

State of New Hampshire
Site Evaluation Committee
Docket No. 2015-01

In re:

SEA-3, INC.,
Request for Exemption

GREAT BAY STEWARDS SUPPLEMENTAL TESTIMONY

Now comes the Great Bay Stewards (Stewards or GBS) by their undersigned representative, and respectfully submit this supplemental testimony by two of its witnesses, pursuant to the Committee's Procedural Order dated September 4, 2015.

Respectfully submitted,
Great Bay Stewards,
By its non-attorney representative,



Dated: October 21, 2015

Fred C. Mason
14 Tidewater Farm Road
Greenland, NH 03840
cell: 309 550 6025
email: fmason@chicagobooth.edu

Certification

I hereby certify that on this 21st day of October 2015, I emailed a copy of the foregoing Supplemental Testimony to the persons on the Service List of this Docket.





Terrence J. Collins, Teresa Heinz Professor of Green Chemistry
Director, Institute for Green Science
Department of Chemistry
Carnegie Mellon University
4400 Fifth Avenue
Pittsburgh, PA 15213
United States

Phone: (412) 268-6335. FAX: (412) 268-1061
Email: tc1u@andrew.cmu.edu
Internet: <http://www.greenscienceinstitute.org>

October 11, 2015

To the New Hampshire Site Evaluation Committee, Docket No. 2015-01:

The Purpose of this Testimony

I write to summarize the testimony I will deliver if asked over Docket No. 2015-01 either in your upcoming hearing scheduled for November 5-6, 2015 or at some later date as you may request. I will first place the decision before the Committee in the broad context of sustainable development and I will then focus on the specifics of why I think the certification process should be fully executed.

Who Am I

I am a Professor at Carnegie Mellon University who has dedicated 35 years of independent thought and research toward building the chemical dimension of a sustainable economy.¹ In my research, I have invented the first small-molecule, full-functional mimics of any of the great families of oxidizing enzymes that marshal the oxidative chemistry of aerobic life. In my entrepreneurship, I am presently deeply engaged in developing the commercial potential of these catalysts for removing micro-pollutants from water. Micropollutants are water contaminants that are toxic at very low concentrations. The underlying toxicity of micropollutants is very often associated with endocrine disruption. An endocrine disruptor is a substance that interferes with the synthesis, secretion, transport, binding, action or elimination of natural hormones in the body that are responsible for development, behavior, fertility and the maintenance of homeostasis (normal cell metabolism). The bacteriocides and fungicides that are the components of creosote that protect railroad ties from biological degradation are micropollutants. This connects my expert knowledge and concern over the immense hazards of micropollutants with the decision-making process for Docket No. 2015-01. In my teaching, I have developed the first university course in the chemical dimension of sustainability, now called "Chemistry and Sustainability"—I have recently reviewed the 23-year history of its development where the content features systematic leadership toward sustainability and the hazardous nature of endocrine disruptors as a serious chemical threat to a sustainable future.² This connects my expert educational knowledge with the broader implications and I will offer my assessment of the sustainable development content that I see in your decision-making process in this case.

¹ <http://www.greenscienceinstitute.org/>

² T. J. Collins, Review of the Twenty-two Year Evolution of the First University Course in Green Chemistry: teaching future leaders how to create sustainable human societies. *J. Cleaner Production*, **2015**, 106, 87-96: <http://dx.doi.org/10.1016/j.jclepro.2015.06.136>

New Hampshire Site Evaluation Committee Docket No. 2015-01 and Sustainability Leadership

According to the famous Brundtland Commission of the United Nations, “Sustainable development is the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Commission, 1987). This is the epic identification of a duality between the present and the future that represents the essence of what leadership must balance to build a sustainable world. It illuminates, as I have decided to capture the challenge, that competent sustainability leadership is all about *building an intimacy for the future in the decision-making of the present*. For New Hampshire, sustainable development leadership will manifest itself in countless wisely made decisions that, over time, will turn the State’s economy toward sustainability. This calls for realism and competence on the part of decision-makers, understanding and being unafraid of the depth of the challenges of sustainability in combination with a competence to steer the State away from unsustainable development and towards a better future. Make no mistake about it, you as the New Hampshire Site Evaluation Committee on Docket No. 2015-01, are being provided through this experience with an opportunity to hone New Hampshire’s skills in sustainability leadership.

The process that you are currently engaging in over Sea-3’s request for an exemption to the certification process and the further deliberations that might come subsequent to this decision provides an excellent case in point of the diverse parameters, powers and performances that comprise modern decision-making in sustainable economic development. Micropollutant chemicals and their impacts are important components of the decision making process. In studying your process, I respectfully submit that the certification process, so wisely established by the State, is meant to fully examine micropollutant issues in a case of this nature. So I sympathetically counsel you not second-guess your own procedural wisdom by granting an exemption. I find your work to be immensely interesting and am prepared to help you in any way I can through participation with the Great Bay Stewards. I will continue to look on with interest to learn what you will determine to be the wisest path forward for the people of New Hampshire of both today and tomorrow. I am not arguing that you should engage in protracted and expensive analyses. I have realized from afar that New Hampshire people care passionately about the welfare of the Great Bay. They will help you. And you need to insist on obtaining certain data from Sea-3 and the railway to underpin your decision making process. So take the time the certification process will afford you to listen carefully to all interested parties and to develop as accurate a picture as you can of the pluses and minuses for New Hampshire.

From the last several centuries of rapid economic expansion, we have learned that there are four critical performances of technologies and practices that must be balanced to achieve sustainable development—these are the technical, the economic, the environmental and the health performances.² We have built a civilization where an Everest of scientific data is telling us that by just focusing on the technical and economic performances, which are relatively simple to evaluate, decisions often lead us down paths of unsustainable development that could have been avoided. Such two-performance decisions miss many important implications that only four-performance optimization can reveal. Technical and economic performances are of the here and now. Environmental and health performances, which are comparatively difficult to evaluate, are of the everywhere and always. In this case, the Certification process provides you with an opportunity to dig into and balance the details of all four performances. Today, a willingness to collect and analyze the full complement of details prescribes an essential competent of sustainability leadership. Thus, regardless of the final outcome, not granting the exemption and going through with the certification process would provide an excellent opportunity for NH decision-makers to improve their sustainability leadership skills. And by going through the full certification process, I anticipate that you will come to recognize superior outcomes for your work that harmonize development for both the near-term and the future AND result in a distinctively better economic outcome in the present.

Chemical and Related Considerations for Not Granting the Sea-3 Requested Exemption

I recognize important chemical components to your decision-making process over the Sea-3 exemption request for the planned expansion of its Newington facility with the associated upgrading and intensified use of the service railway. I offer the following points for your consideration where I will repeat and opine on specific content of the Great Bay Stewards pre-filed testimony.

Sea-3's stated purpose in the proposed expansion is, with respect to propane, "to provide bulk volume available for shipping by sea to accommodate domestic and foreign product price fluctuations". This is a goal set in economic performance terms, a claim by Sea-3 that it will improve the common good in New Hampshire's here and now by bringing pricing stability to some percentage of the New Hampshire citizenry. To the best of my understanding, this percentage is and will likely remain small—Sea-3 is a relatively minor player in the domestic market and the Newington facility is poorly located and therefore competitively disadvantaged for optimally serving the majority of New Hampshire citizens to the North and West that rely on propane for some component of their energy needs. While the Newington facility might be well located to serve international markets, have you determined how much increased international sales would benefit New Hampshire's citizens? To the minds of the Great Bay Stewards and my own, the claim that domestic price fluctuations will be accommodated by the proposed facility and railroad upgrade needs to undergo the reality check of a careful market analysis—I could well imagine the outcome turning out to be otherwise. The certification process should allow you to tease out what New Hampshire will get in return for unquestionably putting an important component of its ecosphere, health and economy at risk of being diminished.

When it comes to the environmental and likely health impacts, I am certain that if the exemption is granted without the careful analysis of the certification process, an expansion and advancement of a hydrocarbon industry facility will occur with the introduction of expanded and inadequately assessed potential for accidents that would be ruinous of the sensitive ecology and economic value of the Great Bay. This will include the ongoing inescapable low dose contamination from creosote infused railroad ties that will slowly leak carcinogens and endocrine disruptors into the wetlands to threaten aquatic life and contaminate human food sources out into the distant future.

Two-thirds of all fish and aquatic life in the Gulf of Maine have a direct link to estuaries like the Great Bay such that the health and vitality of the Great Bay's brackish waters (through which the proposed up-scaled railway will run with its newly creosote-impregnated ties) have vast impacts on the common and future goods. Creosotes contain immensely bioactive, persistent and bioaccumulative substances with pronounced lethality and disruption potential at the cellular level. This is why creosotes works so well in protecting railroad ties for multiple decades. Creosotes, generally from coal tar, are cheap and highly efficacious products for protecting railroad ties from fungal degradation. While railroads are regulated at the federal and not state levels, the fact that you have no power to end the use of creosote in New Hampshire does not mean that you cannot take action to minimize creosote releases to your environment, especially your most sensitive and precious aquatic ecosystems. Railroad ties protected by creosote leak carcinogens and endocrine disruptors over the tie lifetimes. The release rate is directly proportional to the density of the railroad traffic.^{3,4} You can begin to learn both explicitly and implicitly of the serious hazards that you will have to live with if the railroad

³ B. Wiłkomirski, B. Sudnik-Wójcikowska, H. Galera, M. Wierzbicka, and M. Malawska. 2010. Railway transportation as a serious source of organic and inorganic pollution. *Water Air Soil Pollution*. 2011 Jun; 218(1-4): 333-345.

⁴ Bogusław Wiłkomirski, Halina Galera, Barbara Sudnik-Wójcikowska, Tomasz Staszewski, Małgorzata Malawska. Railway Tracks - Habitat Conditions, Contamination, Floristic Settlement - A Review, *Environment and Natural Resources Research*, 2012 March; 2, 86-95.

upgrade proceeds by examining how the State of New York is balancing the hazards of creosote with the associated political and economic realities.⁵

Railroad ties release a complex mixture of micropollutants over their lifetimes. As an excellent case study on environmental contamination by railroads, I include the abstract of reference 5 which describes a study of railroad contamination by PAHs and heavy metals in the Poland:

Polycyclic aromatic hydrocarbons and heavy metal (Pb, Cd, Cu, Zn, Hg, Fe, Co, Cr, Mo) contents were established in soil and plant samples collected in different areas of the railway junction Iława Główna, Poland. Soil and plant samples were collected in four functional parts of the junction, i.e. the loading ramp, main track within platform area, rolling stock cleaning bay and the railway siding. It was found that all the investigated areas were strongly contaminated with polycyclic aromatic hydrocarbons (PAHs). The PAH contamination of the soil was the highest in the railway siding and in the platform area (59,508 and 49,670 $\mu\text{g kg}^{-1}$, respectively). In the loading ramp and cleaning bay, the PAH concentration in soil was lower but still relatively very high (17,948 and 15,376 $\mu\text{g kg}^{-1}$, respectively). The contamination in the railway siding exceeded the average control level up to about 80 times. In the soil of all the investigated areas, four- and five-ring PAHs prevailed. The concentrations of PAHs were determined in four dominating species of plants found at the junction. The highest concentration was found in the aerial parts of *Taraxacum officinale* (22,492 $\mu\text{g kg}^{-1}$) growing in the cleaning bay. The comparison of the soil contamination with PAHs in the investigated railway junction showed a very significant increase of the PAHs level since 1995. It was found that the heavy metal contamination was also very high. Pb, Zn, Hg and Cd were established at the highest levels in the railway siding area, whereas Fe concentration was the highest in the platform area. A significant increase in mercury content was observed in the cleaning bay area. The investigations proved very significant increase of contamination with PAHs and similar heavy metals contamination in comparison with the concentration determined in the same areas 13 years ago.

This study emphasizes that the released PAHs bioaccumulate in the plant roots around the railway lines and it is logical assumption that they will accumulate in the biota of the wetlands and brackish water through which the railroad passes. This paper also raises the question of whether or not the railroad company can convince you that heavy metals are also not being released from their rolling stock—do you have such an assurance and has it been critically assessed?

It is general knowledge that carcinogens are chemicals that cause cancer. The EPA, IARC, and other authorities labeled PAH components of creosote as human carcinogens, probable human carcinogens, or possible human carcinogens⁶—oftentimes, the origin of cancer in later life can be traced to exposure to endocrine disruptors in early life.⁷ The hazards associated with carcinogens and carcinogenic PAHs became part of common

⁵ <http://www.dec.ny.gov/chemical/42394.html>

⁶ Bostrom C-E, Gerde P, Hanberg A, Jernstrom B, Johansson C, Kyrklund T, Rannug A, Tornqvist M, Victorin K, Westerholm R 2002. Cancer risk assessment, indicators, and guidelines for polycyclic aromatic hydrocarbons in the ambient air. *Environmental Health Perspectives* 110 (S3): 451–488.

⁷ Vandenberg, L.N., Colborn, T.E.D., Hayes, T.B., Heindel, J.J., Jacobs Jr., D.R., Lee, D.-H., Shioda, T., Soto, A.M., vom Saal, F.S., Welshons, W.V., Zoeller, R.T., Myers, J.P. Hormones and endocrine-disrupting chemicals: low-dose effects and nonmonotonic dose responses. *Endocr. Rev.*

understanding in the latter half of the 20th century. Because of the power of the internet, the hazards associated with endocrine disruptors have been entering clearly into the common understanding in just the quarter century from 1991.

Endocrine disruptors are riveting. The mere idea that traces of everyday chemicals, in amounts commonly found in people, could be disrupting cellular development and signaling to impair living things sounds like the plot of a science fiction horror movie. Yet copious evidence from wildlife, lab animals, in vitro studies, biomonitoring, epidemiology including human diseases, purposed human uses (e.g., synthetic estrogen in the reproductive pill), and human accidents indicate that, with EDs, this is precisely what is happening today. Endocrine disruptors obliterate the notion that the solution to pollution is dilution. Concentrations as low as parts per trillion of endocrine disruptors in water can have pronounced negative impacts on aquatic life.⁸

When you are making decisions concerning chemical exposures of ecosystems that are vital to the human food web, I respectfully argue that it is important that you take the time required and the due care to ensure that competence with respect to sustainability gets the opportunity to be fully exercised. Exactly as I am doing here, I offer my pro bono services through the Great Bay Stewards to assist you going forward in any way I can to carefully weigh all four critical performances as you decide what is in the best interests of the people of New Hampshire. Obviously, if you wish to engage with this offer, you will need to deny the exemption to Sea-3.

Sincerely yours,



Terrence J. Collins

2012, 33, 378-455.

⁸ M. R. Mills, K. Arias-Salazar, Alice Baynes, L. Q. Shen, J. Churchley, N. Beresford, C. Gayathri, R. G. Gil, R. Kanda, S. Jobling, T. J. Collins, Removal of ecotoxicity of 17 α -ethinylestradiol using TAML/ peroxide water treatment. *Sci. Rep.*, **2015**, *Sci. Rep.* **5**, 10511: doi: 10.1038/srep10511, and references therein.

Supplemental Testimony on the Value to the State of New Hampshire of Oyster
Aquaculture in the Great Bay Estuary and Piscataqua River

Oyster Aquaculture is being established in the Great Bay Estuary and Piscataqua River, primarily in the Little Bay near Durham Point and near the mouth of the Oyster River. Both areas are characterized by significant currents that keeps water flowing over the oysters. These farms are on the cutting edge of a recovering industry.

The New Hampshire Fish and Game Department reports that, as of 2015, there are 16 oyster farms licensed in the Little Bay area of the estuary. There are additional oyster aquaculture farms near the mouth of the Piscataqua River. In 2014, these farmers harvested 153,660 oysters paying 1.5 cents in state taxes on each oyster harvested for a total of \$2,305. In 2015, oyster aquaculture farmers leased 48.4 acres from New Hampshire for bottom culture oysters at \$200/acre/year for a total of \$9,680. Obviously, these numbers are currently very small, but this is only the beginning. Oyster farmers expect to be growing millions of oysters in the estuary in a few years. Restaurants in the area such as Robert's Grill in Kittery and the Franklin Oyster House in Portsmouth are promoting oysters from Great Bay on their menus. Local specialty grocery stores such as "On the Vine" in Exeter, and "Fiddlehead Farms" in Dover; and wholesalers such as Taylor Lobster Company are also helping to promote and build the new local oyster market. At retail pricing of \$1,00 to \$2,00 per oyster, the current crop is generating \$150,000-\$300,000 with the potential of \$1,000,000-\$2,000,000 in the near future.

Oyster reefs once covered hundreds of acres of the Great Bay estuary, with each oyster helping to clean the Bay by filtering approximately 20 gallons of water per day. In filtering the water they also removed suspended sediments that are harmful to eelgrass. Healthy eelgrass was needed by the oysters to help trap and anchor sediments. However in recent years both species have been in decline. The oysters were decimated by disease, excessive siltation, pollution and over-harvesting, and now cover only about five percent of their original area. Eelgrass has declined by about 40 percent.

Since 2009, UNH, the Nature Conservancy, oyster farmers from Wagon Hill Oysters and Choice Oysters, and volunteers around the estuary have been working to restore the oyster reefs. Healthy reefs have been established near Adams Point, the railway trestle at the mouth of the Squamscott, and off of Greenland on the south edge of Great Bay. Some 18 acres of reefs and and more than 3 million oysters have been added to the estuary. The Nature Conservancy estimates that it would require about 90 million oysters to filter the whole bay. They are adding about 20,000 oysters per acre of reef. The aquaculture oyster farmers using suspended oysters have the potential to add many more.

On October 13, 2015, Governor Hassan signed HB 354 and SB 168 to support efforts to restore oyster reefs. In her press release of June 8, 2015 she said that "Great Bay is one of our state's natural treasures, critical to our economy and our high quality of life and we must do everything we can to protect its magnificent yet fragile ecosystem." Both bills had bipartisan support in Concord. State Rep. Adam Schroadter, R-Newmarket, a co-sponsor, praised "the teamwork and partnership that you find with these bills." "As the recruiter in chief for the state of New Hampshire, I can say that it really makes

a difference for businesses and people looking to move (to New Hampshire),” Hassan said, adding “Great Bay is “magnificent and fragile. It’s important that we do everything we thoughtfully can to protect this wonderful resource that protects all of us,” she added.

RSA 162-H:1 requires that, in the siting, construction and operation of energy facilities, “full and timely consideration of environmental consequences be provided”. This requirement will not be met if Sea-3 is granted a exemption from the full certification process. An exemption should be denied.

Respectfully submitted,
Great Bay Stewards,
By its non-attorney representative,

A handwritten signature in black ink that reads "f.c. mason". The signature is written in a cursive, lowercase style.

Fred C. Mason
14 Tidewater Farm Road
Greenland, NH 03840
cell: 309 550 6025
email: fmason@chicagobooth.edu