheelabrator to respond to all of these questions. MDE should also require Wheelabrator to conduct computational fluid dynamics ("CFD") modeling of the NO_x generation in each of the three boilers at the facility in order to provide "a basic understanding of NO_x generation and distribution as well as the effect of SNCR," as described in the Sahu Report. [54] This will provide information that is critical and much more useful than the SNCR optimization assessment.

MDE has full legal authority to require Wheelabrator to provide additional information about the SNCR optimization tests and to perform a CFD and to submit a written report thereon. Under COMAR 26.11.01.05(A), MDE may "require a person who owns or operates an installation or source to establish and maintain records sufficient to provide the information necessary to . . . [a]ssist the Department in the development of an implementation plan, air emissions standard, equipment performance standard, or material formulation standard." MDE may also

> require a person responsible for any installation to install, use, and maintain monitoring equipment *or employ other methods as specified by the Department* to determine the quantity or quality or both, of emissions discharged into the atmosphere and to maintain records and make reports on these emissions to the

[51] Wheelabrator Bridgeport NSR Permit, *supra* note 29.
[52] Sahu Report pp. 2-3.
[53] Email from Leah Kelly, EIP Attorney, to Randy Mosier, Division Chief, Air Quality Regulations Division, MDE ARMA, dated April 4, 2017. The questions in this email are reproduced in Appendix E hereto.
[54] Sahu Report p. 4.

Department or the control officer in a manner and on a schedule approved by the Department or the control officer.[55]

Thank you for your consideration of these comments.

Sincerely,

Leah Kelly
Attorney
Environmental Integrity Project
1000 Vermont Ave. NW, Suite 1100
Washington, D.C. 20005
Phone: 202-263-4448
Email: lkelly@environmentalintegrity.org

Cc: *Via E-mail*

Randy E. Mosier
Division Chief, Air Quality Regulations Division
Maryland Department of the Environment
1800 Washington Boulevard, STE 730
Baltimore, Maryland 21230-1720
randy.mosier@maryland.gov

[55] COMAR 26.11.01.04(B)(1) (emphasis added).