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STATE OF ILLINOIS
Pollution Control Board

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
Petition of Noveon, Inc.	)	
	)	**AS 02-5**
	)	
for an Adjusted Standard from	)	
35 Ill. Adm. Code 304.122	)	

NOTICE OF FILING

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PLEASE TAKE NOTICE that on **Thursday, April 29, 2004,** we filed the attached **Post-Hearing Memorandum of Noveon, Inc.** with the Illinois Pollution Control Board, a copy of which is herewith served upon you.

Respectfully submitted,

NOVEON, INC.

By: ______________________
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POST-HEARING MEMORANDUM OF NOVEON, INC.

Noveon, Inc., f/k/a The BFGoodrich Company ("Noveon"), through its undersigned attorneys, respectfully submits this Post-Hearing Memorandum in support of its Petition for an Adjusted Standard from the ammonia effluent standard set forth at 35 Ill. Adm. Code 304.122(b).

I. Background and Issues Before the Board

This Petition is related to Noveon's NPDES Permit Appeal also pending before the Board. In the Permit Appeal, filed on January 24, 1991, Noveon appealed the condition imposed by Illinois EPA requiring Noveon to meet an ammonia limit based on the provisions of Section 304.122(b) of the Board's rules, 35 Il. Adm. Code 304.122(b). *See* PCB 90-1. Noveon believes the Illinois EPA's application of this regulation was unwarranted, arbitrary and capricious, and based on a misinterpretation of Section 304.122(b). After two days of hearing, the Permit Appeal was stayed in 1991, and Illinois EPA and Noveon engaged in settlement discussions. During this time, Noveon's experts, Houston Flippin of Brown & Caldwell, Michael Corn of AquaTer, Inc., and William Goodfellow of EA Engineering, assisted Noveon in conducting studies and pilot tests to assess methods of treating ammonia at Noveon, the effect of the discharge on water quality and calculation of a mixing zone and Zone of Initial Dilution (ZID), and the toxicity of Noveon's discharge. Noveon and Illinois EPA have met regularly to confer on Noveon's progress and Noveon has allowed Illinois EPA to have ample input into the work that was proceeding.

This Petition is submitted in the alternative to the NPDES Permit Appeal, for which Noveon submitted a Post-Hearing Memorandum on April 15, 2004. Noveon requests that, should the Board determine the Illinois EPA properly applied Section 304.122(b), the Board grant Noveon an adjusted standard from its provisions. Noveon has conducted extensive assessment of treatment technologies and has concluded that no technology is available to Noveon for treatment of ammonia that is both economically reasonable and technically feasible to allow it to achieve compliance with 35 Il. Adm. Code 304.122(b). Noveon therefore seeks relief from Section 304.122(b) and requests as part of the relief that the Board also grant Noveon a mixing zone calculated in accordance with federal and state regulations.

II. Statement of Facts

A. The Noveon and PolyOne Manufacturing Facilities

The Noveon Henry Plant is located on the West Branch of the Illinois River in Marshall County, to the north of the City of Henry. When the NPDES Permit was issued, the Henry Plant was owned by BFGoodrich. It had two manufacturing units: a specialty chemicals manufacturing unit, which started operations in 1958 producing chemicals for the rubber industry, and a polyvinyl chloride (PVC) resins unit that began operating in 1965. The Henry site was selected by BFGoodrich for this facility because of its unique proximity to the Illinois River, Rock Island railroad system, state highway system, electrical power resources, natural gas resources and water resources, as well as the positive work ethic of the local rural population. Since 1958, the plant has expanded and changed ownership so that two separate companies, Noveon, Inc. and PolyOne, now co-exist at the same site. Pet. Ex. 6 at 2. PolyOne manufactures PVC products and was created as a separate entity in 1993, when BFGoodrich spun off the Geon Vinyl division and created a publicly traded company, the Geon Company. In 2001, Noveon, Inc. was created when BFGoodrich sold the remainder of its chemical operations at the Henry Plant to a private investment group. Pet. Ex. 6 at 2.

The facility has a utility operation that serves both companies on site. The utility operation consists of a boiler operation, a water treatment process and a complex wastewater treatment system. The boiler operation is owned and operated by PolyOne while the water treatment and waste treatment systems are owned and operated by Noveon. In 1985, with the assistance of the State of Illinois, BFGoodrich constructed a state of the art circulating fluid bed coal-fired boiler for $21 million that is capable of burning Illinois high sulfur coal in an environmentally clean manner. This boiler has been in operation for the past 17 years, consuming high sulfur Illinois coal and supporting many jobs in the Illinois coal industry. Pet. Ex. 6 at 2, 3.

The current Noveon Henry Plant is a chemical manufacturing facility. Noveon manufactures two general groups of products, antioxidants and accelerators, which are the "salt-and-pepper" chemicals used in the production of rubber and plastics. The first general group of products consists of rubber accelerators used in the vulcanizing process by tire manufacturers to cure tires. The accelerators allow tire vulcanizing to proceed much quicker than without these products, resulting in greater efficiency for tire-making so that tires cost less. The second group of products is antioxidants for plastic and rubber, which are key ingredients for the rubber and plastic industries and allow products to last longer. Without antioxidants present in articles like rubber bands, the rubber band will develop holes and break quickly as it expands and contracts. This concept applies to tires as they support a vehicle and roll down the road; tires could not function safely without antioxidants. Pet. Ex. 6 at 3. Recently, the facility has added Personal

Care and Carboset products to its mix of products. One product called Geltrol is even approved for food grade applications such as baby bottle nipples. Pet. Ex. 6 at 3, 4.

The PolyOne facility produces specialty polyvinyl chloride resins for niche, specialty markets and the flooring industry. The resins produced by PolyOne have myriad applications, including the wear layer (top layer) of resilient floors, the support base (bottom layer) of resilient floors, and protective coating of cans used for food processing and vinyl wallpaper. Pet. Ex. 6 at 4.

B. Impact of Noveon and PolyOne on the Local Economy

Both Noveon and PolyOne play a major role in supporting the local economy through payment of wages, purchase of materials locally and the payment of real estate taxes. On an annual basis, wages and benefits of approximately $6.2 million are paid by Noveon to its 75 employees. PolyOne pays approximately $8.2 million to its 100 employees. PolyOne pays approximately $128,000 per year and Noveon pays approximately $142,000 in real estate taxes. Pet. Ex. 6 at 3, 4.

The City of Henry has a population of approximately 2,700, and these payrolls provide the economic energy that supports the City as well as local businesses within Marshall County and elsewhere. Typical economic models indicate that for every job created by a company such as Noveon, six jobs are created as a result to support its overall production activities. Pet. Ex. 6 at 4.

C. The Wastewater Treatment Facility

The state of the art wastewater treatment system is owned and operated by Noveon, providing wastewater treatment for both companies' wastewater processes. A visual depiction of the wastewater source and treatment facility is available in a flowchart at Pet. Ex. 1.[1] Throughout the life of the facility, Noveon has invested in the wastewater treatment system by installing a number of improvements, including installation of primary and secondary systems with an 800,000 gallon in-ground aeration basin in 1972; improvement of the secondary system to above ground aeration tanks (1,000,000 gallons), and addition of a sludge removal system in 1987 and 1988; installation of a tertiary sand filter system in 1989, with expansion of the tertiary filtering system to a second sand filter in 1992; and addition of aeration (1,000,000 gallons) to the system in 1997 to provide more complete treatment of the wastewater organic load to the system.

All wastewater from the Noveon facility's manufacturing areas is discharged for equalization to the Polymer Chemical (PC) Tank, with wastewater from Noveon's Cure-Rite 18 manufacturing area also receiving pretreatment prior to discharge to a separate equalization tank. Following equalization, the wastewater receives additional primary treatment consisting of pH adjustment, addition of coagulant and polymer to assist in removing solids, and primary clarification; secondary treatment consisting of aeration and secondary clarification with returned sludge to maintain an appropriate population of bacteria; and tertiary treatment consisting of filtering wastewater prior to discharge. Pet. Ex. 7 at 5, 6. The PolyOne facility's wastewater is discharged for equalization to the Polyvinyl Chloride (PVC) Tank, with the exception of certain manufacturing wastewater which receives pretreatment unrelated to ammonia prior to discharge to the PVC Tank. The PVC Tank also receives return streams such as backwash water from the sand filter, filtrate from sludge dewatering, and, routinely, primary

[1] A more extensive narrative description of the wastewater treatment process is also available at Pet. Ex. 7.

sludge from the primary clarifier. 2004 Tr. 36, 37. This wastewater is then pumped with the Noveon wastewaters for primary, secondary and tertiary treatment. Pet. Ex. 7 at 7.

The Noveon and PolyOne facilities also discharge wastewater consisting of stormwater runoff and discharges from cooling towers, boilers and well water treatment to a storm/utility pond. A portion of the pond water discharges to the PVC Tank to assist with removal of Biological Oxygen Demand (BOD) removal in the treatment process or when the stormwater pond's filter reaches capacity. The remaining pond water goes through a filter for treatment and combines with the other wastestreams prior to discharge.

Noveon's wastewater is discharged to the Illinois River through Outfall 001 by a single-port diffuser. The outfall is a pipe that travels approximately 1,000 yards downstream before turning and going into the Illinois River. See Pet. Ex. 8, showing discharge location. Wastewate from the City of Henry's treatment plant shares the pipe with Noveon's discharge. The total flow of the two discharges is around 1.1 mgd or 1.7 cfs. Pet. Ex. 7 at 2.

The Noveon processes do not discharge any significant ammonia nitrogen directly to the wastewater treatment system. They do, however, discharge the organic nitrogen compounds tertiary butyl amine (tBA), mercaptobenzothiazole (MBT) and morpholine. These materials are discharged directly to the wastewater system due to the un-reacted portion of each production reaction or indirectly due to loss of finished solid product to the wastewater system. The solid product can break down in the wastewater to a liquid, organic nitrogen compound-bearing byproduct. The PolyOne processes discharge a small amount of ammonia nitrogen directly to the wastewater system in the form of ammonium laurate, a dispersing agent.

Nitrification is the conventional treatment for ammonia. Noveon's wastewater treatment facility is constructed similarly to municipal wastewater treatment plants to nitrify ammonia, and in fact the design and operation of Noveon's plant meet the conditions defined in 35 Il. Adm. Code 370.920, 35 Il. Adm. Code 370.1210, and Ten State Standards to grow ammonia-degrading bacteria in order to nitrify ammonia. Pet. Ex. 7 at 9. These standards are used by regulators to critique wastewater treatment facility designs to ensure they are adequate to support complete nitrification. The Henry Plant wastewater does not, however, achieve nitrification. The lack of nitrification is due not to a lack of equipment or inadequate design, but to a variety of technical challenges, the foremost of which is that the bacteria necessary for nitrification will not grow because they are inhibited by certain compounds (principally MBT). Pet. Ex. 7 at 9. But there are also other technical challenges to removing ammonia inherent to the Noveon Henry Plant's wastewater that highlight the unique issues Noveon would face in any efforts to comply with 35 Il. Adm. Code 304.122(b):

First, Illinois EPA has reported that only three other plants in the country generate a similar wastewater. Two of these three plants discharge to a Publicly Owned Treatment Works. Only one of the three plants discharges directly to a receiving water. Pet. Ex. 7 at 15. Thus, Noveon's wastewater is not commonly encountered.

Second, the essential building block of rubber accelerators, Noveon's main product line at the facility, is mercaptobenzothiazole, or MBT. As a building block, it is present in numerous wastestreams throughout the facility. Consequently, there is not one small isolated wastestream that could be treated for MBT removal. MBT is a well-recognized inhibitor of biological nitrification, even at trace levels of 3 ppm. Those characteristics that make it useful as a rubber accelerator are exactly what impair its treatability: MBT is poorly degradable. This makes MBT ideal for rubber making, but it cannot be reduced within the wastewater treatment system to the levels required for biological nitrification to occur. Pet. Ex. 7 at 15-16.

Third, Noveon's wastestreams require pretreatment ahead of the on-site biological treatment plant to prevent process upsets and noncompliance with effluent BOD and TSS limits. Consequently, there is an inherent unreliability with any biological treatment process used on site whether it is used for BOD removal or nitrification. Pet. Ex. 7 at 16.

Fourth, the Noveon wastewater contains several degradable organic nitrogen compounds such as tertiary butyl amine and morpholine. When these compounds are degraded, they release ammonia nitrogen. Consequently, effluent ammonia-nitrogen concentrations increase as the presence of these compounds increase in the influent wastewater and as these compounds are more thoroughly biodegraded. This means that the majority of the effluent ammonia nitrogen at the Noveon Plant is due to thorough biological treatment of organic compounds. Pet. Ex. 7 at 16.

Fifth, the compounds present in Noveon's wastewater make oxygen transfer about half as efficient as municipal wastewaters. Consequently, the Noveon Plant has to use blowers with about twice the horsepower to transfer the same amount of oxygen used at municipal wastewater treatment plants. The increased power must also be accompanied by increased aeration tankage to keep operating power levels within a reasonable range. Pet. Ex. 7 at 16.

Sixth, Noveon's wastewater is lightly buffered, so that even if biological nitrification could be implemented with the elimination of nitrification inhibitors, the majority of alkalinity would have to be chemically added, whereas alkalinity is typically present at required levels in municipal wastewaters. This increases technical challenges and cost of treatment. Pet. Ex. 7 at 16.

Seventh, the Noveon Plant does not have any additional appreciable electrical power available to the wastewater treatment facility. Significant additional power for any wastewater treatment upgrade would require installation of a new motor control center and a new power line to a substation located approximately 0.5-mile away. Pet. Ex. 7 at 16-17.

In summary, the predominance of all ammonia in the effluent is a result of the wastewater treatment process and the unique wastewater flows at the Noveon Henry Plant. Noveon's unique influent contains organic compounds that have two effects: first, they degrade to form ammonia nitrogen during the wastewater treatment process; second, MBT and other organic compounds inhibit nitrification so that ammonia nitrogen is not reduced during wastewater treatment. Pet. Ex. 7 at 8, 9. These and other factors make Noveon's wastewater difficult to treat.

D. The Illinois River

A USGS topographic map showing the location of the Henry Plant and the Illinois River was introducted at the hearing as Pet. Ex. 18. The Henry Plant sits on a bluff, about 80 to 90 feet above the Illinois River. Tr. 189. The Illinois River flow varies based on the season, with the lowest flows occurring during the summer and early fall months. The average yearly flow is around 15,300 cfs, with monthly average flows ranging from a low monthly average of around 8,800 cfs in August to a high of around 26,400 cfs in March (based on the water years from October to September of 1982 to 1992). Dissolved oxygen (DO) in the River upstream from the Henry facility is at saturation during the September critical period, and DO downstream from the Noveon facility is around 94% to 96% of saturation. Background ammonia concentration in the River is 0.297 mg/L during the summer months and background organic nitrogen is around 0.8 mg/L. Tr. 206.

Argument

I. The Transcript of the Proceedings in Noveon's Permit Appeal, PCB 91-17, Should Be Incorporated into this Proceeding

Prior to the hearing, Noveon moved for entry of the entire transcript of the hearing in PCB 91-17 into the record of the adjusted standard, including the transcript of the hearing continuation for which a transcript was then unavailable.[2] This request was based on Noveon's desire for the Board to consider all the evidence submitted with respect to the ammonia limitation in the NPDES Permit, as well as avoiding prolonging the hearing by requiring testimony of witnesses in the 1991 hearings who were not necessarily required to be called for any new testimony at the hearings in 2004. At the hearing in 1991, testimony was taken from the following witnesses called by Noveon: Ken Willings, then Senior Manager of Health, Safety and Environmental for the specialty polymers and chemicals division of BF Goodrich; Richard Pinneo, of Illinois EPA's Bureau of Water, and Tim Kluge, also of Illinois EPA's Bureau of Water. A great deal of testimony was taken relevant to the application of Section 304.122 of the Board's rules, its background and purpose, the NPDES permit history, Noveon's Henry Plant and its products, Noveon's decision-making, and other areas of inquiry that are clearly also relevant to the adjusted standard proceeding.

The Illinois EPA objected to incorporation of the transcript, and the Hearing Officer refused to incorporate the transcript of the hearing in PCB 91-17 into this record. At the hearing, Noveon again moved for incorporation of the transcript, and submitted a copy of the transcript from 1991 that had been reviewed to remove material unrelated to Section 304.122's application

[2] This request for incorporation of the entire record includes the transcript of hearings on November 19, 1991, December 16, 1991, February 17, 2004, and all the exhibits entered at these hearings.

to Noveon so as to lessen any purported burden on the Board. The Hearing Officer accepted the copy of the transcript as an offer of proof as Pet. Ex. 38. Tr. 326.

Incorporation of a transcript from another Board proceeding is governed by Section 101.306 of the Board's rules, which states:

> (a) Upon the separate written request of any person or on its own initiative, the Board or hearing officer may incorporate materials from the record of another Board docket into any proceeding. The person seeking incorporation must file with the Board 4 copies of the material to be incorporated. The Board or hearing officer may approve a reduced number of copies for documents incorporated in other Board dockets. The person seeking incorporation must demonstrate to the Board or the hearing officer that the material to be incorporated is authentic, credible, and relevant to the proceeding. Notice of the request must be given to all identified participants or parties by the person seeking incorporation.

This is a lenient standard, as it should be since an adjusted standard proceeding is quasi-regulatory. Noveon unquestionably met all three requirements of authenticity of the transcript, credibility (which is determined by the Board in both proceedings) and relevancy.

Illinois EPA claimed that it would be prejudiced by incorporation of the transcript because incorporation was akin to consolidation of the proceedings. Illinois EPA cited Section 35 Il. Adm. Code 101.406 of the Board's rules concerning consolidation. Illinois EPA's objection was apparently based on the differing burdens of proof in each proceeding.

This argument distorts Noveon's request. Noveon does not seek a consolidation but only incorporation of authenticated, credible and relevant testimony into the adjusted standard proceeding. The Board is perfectly capable of assessing the evidence in light of the proper burden of proof applicable to each proceeding, and the separate briefs of the parties will certainly allow each party to ensure that the proper burden of proof is applied. Section 101.306(b) allows the Board to evaluate incorporated testimony with consideration of the burden of proof. In addition, Noveon believes that the burden is more stringent in an NPDES Permit Appeal than the adjusted standard proceeding in which Noveon wants testimony incorporated, so no prejudice can be claimed by incorporation of testimony from a proceeding subject to a more rigorous burden of proof into one with a less rigorous burden of proof. The rules of evidence governing these proceedings are in any case the same, so a differing ruling to an objection to evidence would be highly unlikely to result in this case and rather questionable if it did.

Mr. Ken Willings is the only prior witness who was not employed by Illinois EPA, and he was cross-examined at the original hearing in 1991 and agreed to be and was present and available for cross-examination at the Adjusted Standard hearing. As for the other witnesses, they continue to be employed by Illinois EPA, and Mr. Pinneo, who was called by Noveon in 1990, testified on behalf of Illinois EPA in both proceedings.

Illinois EPA has had the prior transcript from the permit appeal for over ten years in a proceeding clearly inextricably intertwined with the adjusted standard proceeding, and it had the opportunity to cross-examine all witnesses who testified in 1991 and 2004. There is no prejudice to Illinois EPA in allowing incorporation of the entire transcript. The transcript is authentic, credible, and relevant, and Noveon's motion therefore meets the requirements of the Board's rule. The Board should therefore overturn the hearing officer and incorporate the entire transcript of the hearing on Noveon's NPDES permit appeal.

II. Based on Information Developed Subsequent to the Illinois EPA's Issuance of the NPDES Permit in 1990, Section 304.122 Does Not Require an Ammonia Limit

In the 1990 permit, for the first time, the Agency determined that Section 304.122(b) of the Board's rules required an ammonia effluent limitation for the Noveon Henry Plant's discharge. Illinois EPA's application of the rule ignores its plain meaning and relies on a misinterpretation that has no basis in the language of the rule, the Board's opinion promulgating it, or any Illinois guidance document. Section 304.122 reads as follows:

> (a) No effluent from any source which discharges to the Illinois River, the Des Plaines River downstream of its confluence with the Chicago River System or the Calumet River System, and whose untreated waste load is 50,000 or more population equivalents shall contain more than 2.5 mg/L of total ammonia nitrogen as N during the months of April through October, or 4 mg/L at other times.
>
> (b) Sources discharging to any of the above waters and whose untreated waste load cannot be computed on a population equivalent basis comparable to that used for municipal waste treatment plants and whose total ammonia nitrogen as N discharge exceeds 45.4 kg/day (100 pounds per day) shall not discharge an effluent of more than 3.0 mg/L of total ammonia nitrogen as N.
>
> (c) In addition to the effluent standards set forth in subsections (a) and (b) of this Section, all sources are subject to Section 304.105 [requiring compliance with water quality standards, including those for ammonia].

By its unambiguous terms, Section 304.122(a) applies to sources that discharge to specified waterways, including the Illinois River, and "whose untreated waste load is 50,000 or more population equivalents." A population equivalent is defined in Board regulations as follows:

> Population Equivalent is a term used to evaluate the impact of industrial or other waste on a treatment works or stream. One population equivalent is 100 gallons (380 l) of sewage per day, containing 0.17 pounds (77 g) of BOD_5 (five day biochemical oxygen demand), and 0.20 pounds (91 g) of suspended solids. The impact on a treatment works is evaluated as the highest of the three parameters. Impact on a stream is the higher of the BOD_5 and suspended solids parameters.

See 35 Il. Adm. Code 301.345.

That Noveon's P.E. was less than 50,000 when the NPDES Permit was issued is part of the NPDES Permit Appeal and included in the Post-Hearing Memorandum filed in that proceeding. That argument will not be repeated here but is incorporated by reference. But correct calculations using information developed subsequent to the 1990 NPDES Permit continue to establish that the Noveon plant has less than 50,000 population equivalents. Consequently, by its plain language, 35 Il. Adm. Code 304.122(a) cannot be the basis for any ammonia effluent limit on the Henry Plant's wastewater discharge.

Illinois EPA provided a calculation of Noveon's Population Equivalents subsequent to its decision on the NPDES Permit in responses to Noveon's interrogatories in this case. These calculations were inflated in that they are not based on Noveon's combined untreated wasteload. Pet. Ex. 7, at 12. Rather, they were based on the wasteload fed from the equalization tanks to the primary clarifier. This wasteload contains wastestreams that are internal to the wastewater treatment facility, including primary clarifier sludge when sludge dewatering is not occurring, filtrate from sludge dewatering and backwash water from the tertiary (secondary clarifier effluent) filter. These wastestreams add flow, BOD and TSS, so that they are not representative of the untreated wasteload and their use amounts to multiple-counting of wastestreams which stay within the wastewater treatment facility. Illinois EPA has recognized as much; at the hearing in this matter, the Illinois EPA's witness responsible for making the erroneous calculation admitted that he incorrectly calculated the population equivalent. *See* Tr. 426-28, 442. It has not provided any new calculations, however, instead electing to challenge the calculations of Noveon's expert, Mr. Flippin by claiming Mr. Flippin omitted wastestreams.

Even using Illinois EPA's initial inflated calculation, the population equivalents for flow and BOD were 916 and 19,412, respectively. For TSS, Mr. Flippin calculated the population equivalent using the untreated wasteload based on information supplied by Noveon, which has been filed with the Board. This calculation yielded a population equivalent of 24,955. Pet. Ex. 7 at 13. Because all wastestreams expected to have any significant levels of TSS were included, Mr. Flippin testified that his calculation of population equivalents was accurate to within 25 percent. Tr. 486-88.

In addition, though not a part of the definition of population equivalents in the Board regulations, a population equivalent can also be calculated based on ammonia nitrogen and Total Kjedahl Nitrogen (TKN), which is really the thrust of Section 304.122. These population equivalents are also below 50,000. The Noveon Henry Plant's untreated wasteload would yield a population equivalent of 20,263 for ammonia nitrogen and 35,793 for TKN. Pet. Ex. 7 at 13. Therefore, using all relevant calculations, Noveon's untreated wasteload yields a population equivalent of less than 50,000 and therefore Section 304.122(b) should not apply to Noveon's discharge.

Mr. Pinneo testified that Section 304.122(b)'s applicability to "sources discharging to any of the above waters and whose untreated waste load cannot be computed on a population equivalent basis comparable to that used for municipal waste treatment plants" requires the untreated wasteload to be comparable to the untreated wasteload for municipal plants. This is not reflected in the language of the regulation or the Board's order adopting the regulation. The Board is directed to a more extensive discussion of Illinois EPA's interpretation of this provision on the Post Hearing Memorandum filed in PCB 91-17, which is based on evidence also admitted in this proceeding. Further, Mr. Pinneo clearly stated that this interpretation was not reflected in any regulation or guidance by the Illinois EPA. Tr. 449. It does not comport with the plain language of Section 304.122(b), and therefore cannot be applied.

III. Factors Governing Issuance of an Adjusted Standard

The Board's regulations require it to review a request for an adjusted standard by making the following assessment:

1. Factors related to the petitioner are substantially or significantly different from the factor relied upon by the Board in adopting the general regulation applicable to that petitioner;

2. The existence of those factors justifies an adjusted standard;

3. The requested standard will not result in environmental or health effects substantially or significantly more adverse than the effects considered by the Board in adopting the rule of general applicability; and

4. The adjusted standard is consistent with any applicable federal law. 35 Il. Adm. Code 104.427.

Noveon meets each element of this standard. Ammonia from Noveon's plant is not removed by the conventional treatment considered by the Board, nitrification, in adopting Section 304.122(b). In fact, there is no economically reasonable and technologically feasible alternative available to Noveon for ammonia treatment. Nevertheless, Noveon's wastewater will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting Section 304.122(b), and specifically will not adversely impact dissolved oxygen in the Illinois River. Finally, the adjusted standard is consistent with federal law in that Section 304.122(b) is purely a state effluent standard and there will be no violation of water quality standards if the relief requested is granted.

IV. Factors Related to Noveon Are Substantially and Significantly Different from the Factors Relied Upon By the Board in Adopting the Regulation of General Applicability

The Board promulgated what is now Section 304.122(a) in 1972, after hearing and testimony on the effects of ammonia on dissolved oxygen levels in the Illinois River. *See Board Order, In the Matter of Effluent Criteria, In the Matter of Water Quality Standards, and In the Matter of Water Quality Standards Revisions for Intrastate Waters*, R 70-8, 71-14, and 71-20

(Jan. 6, 1972). This rule applied to sources "whose untreated wasteload is 50,000 or more population equivalents." In 1973, the Board followed up with what is now Section 304.122(b), specifically directed at "industrial dischargers of more than 100 lbs. of ammonia as N, whose wasteload cannot be computed on a population equivalent (PE) basis." *See Board Order, In the Matter of Water Quality Standards Revisions*, R 72-4 (Nov. 8, 1973).

In adopting Sections 304.122(a) and (b), the Board explicitly found that "present technology is capable of meeting this limit and should result in the removal of much ammonia nitrification oxygen demand (NOD) from the stressed waterways." *See Order of the Board*, R 72-4 (Nov. 8, 1973). The Board found that "nitrification can be satisfactorily accomplished for a reasonable price by a second stage of biological treatment." *See Order of the Board*, R 70-8, 71-14, 71-20 (Jan. 6, 1972).

The Board's conclusion is not the case for Noveon. Noveon's facility is designed to meet the standards applicable to nitrifying facilities, but it does not nitrify because of inhibitors in its wastewater. Even further, however, Noveon has spent incalculable time and incurred significant expense trying to find a method of treatment for ammonia. Noveon has conducted literature reviews, consultation with numerous experts including those testifying in this proceeding, laboratory-scale treatment investigations, full-scale operations and capital enhancements, and full-scale plant trial investigations to assess the feasibility of source reduction, removal and recycling of organic nitrogen compounds, pre-treatment technologies, and post-treatment technologies for ammonia. None of these assessments resulted in discovery of any treatment alternative that was both technologically feasible and economically reasonable as a method to achieve compliance with 35 Il. Adm. Code 204.122(b).

A. Noveon Cannot Eliminate Organic Nitrogen Compounds from Its Wastewater

Noveon has evaluated all of its processes for contribution of ammonia precursors to the wastewater treatment system. These have included Noveon's research scientists' evaluation of numerous methods of morpholine, MBT, and t-butyl amine removal from various processes. Noveon eliminated many of these alternatives based on safety and quality control issues for plant workers and customers, as well as environmental concerns not presented by the current effluent discharge. The process for removal of organic nitrogen compounds for many of these alternatives presented risks of explosion, quality control issues related to recycled morpholine, and hazardous waste generation. Pet. Ex. 6 at 7, 8. Flowcharts of the systems that were evaluated are at Pet. Exs. 2, 3, 4, and 5.

Noveon did have some success with its source reduction efforts. In 1996, Noveon spent more than $742,000 to install a new filter system, which significantly improved the dewatering of the wastestreams with organic nitrogen compounds and reduced the loss of solids to the wastewater treatment system. Tr. 36. As a result of this improvement, the annual amount of solids lost to the wastewater treatment system was decreased by 100,000 pounds per year. In 2000 and 2001, Noveon performed an improvement to better capture accelerator product. This improvement reduced 66,000 pounds per year of product to the wastewater treatment system. Tr. 37. Noveon made improvements to its fines (small particles) scrubber to reduce the loss of fines to the wastewater treatment system by 123,000 pounds per year. This effort was recognized with the Governor's Award for Pollution Prevention. Tr. 37. In 2003, Noveon made improvements to the tertiary butyl amine recovery, reducing losses to the wastewater treatment system by 185,000 pounds per year. Noveon was again recognized for this effort with the Governor's Award for Pollution Prevention. Tr. 38.

Noveon's wastewater treatment process does achieve some ammonia removal as a result of BOD removal. Without the BOD removal, the discharge of ammonia would be about 20 mg/L higher than it currently is. Tr. 494.

B. Noveon Cannot Achieve Nitrification in a Cost-Effective or TechnicallyFeasible Manner

Noveon's wastestreams require pretreatment ahead of the on-site biological treatment system to prevent process upsets and noncompliance with effluent BOD and TSS limits. Consequently, there is an inherent unreliability with any biological treatment process used on site whether it is used for BOD removal or nitrification. Pet. Ex. 7 at 16.

The Noveon plant has investigated and experimented extensively with potential treatment methods. These evaluations have included literature reviews, consultation with additional experts, laboratory-scale treatment investigations, full-scale operations and capital enhancements and full-scale plant trial investigations. Pet. Ex. 7 at 18.

Houston Flippin, Noveon's expert, performed over the course of 14 years a thorough evaluation of the costs, feasibility, and effectiveness of all proven technologies for treatment of ammonia. Tr. 75-77. These treatment technologies include the following:

1. Alkaline air stripping of the PC tank, the PVC tank, and the secondary clarifier effluent, which involves converting the ammonia to a gas and stripping it off.
2. Struvite precipitation from the combined wastestream influent, which involves precipitation of ammonia as struvite, which is essentially ammonium magnesium phosphate.
3. Effluent breakpoint chlorination, which involves oxidation of ammonia to nitrogen gas.
4. Single-stage biological nitrification of the PVC tank (non-Noveon) wasteflow combined with separate biological treatment of the PC tank discharge.
5. Biological nitrification of the combined influent wastestream in a single stage.

6. Ion exchange treatment of final effluent, which involves the use of hydrogen resin in a columns system to take hold of the ammonia ion in solution.

7. Ozonation of final effluent, which involves oxidizing ammonia to nitrogen gas,which then leaves as a gas.

8. Nitrification of secondary clarifier effluent (tertiary nitrification).

Tr. 76-77.

Mr. Flippin testified that these "are the proven technologies for effluent ammonia reduction." Tr. 77. Pet. Ex. 11 was prepared by Mr. Flippin, and provides information on the cost of these treatment alternatives. Tr. 75. This exhibit is the product of treatability testing, full-scale plant testing, and data from the Noveon Henry Plant. The costs included in this exhibit are capital costs, annual operating costs, and present worth costs. Mr. Flippin included the present worth costs in order to take into account both installation costs and costs to keep a process running. Tr. 85-86. The present worth cost is the value that is truly representative of the funds that Noveon would have to have "in the bank today, to not only build it, but to keep [each alternative] running". Tr. 85-86. Mr. Flippin used a ten-year period for present worth cost, which is considered to be a minimum term in project life and in line with the conventional practice of using no more than thirty years for project life; had Mr. Flippin used a longer life, it would have increased the operation and maintenance costs and hence the present worth costs.[3] Tr. 87-88. Pet. Ex. 11 also contains block flow diagrams for each treatment alternative that shows the existing equipment in bold and equipment that Noveon would be required to purchase in a non-bolded line.

[3] The Agency has suggested a twenty-year life for equipment. As a result, Mr. Flippin performed his analysis using a twenty-year lifespan, which would have made the present worth cost of annual O&M much higher. See Pet. Ex. 13 and Tr. 96.

Pet. Ex. 12 contains the breakdown of costs for each treatment alternative, which includes the required costs (as applicable to each alternative) for labor at $40/hour including benefits, electrical usage at $0.06 per kilowatt hour, natural gas costs based on $0.06 per therm, maintenance materials cost using a conventional value of five percent of the equipment costs annually, and chemical costs, which were calculated using the actual cost that Noveon paid for chemicals at the time the exhibit was prepared. Tr. 83-85. This exhibit also shows the average ammonia removal in pounds per day and percentage, so that an incremental present worth cost of ammonia removal can be evaluated.

Finally, Pet. Ex. 13 shows the capital, annual operating and present worth costs for each alternative. Mr. Flippin included in the first chart a 10-year project life and in the second chart a 20-year project life. Tr. 95-96. The next two pages include the average percentage of ammonia removal provided by each alternative along with a reliability rating. The reliability rating is on a scale of 0 (lowest reliability) to 10 (highest reliability) and was based on the relative assessment of mechanical and processed performance reliability to achieve the average percent ammonia removal stated. The next column describes what each technology would involve and what obstacles, if any, they would face. Tr. 97.

With that background, below is a summary for each alternative, the present worth costs, the percentage of ammonia removal, and the reliability rating, along with a brief discussion of the technical obstacles of each alternative. For a more detailed discussion, Pet. Exs. 11 through 13 should be reviewed.

1. <u>Alkaline Air Stripping</u>

Ammonia exists in two forms, aqueous and gaseous, and as pH increases the aqueous form becomes a gas. Tr. 76 and Pet. Ex. 13 at p. 1 of 4. Thus, by increasing the pH of a wastewater stream it is possible to strip or remove the ammonia gas. *Id.* This alternative as investigated involved the use of air stripping at three separate portions of the treatment system as a means of ammonia removal: (1) within the PC tank; (2) within the PVC tank and (3) the secondary clarifier effluent. Pet. Ex. 7 at 25; Pet. Ex. 11 at 2 and Fig. 2; Pet. Ex. 13 at 1.

Because samples of the PC tank and PVC tank discharges contained greater than 500 mg/L TSS, a packed tower air stripper or horizontal tray stripper would require frequent maintenance due to fouling. Thus, diffused air stripping and surface aeration processes were both selected for evaluation in both the PC tank and PVC tank. Pet. Ex. 13 at 1. Due to the slow rate of these stripping processes, the small amount of ammonia available in these tanks, and the large flow rates of the wastewater into the PC tank and PVC tank, only stripping within existing tankage was considered. Building additional tankage would have only made these processes look less economically favorable. With respect to stripping ammonia from the PC tank and PVC tank, since the bulk of the ammonia discharged from the Henry Plant is generated as a byproduct in the downstream wastewater treatment facility, ammonia reductions of only 14-27% were achieved. Pet Ex. 13 at 1. Conventional packed tower air stripping was selected for evaluation of the wastewater treatment facility effluent downstream of the secondary clarifier wastewater since this is a well-established stripping technology. *See* Pet. Ex. 7 at 22-23 and Pet. Ex. 13 at 1.

This low level of ammonia reduction means air stripping from the PC tank and PVC tank would not achieve sufficient ammonia reduction that would allow the Henry Plant to meet the effluent limitation of 35 Il. Adm. Code 304.122(b). Pet. Ex. 13 at 1. Further, given the present worth costs (capital, operation and maintenance costs) of $2.21 million for PC tank treatment and $14.1 million for PVC tank treatment, this alternative was also deemed economically unreasonable in light of the high costs and low ammonia reduction obtained of only 27% and 14%, respectively. Pet. Ex. 13 at 1.

The ammonia removal achieved from air stripping of the secondary clarifier was greater than 95% using packed tower air stripping technology. Pet. Ex. 13 at 1. One difficulty with this alternative is that it would increase Total Dissolved Solids (TDS) by more than 20%, which would likely increase the aquatic toxicity of the effluent.[4] *Id.* The most important difficulty with this treatment alternative is its complexity to operate, high operation, maintenance and installation costs, together making it economically unreasonable with present worth costs of over $14 million. Pet. Ex. 13 at 1. The costs associated with this alternative would be even higher if additional equipment were required to remove the ammonia from the off-gas.[5] Other technical difficulties with this alternative, namely fouling of tower media with precipitants, make this an unreliable technology. Pet. Ex. 13 at 1.

2. <u>Struvite Precipitation</u>

This alternative involved an analysis of the ammonia reduction achieved by the precipitation of struvite from the combined Noveon Henry Plant and PolyOne wastestream. Pet. Ex. 11 at 2 and Fig. 3. This treatment process, however, provides only a 24% reduction in the average final effluent ammonia level at a present worth cost of $5.1 million. Pet. Ex. 11 at 2. This alternative also would increase TDS in the Henry Plant effluent and the precipitant is prone

[4]The toxicity of Noveon's discharge for TDS and the implications of this are discussed later in this brief.
[5] Even without off-gas treatment this alternative has a present worth cost of $10.5 million. Pet. Ex. 13 at 1.

to foul pumps and piping making it operationally unreliable as a compliance alternative. Pet. Ex. 13 at 2.

In sum, struvite precipitation would not result in compliance with the ammonia effluent limit in Section 304.122(b). Because only a small portion of the wastewater nitrogen load would be removed from the Henry Plant treatment system by struvite precipitation, the technology would increase effluent TDS, Noveon would encounter operating difficulties due to anticipated fouling, and high costs, make this an infeasible compliance alternative. Pet. Ex. 13 at 2.

3. Effluent Breakpoint Chlorination

Brown and Caldwell also evaluated the use of chlorine to achieve ammonia reduction. Pet. Ex. 7 at 25 and Pet. Ex. 11 at 2 and Fig. 4. This alternative involved routing of the secondary clarifier wastewater to a reaction tank where chlorine gas would be sparged into the tank and caustic soda added to maintain a pH of approximately 6.9. Pet. Ex. 11 at Fig. 4 and Pet. Ex. 13 at 2. Following the addition of chlorine, the wastewater would be discharged to the existing sand filters.

This alternative could reduce ammonia by 98% and meet the standard set forth in 35 Il. Adm. Code 304.122(b). Pet. Ex. 13 at p. 2 of 4. The problem it presents, however, is that breakpoint chlorination is prohibitively expensive, at a present worth cost of $9.7 million, which makes it economically unreasonable. Pet. Ex. 11 at Table 5. Thus, this alternative admittedly reduces ammonia but is economically unreasonable. This alternative is also problematic because it would dramatically increase effluent TDS and would likely result in the formation of chlorinated organics in the effluent. Pet. Ex. 13 at p. 2 of 4.

4. Single-stage Biological Nitrification of Non-PC Wastewater

Noveon's expert Houston Flippin also examined what level of ammonia reduction would occur by first-stage nitrification of the non-PC wastewater followed by second-stage biological treatment of the PC tank wastewater after combination with effluent from the first-stage reactor. Pet. Ex. 11 at Fig. 5 and Pet. Ex. 13 at 2. This alternative involved the existing sludge system to remove BOD and nitrify the PVC wastewater, and the treated effluent would then be combined with PC wastewater and treated in a new activated sludge system. Pet. Ex. 13 at 2. It was determined after the batch treatability study that this was not a feasible compliance alternative because of the low level of ammonia reduction that was achieved and complexity of operation. This alternative had a reliability rating of 7, meaning it would not produce a reliable reduction 30 % of the time. Pet. Ex. 13. The percentage of ammonia reduction was only 47%, which is too low to achieve compliance with the effluent ammonia standard, and yet had a present worth cost of $4.9 million. Pet. Ex. 11 at Table 5 and Pet. Ex. 13 at 2, 4.

5. Biological Nitrification of Combined Wastewater

Brown and Caldwell conducted a series of batch and continuous flow treatability studies that Noveon's expert witness Houston Flippin designed and supervised to remove bio-inhibitions. One such treatability study required pH reduction to 2 of the PC tank discharge, followed by river water addition and combined single-stage nitrification with non-PC wastestreams. Pet. Ex. 11 at Fig. 6; Pet. Ex. 13 at 3. The results of the analysis by Noveon's expert showed that biological nitrification of the combined wastewater stream was technically feasible with pretreatment. Pet. Ex. 7 at 20. This alternative suffers from a lack of reliability, though, which is necessary for consistent compliance, since it is sensitive to the variable characteristics inherent in the wastewater produced by the different batch processes at the Henry

Plant and the system's performance would vary with the success of bio-inhibitor removal. Pet. Ex. 7 at 27 and Pet. Ex. 13 at 3. This alternative had a reliability rating of only 7, meaning it would not produce a reliable reduction 30 % of the time. Pet. Ex. 13.

Further, biological nitrification is a very costly alternative. Brown and Caldwell estimated the present worth costs of this alternative at $11.7 million. Pet. Ex. 11 at Table 5 and Pet. Ex. 13 at 2. Those costs make this an economically unreasonable alternative, particularly in light of the reliability concerns associated with it. Thus, biological nitrification of the combined wastewater after pretreatment to remove bio-inhibitors is not only an extremely expensive alternative but is also too unreliable to achieve consistent compliance. Pet. Ex. 7 at 27.

6. <u>Ion Exchange</u>

One other compliance alternative analyzed by Brown and Caldwell was ion exchange treatment of the secondary clarifier effluent using clinoptilolite, an ammonia selective ion exchange resin. Pet. Ex. 11 at Fig. 7 and Pet. 13 at 2. A standard hydrogen ion exchange resin was also considered. This alternative could reduce ammonia nitrogen by 98% and meet the ammonia effluent standard of 35 Il. Adm. Code 304.122(b). The batch treatability test results demonstrated that approximately 100 lbs. of clinoptilolite would be required to remove each pound of ammonia. Pet. Ex. 7 at 19. This poor removal efficiency was presumed to be due to the large concentration of competing ions in the effluent. Further, the ion exchange system is complex to operate and its reliability questionable because of fouling of the resin columns with precipitants and biomass. Pet. Ex. 13 at 3. This alternative had a reliability rating of 6, meaning it would not produce a reliable reduction 40 % of the time. Pet. Ex. 13. The poor removal efficiency and reliability concerns precluded further consideration of ion exchange as a compliance alternative. This alternative had a present worth cost of $5.1 million. Pet. Ex. 11 at Table 5.

7. Ozonation

This ammonia treatment alternative was one of the last technologies evaluated by Noveon's expert as a compliance alternative. Pet. Ex. 7 at 24, Pet. Ex. 11 at Table 9; Pet. Ex. 13 at 4. This alternative could reduce ammonia by 98% and meet the ammonia standard set forth in 35 Il. Adm. Code 304.122(b). It was rejected as an alternative due to its high present worth costs of $20.3 million, which were almost twice the cost of any other alternative. Pet. Ex. 11 at Table 5. Further, it would significantly increase the effluent TDS concentrations. Pet. Ex. 7 at 24. This alternative would likely also convert some of the effluent non-degradable COD into BOD, which could cause BOD effluent limit violations. *Id.*

8. Tertiary Nitrification

This alternative would involve pumping the secondary clarifier effluent through a separate aeration basin containing fixed film media that nitrifying bacteria would grow on. Pet. Ex. 7 at 19, Pet. Ex. 11 at 2; Pet. Ex. 13 at 4 of 4. Alkalinity and DO would be controlled in this basin to meet the demands associated with nitrification. Pet. Ex. 13 at p. 4 of 4. Effluent from this tank would be directed to the existing tertiary filtration process that would be expanded to accommodate the additional solids loading. Results of analyses dating back to the late 1980s and confirmed during the 1990s indicate this process is a technically feasible compliance alternative. The difficulty with this alternative is that it lacks reliability, which is necessary to achieve and maintain compliance, due to its great sensitivity to variations in wastewater characteristics that occur with the Henry Plant's batch processes. Pet. Ex. 7 at 19. This alternative had a reliability rating of 7, meaning it would not produce a reliable reduction 30 % of the time. Pet. Ex. 13.

Further, tertiary nitrification is a very costly alternative. Brown and Caldwell estimated that the present worth costs of tertiary nitrification are $11.4 million. Pet. Ex. 11 at Table 5. Those costs make this an economically unreasonable alternative, particularly in light of the reliability concerns associated with it.

9. Other Ammonia Reduction Efforts

One of the early efforts to reduce ammonia at the Henry Plant involved the use of powdered activated carbon (PAC) to remove the bio-inhibiting compounds. Pet. Ex. 7 at 18. The results of batch testing to evaluate this alternative established that an untenable, large dose of PAC was required: 5000 mg/L or 17 tons/day. *Id.* In addition, treatment of the PC Tank discharge and the primary clarifier effluent with Granular Activated Carbon (GAC) was considered but quickly abandoned due to the large PAC dosing required and the certain fouling problems. Pet. Ex. 7 at 19.

A German process to recover MBT was also evaluated as a potential ammonia reduction method. Pet. Ex. 7 at 20. This process involved solvent extraction but posed significant safety concerns due to the potential for explosions. *Id.*

Noveon also evaluated the use of specialty bacteria as a treatment alternative. Pet. Ex. 7 at 21-22. Nitrifying bacteria from the Peoria Sanitary District and U.S. Steel's biological nitrification plant were added but to no avail; nitrification would not occur. Pet. Ex. 7 at 22.

One of the steps taken by Noveon's expert did not involve the evaluation of treatment technology but examined whether there was an error in the method used to measure ammonia. Pet. Ex. 7 at 27. This required an analysis of three U.S. EPA approved methods of ammonia measurement. All methods accurately measured ammonia in the Noveon Henry Plant wastewater and the different test methods did not account for any appreciable differences in ammonia levels. Pet. Ex. 7 at 27.

C. The Costs of Treatment Alternatives Impact the Long-Term Viability of the Plant

Noveon asked an accountant from its corporate headquarters, Linda Shaw, to analyze the projected cost of four of the alternatives evaluated by Mr. Flippin on the profitability of Noveon's Henry Plant, as reported in its Plant Sales and Income (S&I) report. Pet. Exs. 33 and 34. The alternatives considered were reported in Mr. Flippin's memorandum at Pet. Ex. 11 as treatment alternative 3 (alkaline air stripping of secondary clarifier effluent), 6 (nitrification of PVC tank wastewater), 7 (nitrification of combined wastewater) and 10 (nitrification of secondary clarifier effluent). These alternatives were selected for evaluation based both on what were perceived to be the technologies Illinois EPA considered economically reasonable and technologically feasible in its recommendation in this matter, as well as that the costs evaluated were representative of costs for the range of the treatment technologies considered by Mr. Flippin.

Ms. Shaw calculated two financial ratios – return on revenue and return on net property, plant and equipment – as indicators for how the plant is performing. The return on revenue was calculated by dividing operating income by revenue. The return on net plant, property and equipment was calculated by dividing operating income by net plant, property and equipment. As the chart shows, both of these financial ratios have declined over the last 3 years. The return on revenue declined from 7% in 2001, to 5% in 2002 to 2% in 2003. Likewise the return on net plant, property and equipment declined from 6% in 2002 to 3% in 2003.

If the Henry plant were to implement any of the ammonia-nitrogen treatment alternatives detailed in the Houston Flippin memorandum dated May 17, 2002, operating income would be further eroded resulting in a lower return on revenue and a lower return on net plant, property and equipment. For alternative 3 (alkaline air stripping of secondary clarifier effluent), the Henry plant would incur an incremental cost of $1,049,000.00. This alternative would result in a negative return on revenue of -2% and a return on net plan, property and equipment of -2%. For alternative 6 (nitrification of PVC tank wastewater), the Henry plant would incur an incremental cost of $329,000.00. This alternative is the only one of those considered that would not generate a negative return on revenue and on net plant, property and equipment. This alternative would result in a drop to 1% on revenue and 2% on net plant, property and equipment. For alternative 7 (nitrification of combined wastewater), the Henry Plant would incur an incremental cost of $1,089,000.00. Alternative 7 would result in a negative return on revenue of -2% and a return on net plan, property and equipment of -2%. For alternative 10 (nitrification of secondary clarifier effluent), the Henry Plant would incur an incremental cost of $692,000.00. Alternative 10 would result in a negative return on revenue of -1% and a return on net plan, property and equipment of -1%. Pet. Ex. 33 and 34.

Based on the analysis by Ms. Shaw, the return on investment for Noveon's Henry Plant would be very small or negative for the treatment technologies she considered. The Noveon Henry Plant's major product line would lose money. Tr. 285. Mr. Guy Davids, the former production superintendent and former site manager of the Henry Plant during a portion of the period of Noveon's investigation of treatment technologies for ammonia, testified that the consequences of the low to negative return would be that the plant's management would have a very difficult time justifying essentially any capital to the plant. It would also be very difficult to attract new products. Tr. 286. Mr. Davids testified that if the Henry Plant were required to implement the treatment technologies at a cost considered by Ms. Shaw, he would be concerned about the long-term viability of the plant. Tr. 286.

In sum, Noveon, its consultants and expert have evaluated all the available proven ammonia treatment alternatives. As Houston Flippin testified to at great length during the hearing, no treatment technology could provide significant (greater than 50%) reduction in effluent ammonia for a present worth cost of less than $5.0 million, and the present worth cost of installing single stage nitrification is $11.7 million. The costs of implementing these alternatives would be a low to negative return, which would impact the long-term viability of the plant. In addition, the absence of an impact on the water quality of the Illinois River and upon aquatic life adds to the economic unreasonableness of these alternatives.

V. The Adjusted Standard Will Not Result in Environmental or Health Effects Substantially or Significantly More Adverse than the Effects Considered by the Board in Adopting the Rule of General Applicability

A. Dissolved Oxygen, Which Was the Basis for the Board's Ammonia Effluent Limitation, Is Not Adversely Affected by Noveon's Discharge

The purpose of Section 304.122 was to protect against dissolved oxygen sags in the Illinois River, which the Board in its order stated was "conclusively established" in a study by T.A. Butts, R.L. Evans and others. The Board's own opinion in another case shows that Mr. Butts and Mr. Evans abandoned the conclusions of these earlier studies. Later work showed that based on the relative influence of the three primary oxygen demand sinks—carbonaceous BOD, nitrogenous BOD, and sediment oxygen demand—effluent limitations in the ammonia rule were unjustified and severely restrictive. *In the Matter of Site Specific Exception to Effluent*

Standards for the Greater Peoria Sanitary District and Sewage Disposal District, R 87-21 (Oct. 6, 1988).

Work performed by Noveon's expert witness, Michael Corn, also shows that the adjusted standard will not result in environmental or health effects substantially or significantly more adverse than the effects considered by the board in adopting the rule of general applicability. Mr. Corn developed a wasteload allocation model to assess the effect of Noveon's discharge on the Illinois River, using the U.S. EPA's QUAL2E model, data from the Illinois River, and reaeration rates and deoxygenation rates measured in similar size rivers. The model was run with Noveon's permitted 5-day carbonaceous biochemical oxygen demands ($CBOD_5$) or organic loadings and high ammonia loadings. Both $CBOD_5$ and ammonia are oxygen depleting substances. Pet. Ex. 16 at 12. The results of this modeling showed that, during the critical 7Q10 low flow and corresponding high temperature periods,[6] the DO concentration in the Illinois River downstream from the Noveon discharge is around 7.5 mg/L. Pet. Ex. 16. The existing DO standard is 5 mg/L during this time period. See 35 Il. Adm. Code 302.206. The Illinois River therefore meets existing standards for DO, and Noveon's discharge has not had an adverse impact on DO levels downstream of its discharge.

B. Noveon's Discharge Does Not Have an Adverse Impact on Aquatic Life

Given the rapid mixing that physically occurs in the Illinois River, however, there is no impact to aquatic life from Noveon's discharge. Mixing of an effluent into a river is a natural phenomenon that allows the two waters to reach equilibrium where the two are totally mixed.

[6] The summer conditions of low flow, high temperature are the most critical from a water quality and toxicity standpoint. Tr. 212.

Pet. Ex. 16 at 4. Physical mixing of a tributary or an effluent discharge (the entering stream) that enters into a larger body of water (the receiving stream), such as the Illinois River, occurs because the entering stream of water normally has enough physical energy, either through the entering velocity being greater than the river or a density gradient between the entering stream and the river. This allows the entering stream to force its way into the river, similar to a car entering the freeway from a merging lane. Until the mixing of the entering stream and the receiving stream are in equilibrium, a definitive plume occurs where the entering stream and the receiving stream are at different concentrations and densities. *Id.*

The actual mixing that occurs between the Noveon discharge and the River has been physically monitored and mathematically modeled. The "near field zone" is defined as the turbulent zone at the discharge point where rapid and immediate mixing occurs due to the immediate mixing of a high energy stream and a low energy stream. Pet. Ex. 16 at 5. The near field zone includes the jet momentum zone through the early phases of a buoyant spreading region, where the plume goes from rapid and immediate effluent-dominated mixing to mixing totally dominated by river ambient diffusion. See Pet. Exs. 20 and 23, with a depiction of these areas. When an effluent discharge flows into a receiving stream, it normally has an excess velocity over the stream itself, which is the case with Noveon's discharge. This excess velocity allows the stream to push its way into the river until the river and effluent mixture reach equilibrium. Additionally, the Noveon discharge is heavier than the river water, which causes the effluent plume to have momentum. This near field zone is about 100 feet long. The dispersion at the end of the near-field mixing zone is about 20:1 or more. This shows that Noveon's discharge is effectively dispersed into the Illinois River. Pet. Ex. 16 at 6.

Aquatic life is not able to live in the area of rapid and immediate mixing because of the velocity of the discharge. This would be the case with or without the ammonia in the discharge, and the velocity is effective to move aquatic life away from the area of maximum concentrations. Tr. 228. Past this zone, however, aquatic life would potentially be able to live.

Illinois EPA has agreed with the conclusion that Noveon's discharge does not have an adverse impact on water quality.[7] The Illinois EPA's witness on water quality, Mr. Robert Mosher, concluded that based on water quality data showing ammonia concentrations at a station down stream from Noveon at levels lower than the upstream station, it is possible that "the relatively small increase in ammonia concentration caused by BF Goodrich is naturally nitrified by the rime the river flow reaches the next downstream station." Illinois EPA Ex. 1 at 3.

C. Noveon Meets the Regulatory Requirements to Receive a Mixing Zone as Part of this Relief

As part of the adjusted standard, Noveon seeks a mixing zone designation in the Illinois River. The mixing zone requested by Noveon is based on work performed by Michael Corn, Noveon's expert on water quality modeling and diffuser design.[8] Mr. Corn performed extensive modeling using verifiable characteristics of Noveon's discharge and the Illinois River. A complete description of the work performed by Mr. Corn and a more extensive description of his calculation of the mixing zone requested by Noveon may be found at Pet. Ex. 16, Expert Written Report of Michael R. Corn, P.E. (certain statements in this Exhibit were clarified at the hearing; see Tr. 204-12). Mr. Corn also measured the conductivity[9] (salinity) in the Illinois River, to

[7] In fact, if the Board incorporates the transcript of the permit appeal, it may consider Mr. Mosher's testimony in that proceeding that the water quality in the entire upper Illinois River has improved notwithstanding Noveon's discharge. Tr. 117, 118.

[8] A summary of Mr. Corn's qualifications and experience in the area of water quality is at Pet. Ex. 17.

[9] Conductivity is a conservative tracking chemical, because other constituents would undergo the same dispersive forces as salt. Tr. 230-31.

determine the dispersion achieved and confirm that Noveon would meet the acute and chronic water quality standards in the Illinois River. Tr. 219.

Regulatory mixing zones have been allowed in the U.S. since the late 1960s to provide protection to the receiving stream when treatment technology or costs prevent achievement of the numeric or aesthetic limits and since the late 1980s for whole effluent toxicity standards in the discharge itself, and they are permissible under almost all state water quality regulations. They are defined by a combination of mathematical descriptions and prescriptive definitions.

1. Noveon's Calculation of a Mixing Zone Is Consistent with Regulatory Requirements

Illinois regulations governing mixing zones are found at 35 Il. Adm. Code 302.102. The opening paragraph of this regulation states that an opportunity for mixing shall be allowed provided that the regulatory requirement in Section 304.102 to provide "best degree of treatment" (BDT) to wastewater is met. Noveon meets the initial regulatory requirement for a mixing zone. Illinois EPA has conceded that Noveon provides BDT for all existing parameters with the exception of ammonia. Noveon also provides BDT for ammonia because its wastewater treatment facility is constructed in compliance with the same standards governing facilities that nitrify; the wastewater itself prevents that from occurring. The Board can determine that Noveon meets BDT for ammonia and no further treatment is required. See Tr. 420.

Both U.S. EPA and the Illinois EPA have issued guidance on designating mixing zones. *See Technical Support Document for Water Quality-based Toxics Control* (U.S. EPA March 1991) ("TSD")[10]; Illinois Permitting Guidance for Mixing Zones, (April 23, 1999). Pet. Ex. 16,

[10] A depiction of the mixing zone concept developed by the National Academy of Sciences in 1972, and which is included in the TSD, is at Pet. Ex. 21.

at 4. The TSD has been entered as Hearing Officer Ex. 1. Illinois EPA's guidance on mixing zones mirrors the U.S. EPA's guidance.

Illinois EPA defines the following areas in a mixing zone:

1) Zone of Free Passage, which establishes the maximum volume of river flow that can be used for mixing in the Near-Field Zone, called the Zone of Initial Dilution (ZID) and/or the Far-Field Zone, called the Total Mixing Zone (TMZ);

2) Zone of Initial Dilution or ZID, establishes a regulatory zone where acute numeric and whole effluent toxicity are allowed until this initial rapid and immediate mixing is completed; and

3) Total Mixing Zone or TMZ, establishes a regulatory zone where chronic numeric and whole effluent toxicity are allowed for some distance downstream, limited by 26 acres and 25% of the volume of flow or cross-sectional area.

The mixing zone requested by Noveon is based on the low flow, high temperature period, which is the most critical period from a water quality and toxicity perspective. Tr. 212-214. Noveon seeks a mixing zone of five acres, which is far less than the maximum allowable mixing zone under Illinois law of 26 acres. Noveon has defined the Total Mixing Zone (TMZ) as having a length of 1,000 feet, and Noveon will meet the chronic water quality standard at the end of the TMZ. Pet. Ex. 16 at 8; Tr. 232. Noveon has defined the Zone of Initial Dilution (ZID) of 66 feet, at the edge of which Noveon will meet the acute water quality standard. Pet. Ex. 16 at 7, 8; Tr. 232. The TMZ and the ZID are depicted on Pet. Ex. 20.

If relief is granted by the Board, however, Noveon will install a multi-port diffuser.[11] The multi-port diffuser is an engineered structure that enhances the mixing of an effluent into a receiving stream. Pet. Ex. 16 at 9, 10. The multi-port diffuser could be expected to achieve dispersion of 43:1, compared to dispersion of 13.2:1 for the single-port diffuser. Pet. Ex. 16 at 10. With the mixing zone downstream from the existing single-port diffuser, and the projected mixing zone downstream from the multi-port diffuser, the identified toxicity discussed at Pet. Ex. 29 and Pet. Ex. 31 would not impair water quality in the River.

The distance of the ZID was determined using U.S. EPA's and Illinois EPA's criteria for discharges that do not achieve 10 feet per second port exit velocity but still achieve rapid and immediate mixing. The three methods to determine the ZID are:

a. 50 times the square root of the cross-sectional area of the port (known as the zone of flow establishment).[12] Here the port diameter is 1.5 feet, allowing 66.5 ft ZID length for the Noveon single-port diffuser;

b. 5 times the local water depth (depth = 13.5 ft) = 67.5 ft; and/or

c. 10% of the total mixing zone (allowable mixing zone length defined by 26 acres divided by width of 25 % of the cross-sectional area or about 250 ft for the Illinois River at Noveon) or approximately 4,530 ft; Noveon requested 1,000 ft total mixing zone. Under this total mixing zone TMZ length, the ZID would be 10% of the 1,000 ft or 100 ft in length.

It is important to note that, in each of these ZID length determinations, the U.S. EPA specifies that these lengths are to be met in "any spatial direction." U.S. EPA defines spatial as a ***discharge length scale***; distance is defined in each of the three methods of calculating the ZID as a length along the centerline of the plume. Tr. 477-79; Hearing Officer Ex. 1 at 71. In free-flowing streams, such as the Illinois River (versus tidal two-dimensional flow situations), this length is defined in the downstream flow direction or along the length where maximum plume concentrations occur. Pet. Ex. 16 at 8; Tr. 477-79.

The ZID calculated in (a) is the smallest distance of these criteria and therefore the calculation that Noveon has requested, for a ZID of 66 feet. A depiction of the ZID for a stable plume including the zone of flow establishment and the zone of establish flow is at Pet. Ex. 22,

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[11] A depiction of an actual profile of a plume from a multi-port diffuser is attached as Pet. Ex. 24. Pet. Exhibit 27 shows a planning profile view of what the diffuser would look like. The port would be at an angle to ensure complete mixing occurs. Tr. 200.

[12] Exhibit 26 depicts the cross-sectional area of the Illinois River at the discharge point. Tr. 198-99.

and a depiction of a Hypothetical Exposure Scenario for Fish Passing Through a ZID is at Pet. Ex. 21. With the single-port diffuser, Noveon's discharge will travel the distance of the ZID in less than three minutes; with the multi-port diffuser, the time it takes to reach the edge of the ZID would be seconds. Tr. 226-27; 233. Aquatic life do not live in the ZID, because the velocity of the discharge basically sweeps aquatic life away from the maximum concentrations. Tr. 228.

2. Illinois EPA's Calculation of the ZID Is Inconsistent with the TSD, Board Regulations and Illinois EPA Guidance

Illinois EPA agrees that a mixing zone is permissible in this case, and it also concedes that a multi-port diffuser would make a mixing zone generally acceptable. See Pet. Ex. 37. and Tr. 390. Further, with the multi-port diffuser, the mixing zone is approximately the size that Illinois EPA has indicated it would accept. See Pet. Ex. 37; Illinois EPA Exs. 1 and 2; Tr. 484. What is in dispute is the ZID determination. As stated earlier, U.S. EPA's TSD requires the ZID length calculation to be met in "any spatial direction." The Board's regulations require "rapid and immediate mixing." See 35 Il. Adm. Code 302.102. The Board's regulations also state that mixing zones can only take up to 25% of the width of the river. Mr. Mosher makes a hash of the Board's regulations and the TSD by melding all of these regulatory limitations to require the ZID to meet the TSD limitations for the width of the stream as well the length. Mr. Mosher gets there by applying the U.S. EPA's limitation that a ZID cannot be more than 10% of the total mixing zone to the Board's regulation limiting the mixing zone to 25% of the river, so that Mr. Mosher calculates that the ZID is limited to 2.5 percent of the width of the river. This results in a ZID of 22.5 feet. Tr. 341-42; 384-87.

Mr. Mosher's interpretation is not reflected in the Board's rule and is patently inconsistent with U.S. EPA's expressed intent. It is not reflected in Illinois EPA's mixing zone guidance nor any guidance issued by Illinois EPA. Mr. Mosher's interpretation is inconsistent with the NSD itself for determination of ZIDs and mixing zones, since application of Illinois EPA's interpretation of ZIDs would render moot any other guidance on the TMZ or methods of calculating the ZID where a mixing zone is sought in a free-flowing stream. There would be no point in calculating a hydraulically-defined jet momentum zone (or any other zone for that matter). The hydraulically-defined jet momentum zone is intended to ensure that a minimum dispersion of 10:1 is achieved in the ZID. Mr. Mosher's ZID size calculation for Noveon's existing discharge would limit the dispersion in the ZID to 6:1 and would not allow an adequate dispersion in the jet momentum zone to allow the river to meet either ammonia or salt acute toxicity. The ZID limit under Board regulations at Section 302.102(b) to 25 percent of the cross-sectional area or volume of flow has always been a maximum volume of water that can be used for mixing in either the ZID and/or the TMZ. The intent is to maximize the dispersion as rapidly as possible, and not to limit this dispersion in the ZID. Illinois EPA's guidance specifically lists two dimensions: the total volume of flow (25% limitation) and the total area (width times length) of 26 acres (with one of these dimensions being defined by the 25% cross-sectional area or volume of flow, i.e., from which a maximum width can be calculated, and then a maximum length can be calculated). In fact, several of the mixing zones granted in Illinois are wider and longer than Mr. Mosher's 2.5% maximum length. See Tr. 477

A careful reading of the TSD shows that dispersion is intended to be maximized in the ZID, and the Illinois EPA's guidance reflects this by giving a maximum volume of flow that can be used and a total area that can be used. Using Mr. Mosher's interpretation, the area is de facto limited in width by the 25 percent of cross-sectional area requirement. The memorandum written by Mr. Mosher concedes as much in his conclusion:

> While the effluent is achieving relatively good mixing given its present location of discharge, the very high ammonia levels in the effluent are responsible for the large mixing area. If the effluent was in compliance with [Illinois EPA's interpretation of] the acute standards/ZID, the area of the mixing zone proper would be much smaller, so again, this situation points back to the acute standard/daily maximum effluent limit as the driving factor.

Illinois EPA Ex. 2 at 2.

It is clear that Mr. Mosher simply does not like mixing zones, notwithstanding their permissibility in the regulations of U.S. EPA and in most states, including Illinois. Mr. Mosher referred to the ZID as "a condition that we don't want to occur in our waters," Tr. 343, and referred to mixing zones as "a regrettable thing. We wish there were no ZIDs or mixing zones." Tr. 344-45. While Noveon agrees that mixing zones should be established only under very limited circumstances, those standards have been established by the Board in its regulations and by U.S. EPA in its TSD. Illinois EPA's Guidance has not changed the Board's regulations. Mr. Mosher's wishes cannot change what is established under properly promulgated rules as the correct method of allowance and calculation of ZIDs. Noveon's proposed mixing zone and ZID meet those standards.

D. Even If Noveon's Discharge Were Treatable for Ammonia, It Would Still Be Toxic and Untreatable Because of TDS

Even if there was a treatment for Noveon's discharge that is both economically reasonable and technologically feasible, Noveon's discharge is also toxic for salts. Testing of the toxicity of Noveon's discharge was performed by Mr. William Goodfellow, Noveon's expert on toxicity. See Pet. Ex. 29, Results of An Acute Toxicity Evaluation, EA Engineering (March

1999), and Pet. Ex. 31, Written Expert Testimony of William L. Goodfellow.[13] Following established U.S. EPA protocol, Mr. Goodfellow performed acute and chronic toxicity tests in two rounds of testing on Noveon's effluent. In addition and also following established U.S. EPA protocol, a Toxicity Identification Evaluation (TIE) was performed on the most toxic of the samples taken in order to characterize and potentially identify the specific toxicant in the effluent. The TIE is a series of physical and chemical procedures that is meant to evaluate various fractions of the effluent to track and determine characteristics of the wastewater. Tr. 247. It provides information on organic toxicity, ammonia toxicity, metal toxicity, oxidant toxicity, and reducible compounds. Tr. 248.

The results of the TIE showed that the toxicant was associated not only with ammonia and the organic compounds in Noveon's wastewater, but also with salinity, which is an expression of the total dissolved solids or TDS in the effluent. Pet. Ex. 31 at 6-8; Tr. 247-48, 253-55. There is no dispute that Illinois regulations do not require treatment for TDS in Illinois, since technically feasible methods are in general not economically reasonable. Tr. 398. Pet. Ex. 36. Mr. Goodfellow also concluded that if ammonia were removed, Noveon's effluent would still be toxic for TDS, and toxicity would likely be exacerbated because several treatments for ammonia, such as alkaline air stripping, struvite precipitation, effluent breakpoint chlorination, and ozonation, would increase effluent TDS. Tr. 472-74. Further, TDS is a more rapid toxicant than ammonia so its effect on aquatic life would be more rapid than that of ammonia. Tr. 472. Mr. Goodfellow's testing also addressed whether another toxicant was underneath the toxicity curve by removing ammonia from the test sample using zeolite, although there was no treatment for TDS. Tr. 471.

[13] Mr. Goodfellow's curriculum vitae is included at Pet. Ex. 32.

Mr. Goodfellow concluded that no other toxicants were determined from these standard test procedures to be "hiding in the weeds." Tr. 470. One purpose of his investigation was to establish what is in fact toxic in the effluent. Mr. Goodfellow has abundant experience, and followed U.S. EPA protocols. He found two toxic parameters: salt and ammonia. As much as the Agency may believe there may be another toxicant, the conclusion from Mr. Goodfellow's testimony is that there is simply not another toxicant in Noveon's effluent.

Requested Relief

At the time Noveon filed its Petition for Adjusted Standard, the ammonia water quality regulation at 35 Il. Adm. Code 302.212 had not yet been amended to change the date for the summer period from March through October. In addition, Noveon obtained a memorandum written by Illinois EPA that concedes that, with the multi-port diffuser, Noveon's daily maximum limits could theoretically be 232.7 mg/L for summer and 398 mg/L for winter. *See* Pet. Ex. 37. Noveon is therefore withdrawing proposed adjusted standard alternatives 1 and 2 in its Petition (*see* Petition for Adjusted Standard at 24, 25), and instead seeks a daily maximum limit. In addition, because one Noveon effluent sample did exceed 200 mg/L, though Noveon previously had divided its relief into the winter and summer periods, Noveon is amending proposed adjusted standard alternative 3 to simply request a year-round effluent limit for ammonia of 225 mg/L. Illinois EPA's conclusion on theoretical limits makes delineation of the winter and summer period limits unnecessary.

Noveon's proposed language for an adjusted standard therefore is as follows:

> Noveon, Inc. ("Noveon") is hereby granted an adjusted standard from 35 Ill. Adm. Code 304.122. Pursuant to this adjusted standard, 35 Ill. Adm. Code 304.122 shall not apply to the discharge of effluent into the Illinois River from the Noveon plant located at 1550 County Road, 850 N., in Henry, Illinois as regards

ammonia nitrogen. The granting of this adjusted standard is contingent upon the following conditions:

A. Noveon shall not discharge total ammonia nitrogen at concentrations greater than 225 mg/l from its Henry, Illinois plant into the Illinois River.

B. Discharge into the Illinois River shall occur through a diffuser that is at least 15 ft. in length, with 9 two-inch ports, angled at 60 degrees from horizontal, co-flowing with the river, designed to achieve an effluent dispersion of 43:1.

Conclusion

Based on a plain reading of the regulation and the Board's opinions adopting Section 304.122(a) and (b), Illinois EPA's interpretation is arbitrary and capricious and must be rescinded. If the Board does not rescind the permit, however, Noveon meets the standard for an adjusted standard. Ammonia from Noveon's plant is not removed by the conventional treatment considered by the Board, nitrification, in adopting Section 304.122(b), and there is no economically reasonable and technologically feasible alternative available to Noveon for ammonia treatment. Noveon's wastewater will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting Section 304.122(b), and specifically will not adversely impact dissolved oxygen in the Illinois River. Water quality standards for dissolved oxygen are currently being met in the Illinois River with Noveon's existing discharge.

As part of the relief, Noveon seeks a mixing zone. The Board has the authority to designate a mixing zone and, given the clear dispute concerning Illinois EPA's method of calculating the mixing zone and the ZID, the Board should decide this issue as part of this proceeding. Noveon's proposed mixing zone and ZID meet the standards in the TSD issued by U.S. EPA and the Illinois EPA's guidance concerning calculation of mixing zones and ZIDs.

Respectfully submitted,
NOVEON, INC.

By: [signature]
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CERTIFICATE OF SERVICE

The undersigned certifies that a copy of the foregoing **Notice of Filing** and **Post-Hearing Memorandum of Noveon, Inc.** was filed by hand delivery with the Clerk of the Illinois Pollution Control Board and served upon the parties to whom said Notice is directed by first class mail, postage prepaid, by depositing in the U.S. Mail at 191 N. Wacker Drive, Chicago, Illinois on **Thursday, April 29, 2004.**

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