

Memorandum

To: Earthjustice, the Natural Resources Defense Council, and the Southern Environmental Law Center.

From: Dennis Guignet, PhD.

Subject: Economic Comments Related to the Economic Analyses and Rule Text for the Proposed SDWA PFAS “Delay Rule” and “Rescission Rule.”

Date: July 13, 2026

Purpose

The purpose of this memorandum is to evaluate the U.S. Environmental Protection Agency’s Economic Analyses (EAs) and economic rationale pertaining to two PFAS-related deregulatory actions proposed by the US Environmental Protection Agency (EPA) under the Safe Drinking Water Act (SDWA):

- (1) Extending the Compliance Deadline for the PFOA and PFOS Maximum Contaminant Levels, 91 Fed. Reg. 29425 (henceforth referred to as the “Delay Rule”), and
- (2) Rescission of Regulatory Determinations and Removal of Related Provisions for Four PFAS Substances (PFHxS, PFNA, HFPO-DA (GenX), and the Mixture of These Three Plus PFBS), 91 Fed. Reg. 29413 (henceforth referred to as the “Rescission Rule”).

Both rules involve delaying or rescinding parts of the 2024 Per- and Polyfluoroalkyl Substances National Primary Drinking Water regulation (henceforth referred to as the “2024 Rule”).

Many of the comments outlined in this memorandum focus on the corresponding economic analyses for each of the proposed rules, but when warranted I provide comments regarding the economic rationale argued in the rule preambles.

As a trained economist with over two decades of experience, I am qualified to identify analytical strengths and weaknesses in the economic rationale and analyses for these proposed deregulatory actions. I received my undergraduate degree from the Pennsylvania State University in 2006, and subsequently earned my MS and PhD in Agricultural and Resource Economics from the University of Maryland in 2009 and 2011. I served as a research economist in the National Center for Environmental Economics at the US EPA from 2011 to 2018. During that time, I helped develop, review, and revise economic analyses (EAs) of regulatory actions, including regulations under the Safe Drinking Water Act.

I have taught environmental economics courses at the University of Maryland and American University, as well as graduate and undergraduate courses in microeconomics and benefit-cost

analysis at Appalachian State University, where I am currently employed as a tenured Associate Professor of Economics. I have served as an economic consultant for various domestic and international organizations, including the National Science Foundation, Earthjustice, the Organisation for Economic Co-operation and Development (OECD), Fondazione Eni Enrico Mattei (a think-tank based in Italy), and Landcare Research (a quasi-public government agency in New Zealand).

My research focuses on applied quantitative analysis, benefit-cost analysis of environmental policies, and the estimation of environmental and human health benefits, with a particular focus on toxic chemicals. I have written book chapters on valuation methods and benefit transfer, and have published over 40 peer-reviewed studies. My full curriculum vitae is appended to this memorandum.

Overall, based on my professional experience, the economic rationale behind the two proposed rules and the supporting EAs have several flaws. Most pressing is that the documents are often biased and inconsistent, usually in ways that paint the proposed Delay Rule and Rescission Rule in more flattering, but inaccurate ways. The comments presented below are intended to help characterize the proposed rules and their impacts in a more objective and transparent manner, with the ultimate goal of facilitating more socially efficient regulatory decisions and better informing the public.

This memorandum is organized separately for each proposed regulatory action, covering both the corresponding preamble text and economic analysis (EA).

Delay Rule

Delay Rule Regulatory Text

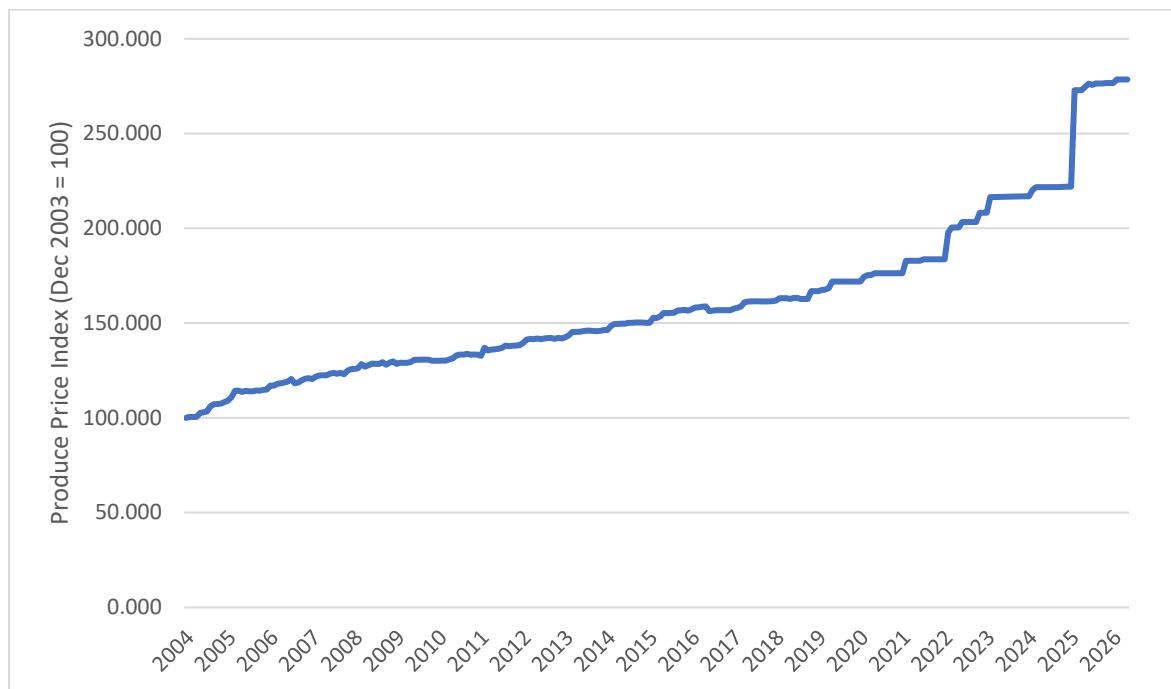
The preamble text pertaining to the proposed Delay Rule asserts that an additional two-year extension for complying with the PFOA and PFOS MCLs is needed to reduce the financial burden placed on water systems. The Agency's economic rationale for the two-year extension for compliance is based on the unsupported narrative that compliance costs will be lower in the future. The EPA focuses on four cost-related components: (1) high construction and equipment costs; (2) technological innovation and support; (3) difficulties in finding the necessary skilled labor; and (4) that future regulations will lower costs in the future. The arguments underlying each component are unsupported and often contrary to the evidence. I evaluate the economic rationale behind each of these points below, assessing the theoretical underpinnings and empirical evidence.

- 1. The argument that high construction and equipment costs necessitate a delay for compliance ignores the likely possibility that such costs will be even greater in the future.**

The EPA states that since the 2024 promulgation of the PFOA and PFOS MCLs, circumstances have changed and construction costs are now 20% higher and more volatile. The EPA goes on to argue that these higher costs necessitate the proposed two-year delay

for compliance (US EPA 2026a, page 29429). As shown in Figure 1, plotting the same US Bureau of Labor Statistics data (US BLS 2026) referenced in the Delay Rule preamble suggests that based on current trends costs will continue to rise. There is no evidence to suggest that the trend in increasing costs and volatility will subside within an additional two years. Given the current global conflicts in Ukraine and Iran, as well as the trade tariffs invoked by the Trump Administration, there will likely be even greater volatility and higher costs in the future (Amiti et al. 2019; Flann et al. 2020; Fang and Shao 2022; Tong 2024; Kori 2026 Wang et al. 2026). All else constant, the overall evidence based on current trends and events suggests that compliance costs after the two year delay will likely be even higher.¹

Figure 1. Monthly Produce Price Index by Commodity: Machinery and Equipment: Domestic Water Systems.



2. **Although innovation could lead to more cost-effective technologies, there is no evidence to support the idea that such innovations will occur and reduce costs in any substantive way within just an additional two year period.**

There is insufficient evidence that an additional two years will lead to any substantive innovations that will greatly reduce costs or increase compliance effectiveness. The Delay Rule preamble text lists some nascent technologies that are under development or have been

¹ To be fair, my argument that costs will likely continue to increase over time is assuming that technology is fixed. As discussed next (under comment #2), the EPA presents little evidence to suggest that substantial innovations will emerge within an additional two years that would lead to noticeable cost-savings.

demonstrated at a small scale, but it seems that these technologies have not been employed at a large enough scale to lead to more cost-effective compliance technologies (US EPA 2026a, page 29430). The EPA presents no evidence to suggest that an additional two years would lead to any substantive innovation that would reduce future compliance costs.

If anything, a further delay and the subsequent regulatory uncertainty that the Delay Rule introduces may reduce incentives for such innovation. For example, in response to the proposed delay, water systems may now perceive a non-trivial probability of additional compliance delays in the future. The economic literature generally suggests that regulations tend to induce technological innovation (Ambec et al. 2013; Johnstone et al. 2010), and that regulatory stability helps further foster innovation (Johnstone et al. 2010). Focusing specifically on drinking water, an EPA study of the 2001 MCL for Arsenic found that the regulation did lead to technological innovation, and in turn lower compliance costs (Morgan and Simon 2014).

Lastly, the EPA argues that the two-year delay is needed so that the EPA is better able to provide water systems with technical assistance, and thus help further reduce costs. However, given the ongoing trends in cutting the EPA's workforce and funding (Environmental Protection Network 2026), the Agency will likely be in less of a position in the future to provide such technical support.

3. The EPA provides insufficient evidence to suggest that a two-year delay in complying will substantively alleviate any difficulties in finding skilled employees.

The EPA argues that more time is needed for water systems to find skilled workers in order to comply with the PFOA and PFOS MCLs. At the same time, the Agency provides no evidence that more time will help water systems hire any necessary skilled workers. In the rule text, the Agency recognizes the increasing labor market shortage that water systems face in general (US EPA 2026a, page 29429). Further delays in the rule may exacerbate issues with an aging workforce, inadequate compensation, and information transfer gaps, all of which have been identified in the 2026 American Water Works Report as substantive issues facing the sector (AWWA 2026).

Economic theory suggests that an increase in demand for skilled water system workers due to regulatory requirements like the PFOA and PFOS MCLs would lead to an increase in wages, and thus entice more skilled workers to enter the market. In contrast, a two-year delay will dampen any increase in demand for skilled workers, especially when considering the additional regulatory uncertainty that is introduced. Put plainly, theory suggests that water systems are less likely to invest in the necessary skilled workers when the need to do so is pushed further into the future and when there is increased regulatory uncertainty.

4. **The EPA’s claim that an additional two-year delay is needed so that broader regulatory strategies for PFAS can be put in place, and that this will in turn lower water systems’ compliance costs for the PFOA and PFOS MCLs, is unsupported and runs counter to best practices for economic analysis.**

The Delay Rule preamble text states that “EPA has announced the development of effluent limitations guidelines (ELGs) for certain PFAS that will help stop PFAS from entering drinking water systems,” and goes on to state that “the forthcoming ELGs are expected to minimize the occurrence of PFAS in drinking water sources... thereby reducing costs.” (US EPA 2026a, page 29431). First of all, any future water system cost-savings resulting from future ELGs may be relatively small because, as the EPA notes at the beginning of the preamble “The manufacturing and use of these compounds [(PFOA and PFOS)] have largely been voluntarily phased out in the United States.” (page 29427). The EPA goes on to note that “small quantities of PFOA may still be produced, imported, and used by some companies, and limited uses of PFOS are ongoing” (US EPA 2026a, page 29427).

Second, the EPA has not committed to any binding timeline for the promulgation and implementation of ELGs for PFOA and PFOS discharges (Kelley Drye & Warren LLP 2026). The Agency’s argument is that compliance costs for meeting the PFOA and PFOS MCLs will be less in the future because of (currently hypothetical) future ELGs, and in turn that the proposed Delay Rule will result in additional cost-savings in this respect. The costs of the MCLs are measured relative to the baseline, and so in making these claims the Agency is incorrectly including hypothetical future ELGs in the baseline. This goes against the Agency’s own economic guidelines, which emphasize that only *finalized* rules should be accounted for in the baseline [emphasis added] (US EPA 2024a, page 5-7).

The above criticisms of the economic rationale discussed in the Delay Rule preamble focused primarily on the EPA’s argument of reduced costs, but there is also one unsupported argument that pertains to the forgone benefits – more specifically, an invalid statement that the proposed Delay Rule would not result in increases in risks to human health.

5. **The Agency falsely states that “the same level of health protection... is reached when compared to the baseline” (US EPA 2026a, page 29440).**

As demonstrated in that same paragraph in the preamble, this statement is simply not true and should be deleted. There would be forgone benefits as a result of the proposed two-year delay, particularly for populations who experience increased exposure during sensitive life stages, and in terms of subchronic health impacts. The proposed delay does *not* achieve the same level of protection relative to the economically valid baseline. As stated in the EPA’s own Economic Guidelines, the appropriate baseline for comparison is “the future state of the world without the regulation” (US EPA 2024a, page 5-7), and that “other related policies and programs that are already in place should be accounted for” (US EPA 2024a, page 5-7). In the current context, the appropriate baseline is a world where the PFOA and PFOS

MCLs are implemented and enforced by April 2029, as specified in the original 2024 Rule. The notion that this is the appropriate baseline is reaffirmed by the fact that this is the baseline utilized in the Delay Rule EA, where there are estimated decreases in human health protections from the proposed Delay Rule (US EPA 2026b).

The Agency's invalid claim that the same level of health protection is reached under the Delay Rule is relative to the current situation, but the EPA's own economic guidelines explicitly state that the baseline "is not a scenario assuming no change from current conditions" (US EPA 2024a, page 5-7). In short, the Agency is incorrect in stating that the same level of health protection is reached. Their argument highlights inconsistent assumptions across the EA and preamble text.

Furthermore, although the EPA assumes in the EA that pitcher filters will be utilized to minimize losses in human health, a decrease in health protection would still be experienced. First, as documented in the EA, the pitcher filter technology is not sufficiently developed to achieve the same level of health protection as the MCLs. This is acknowledged by the Agency in stating that "EPA *anticipates* that by the time of the exemption period, devices will *likely* be able to achieve PFOA and PFOS reduction to levels as low as the PFOA and PFOS MCLs" [emphasis added] (US EPA 2026b, page 4-13). Second, pitcher filters do nothing to reduce human exposure through dermal contact or inhalation when showering and bathing. Third, not all exposed households will request or properly use pitcher filters. Additionally, many households will not be eligible to receive a system-provided pitcher filter because only systems with recent PFOA or PFOS levels above 12 ppt will be required to provide them (or provide any such interim mitigative measures in general). Finally, although EPA assumes in the EA that a cost-minimizing system will adopt pitcher filters and distribute public education materials as their two required interim control measures, the proposed Delay Rule allows for two (out of six) possible measures to be adopted. There is no evidence provided regarding the extent to which the other four interim measures will protect human health. All of these factors highlight the need for regulatory action in order to reduce exposure to PFOA and PFOS in drinking water.

Overall, the Agency's claims that "water systems are much more likely to effectively and successfully implement and maintain compliance with the PFOA and PFOS MCLs when granted additional time" (US EPA 2026a, page 29429), and in particular, an extension of just two years, is unsupported; as is the argument that the Delay Rule achieves the same level of health protection. PFOA and PFOS issues in drinking water have been on the EPA's and water systems' radars for decades, and at the very least since 2009, when the EPA first added the substances to the Contaminant Candidate List (US EPA 2026c, page 29415). The idea that an additional two-year extension would lead to substantive reductions in costs and/or increases in technology effectiveness is not supported by the provided evidence. If the Agency did feel confident in these claims, then they would have incorporated the related benefits and cost-savings through these mechanisms into the formal EA for the proposed rule, but they did not. Similarly, the EPA's own EA for this rule demonstrates that there are losses in human health protections (US EPA 2026b),

which is in sharp contrast to claims in the preamble text that the same level of health protection will be achieved (US EPA 2026a). These inconsistencies across the preamble and EA demonstrate that the EPA's reasoning and stated motivation for the Delay Rule, as argued in the preamble, are critically flawed and are not supported by the available data and evidence.

Delay Rule Economic Analysis

In general, the EPA's primary conclusion that the cost savings from the proposed Delay Rule will exceed the foregone benefits is not adequately supported. First, this conclusion is sensitive to the assumed discount rate, and despite recommended best economic practices, the Agency is neither consistent nor transparent regarding its assumed discount rate. Second, the EPA's conclusion disregards the likely large unquantified forgone benefits. As stated in the 2024 Rule EA "the quantified benefits alone... are a significant underestimate of the total benefits" (US EPA 2024b, page 6-1). As such, the estimated forgone benefits under the proposed Delay Rule are also a significant underestimate of the total forgone benefits. Third, application of more theoretically valid and comprehensive willingness to pay (WTP) estimates to monetize increases in human health risks, rather than the subpar cost-of-illness estimates currently used, would yield larger estimates of the monetized forgone benefits, again calling into question the EPA's conclusion that the cost-savings from the proposed Delay Rule exceed the forgone benefits. These comments, and others intended to yield a more accurate and transparent economic analysis, are documented below.

6. The EPA fails to present a sufficient number of regulatory options for policymakers and the public to evaluate.

The EPA presents just one regulatory option – to delay implementation of the MCLs for PFOA and PFOS by two years. In doing so the EPA does not properly inform policymakers and the public, and in general goes against their own economic guidelines, which state that:

*"At a minimum, the economic analysis should fully **assess and present three options** for consideration: the proposed or finalized option; a more stringent option; and a less stringent option... Assessing at least three options **applies in any circumstances**. It is **not adequate to evaluate only the selected option**... Assessing multiple options helps inform the public about the anticipated benefits and costs of the Agency's final action compared to options not pursued, it is **imperative that the analysis assesses multiple options** [emphasis added]"* (US EPA 2024a, page 3-7).

The Agency is quite clear in their guidance in this regard, which is largely informed by broader guidance from the US Office of Management and Budget (US OMB, 2003, 2023); and yet for some unexplained reason the EPA decided to disregard their own recommended best practices for economic analysis. Such inconsistencies are an ongoing theme throughout my comments.

One obvious, less stringent option to consider would be to allow for an exemption only among smaller, more rural water systems. The preamble text motivates the proposed Delay Rule in stating that costs of the rule are particularly burdensome for small, more rural systems (US EPA 2026a). At the same time, these systems serve less people, and so the forgone benefits will be less compared to a larger system serving many households. From an economic efficiency standpoint, analyzing a regulatory option that allows only smaller, more rural systems to apply for an exemption makes sense.

7. Despite recent directions under E.O. 14192, best economic practices should still be followed and a 2% discount rate should be included in all main tables and results in the Economic Analysis.

I fully recognize that recent direction under E.O. 14192 (US Executive Office of the President 2025) specifies that executive agencies should revert back to OMB's outdated 2003 guidance and use a 3% and 7% discount rate for the main analysis (US OMB 2003). But at the same time, the EPA cannot disregard the science and should also use a 2% discount rate in their primary economic analysis. Section 12 of OMB's revised Circular A-4 contains a thoughtful discussion of the discount rate, grounded in economic theory and empirical evidence. Based on that, OMB recommended a default social discount rate of 2% (US OMB 2023). A subsequent special issue of the Journal of Benefit Cost Analysis included several studies discussing OMB's revised guidance, including suggestions regarding the discount rate.² Blomquist (2025) generally found (i) an overall consensus among experts that a 3% rate may be appropriate (as is currently presented in the Delay Rule EA), but more importantly, that (ii) alternative rates should always be used to demonstrate the sensitivity of results, and (iii) that a 2% rate generally seems reasonable.

Presenting the results under the assumption of a 2% discount rate is particularly important in the context of the Delay Rule. First, the overarching conclusion that quantified cost-savings exceed quantified forgone benefits is not robust under an alternative 2% discount rate, as illustrated in the original 2024 Rule EA (US EPA 2024b). In the interest of full transparency to the public, industry, and policymakers, the 2% discount rate results should be presented alongside the currently assumed 3% and 7% discount rates. More specifically, the results under a 2% discount rate should be right alongside the main results in Table 6-1 and 6-2 in the Delay Rule EA (US EPA 2026b, page 6-3). Second, presenting the results under the alternative 2% discount rate is needed to facilitate comparison to the original 2024 Rule EA and increase transparency. Third, the simultaneously proposed Rescission Rule EA still uses a 2% discount rate (US EPA 2026d). The inconsistent use of discount rates seems selectively strategic; suggesting that the Agency did not present a 2% discount rate when analyzing the Delay Rule simply because they did not like the result.

² Regulatory Impact Analysis Guidelines. 2025. Special Issue in the Journal of Benefit-Cost Analysis, 16(S2). Accessed at: <https://www.cambridge.org/core/journals/journal-of-benefit-cost-analysis/issue/7382CC40101643B8A5BC09633633D858>, 27 Jun 2026.

8. The EPA failed to fully discuss the forgone benefits that cannot be quantified, and more could be done to quantify and monetize several key forgone benefits in general.

The Delay Rule EA simply lists some of the unquantified forgone human health benefits, providing little to no context, relevance, etc. The EPA's own economic guidelines state that all benefits and costs should be identified and qualitatively discussed, even when quantification and monetization is not possible. The Economic Guidelines provide clear instruction on how to thoroughly incorporate unquantified impacts into a benefit-cost analysis (US EPA 2024a). Not following these guidelines and simply listing some of the unquantified forgone benefits minimizes the role of these potentially large impacts in the decision-making process, and paints a biased picture of the proposed Delay Rule for the public.

The original EA for the 2024 Rule (US EPA 2024b) included detailed qualitative discussions on many of the human health benefits that could be reasonably identified given the state of the science at the time. Given that these human health benefits would be *reduced* under the proposed Delay Rule, it is imperative to have an equally detailed discussion in the Delay Rule EA. This is particularly important because in the 2024 Rule EA "EPA notes that the quantified benefits alone of this analysis are a significant underestimate of the total benefits expected to result from this rule because the EPA was not able to quantitatively monetize all benefits" (US EPA 2024b, page 6-1). As such the quantified forgone benefits from the currently proposed Delay Rule also represent a significant underestimate of the total forgone benefits.

The qualitative discussion in the proposed Delay Rule EA must do a better job in presenting the current state of the science and the human health implications of the proposed delay in terms of increased risks of impaired liver function, immunosuppression, endocrine, metabolic, and reproductive effects, osteoarthritis, decreased bone density, impaired mammary gland development and function, cancer, etc. The discussion could pull largely from that presented in the 2024 Rule EA, but should also include updates to the science based on new information and studies that have come out since the 2024 Rule analyses were written.

In many cases, more recent scientific developments may have established a more concrete causal link and/or may now allow for quantification of changes in human health risks, and hence additional quantified forgone benefits from the proposed Delay Rule. The following are just a few examples, and do not represent a comprehensive list. A more comprehensive assessment is provided in the accompanying comments from the Natural Resources Defense Council (NRDC) et al. Pelch et al. (2026) have since published a peer-reviewed study highlighting that PFAS exposure is associated with reduced mammary gland function, including shorter breast-feeding durations. This adds to an already established literature finding a potential causal association between PFAS exposure and breastfeeding duration (see the review by Timmerman et al. 2023). Given the importance of breastfeeding for

infants' development, the corresponding forgone breastfeeding benefits from the proposed Delay Rule could be quite large. Similarly, Bline et al. (2024) recently published a peer-reviewed study that describes the association between PFAS exposure and suppressed immune system function; and in particular, reduced antibody levels in response to vaccinations. Rudzanova et al. (2023) and van Larebeke et al. (2023) have also recently found evidence that PFAS exposure is associated with suppressed immune system function, and add to a growing literature on the topic (see reviews by Crawford et al. 2023; Ehrlich et al. 2023; and Zhang et al. 2023). In general, it appears that the EPA made no effort to review the more recent literature and incorporate scientific developments that have been made since the development of the 2024 Rule. In pursuing and developing the proposed Delay Rule, it is important that the Agency review the science and clearly document and incorporate any new information that is now available since 2024, and how that new information has informed the proposed regulatory options. The Agency referenced several motivations and new information on the cost-savings side, but has done nothing to incorporate any new information on the forgone human health benefits.

Lastly, for the 2024 Rule EA the EPA conducted a sensitivity analysis that included the benefits from reductions in liver cancer due to reduced PFOS exposure. In doing so, they found that the total annualized health benefits increased by almost \$14 million (US EPA 2024b). At the same time, the EPA did not clearly document why these benefits were not included in the main analysis for the 2024 Rule EA. Clearly there was sufficient scientific evidence to quantify and monetize these benefits. The EPA must revisit this analytical decision. The forgone benefits due to increases in liver cancer cases from the proposed Delay Rule should be quantified and included in the main EA results. Doing so will provide a more comprehensive picture of the impacts of the proposed Delay Rule, and thus better inform the public and regulatory decisions.

9. EPA should use willingness to pay (WTP) estimates to monetize the forgone benefits associated with increases in the risk of non-fatal human health outcomes.

The 2024 EA used cost-of-illness (COI) estimates to monetize the non-fatal human health benefits. The proposed Delay Rule EA uses the same COI estimates. However, a theoretically more appropriate approach (when available) is to use estimates of WTP (US OMB 2003). WTP estimates better account for “pain and suffering and other quality-of-life effects” (US OMB 2023, page 48). Recognizing this in the earlier 2024 EA, EPA conducted a sensitivity analysis using WTP estimates. More specifically, the 2024 Rule EA states that:

“When using willingness to pay instead of cost of illness values to monetize cancer morbidity impacts, annualized RCC [(renal cell carcinoma)] benefits are \$360.97 million, whereas annualized bladder cancer benefits are \$456.28 million (see Appendix O). If used in the national benefits analysis, these willingness to pay estimates would result in approximately 83 million dollars

additional, ... resulting in an increase in quantified benefits of approximately 5.4%” (US EPA 2024b, page 6-4).

The Safe Drinking Water Act explicitly recognizes the appropriateness of WTP estimates for valuing the benefits of health risk reductions from drinking water contaminants (42 U.S.C. § 300g-1 (2024), section 1412(b)(3)(C)(iii)).³ Following best practices, the Agency should use WTP estimates when possible to monetize forgone health benefits resulting from the proposed Delay Rule. As done in the 2024 Rule EA, this should be possible for forgone benefits related to increases in RCC and bladder cancer, as well as for the currently unquantified increases in liver cancer (see comment #8). The use of theoretically superior WTP estimates for monetization is particularly important because the EPA’s primary conclusion that the cost-savings of the proposed rule outweigh the forgone benefits may not be robust when using more economically valid WTP estimates for valuation.

On a related note, I would like to point out that the Organisation for Economic Co-operation and Development (OECD) has implemented stated preference studies that estimate the public’s WTP for reductions in the risks of various non-fatal health outcomes that result from reduced exposure to toxic chemicals. Their research estimates people’s WTP for reductions in the risks of non-fatal cancer, underactive thyroid, hypertension, miscarriage, low birthweight, and asthma (OECD n.d.). These studies could be useful in monetizing several of the forgone health benefits resulting from the Delay Rule.

10. Costs to households who opt for a filter pitcher under the proposed exemptions should be accounted for in the economic analysis.

Under the proposed Delay Rule, in order to be granted an exemption and delay in compliance for an additional two years, systems with PFOA and/or PFOS levels above 12 ppt must implement two of six different control measures. The EPA assumes that cost-minimizing systems will opt to provide water customers with (i) educational materials and (ii) water pitcher filters. Although the costs of these measures to the systems are quantified, the EPA does not account for the costs to households to review educational materials and to request, properly use, and maintain the provided water filters, nor does it account for the costs of other averting or mitigating actions that households may opt to take when their systems are allowed to continue to provide water with elevated PFAS levels.

The proposed Delay Rule requires that systems distribute educational materials that are meant to inform consumers about steps they can take to reduce PFOA and PFOS exposure (US EPA 2026b, page 4-10), but the costs to households to review these materials and to take such mitigative and averting actions to reduce their PFAS exposure are not accounted for. The former includes their opportunity cost of time, as well as welfare losses due to increased anxiety. Even if the latter is not explicitly required, after reviewing the educational

³ Accessed 10 July 2026, at <https://www.govinfo.gov/content/pkg/USCODE-2024-title42/pdf/USCODE-2024-title42-chap6A-subchapXII-partB-sec300g-1.pdf>.

materials households may voluntarily take the recommended actions to reduce their exposure. In theory the costs for additional filters, alternative water sources (e.g., increased purchases of bottled water), etc. to these households are a social cost that should be accounted for.

For households requesting water pitcher filters under the proposed exemptions, the Delay Rule EA states that “water systems will be required to provide pitcher devices, two years of replacement filters, and instructions for their use and maintenance” (US EPA 2026b, page 4-13). But the opportunity cost of time for households to request a pitcher, review and comprehend the instructions, and maintain the filters properly are not accounted for, nor are any welfare losses due to increased anxiety from households having to take action themselves, rather than having their water system provide safe water.

On a related note, EPA’s assumptions regarding the effectiveness of pitcher filters, and in particular “that filters reduce PFOA and PFOS to 20 ppt”, is unsupported by the evidence presented in the EA (US EPA 2026b, page 5-3). First, the provided evidence suggests that the necessary technology is not yet fully developed. Second, with no support the EA implicitly assumes a constant rate of effectiveness as concentrations are reduced further and further. Third, the Delay Rule EA characterizes water systems as cost-minimizers, but at the same time disregards the fact that water systems may opt to provide households with cheaper, less effective filters (that are only certified to reduce PFAS to 70 ppt). Furthermore, given the risk of adverse health effects for dermal exposure and inhalation, a water pitcher filter seems inadequate in protecting human health.

11. Several of the other assumptions made in the Delay Rule EA are unsupported and will lead to incorrect estimates of both the presumed cost-savings and the forgone benefits.

More needs to be done to better inform several of the key assumptions. Examples of such assumptions include: (i) that 100% of systems that exceed the PFOA or PFOS MCLs will adopt an exemption, (ii) that only 20% of eligible households will opt to be provided a pitcher filter, and (iii) that there are no existing state regulations in the baseline. When necessary, additional sensitivity analysis should be carried out regarding these assumptions. I briefly elaborate on the concerns for some of these assumptions below.

EPA assumes that 100% of systems that exceed the PFOA or PFOS MCLs will adopt the exemption and opt for a two-year delay in compliance. This assumed rate seems high, especially given the relatively arduous requirements that are associated with the proposed interim control measures. In my professional opinion, the necessary steps for an exemption, such as developing and circulating educational materials and establishing a pitcher filter program (which are assumed to be the cheapest two interim measures available), entail relatively large fixed costs that may make the exemption for a delay of just two years not worthwhile for a system. In other words, it may be cheaper for systems to simply comply with the PFOA and PFOS MCLs by 2029, as the original 2024 Rule required. In the Delay

Rule preamble text, EPA acknowledges that larger systems in particular may find the interim measures more costly than long-term treatment options for PFOA and PFOS treatment (US EPA 2026a, page 29441). A lower system adoption rate should likely be assumed for the main analysis, along with a balanced sensitivity analysis suggesting slightly higher and lower system adoption rates.

EPA assumes a 20% adoption rate for eligible households opting for a system-provided pitcher filter. This is based on findings for the previously promulgated revisions to the Lead and Copper Rule. However, given the significant public attention to PFAS, the actual adoption rate and hence costs of this assumed control measure could be much higher. This would imply that the currently quantified costs to systems are likely underestimated, and that the corresponding unquantified costs to households, which are currently omitted from the Delay Rule EA (see comment #10), would be even larger.

The EPA performed a sensitivity analysis on the assumed household adoption rate, changing it from an assumed 20% to 50% of eligible households adopting. The results of this sensitivity analysis are characterized as follows:

“EPA assumes that 50 percent of customers use pitcher filters, instead of 20 percent, the estimated annualized costs to PWSs [(public water systems)] for pitcher filter distribution and program management will increase from \$6.5 million, at the three percent discount rate, and \$11.3 million, at the 7 percent discount rate, to \$16.1 million, at the three percent discount rate, and \$27.9 million at the 7 percent discount rate, in 2024 dollars” (US EPA 2026b, page 4-5).

Given that the estimated costs of this control measure more than doubled, and that such estimates may bring into question the EPA’s overall conclusion that the quantified cost-savings exceed the quantified forgone benefits, the results of such a sensitivity analysis should be presented more prominently and upfront in the EA. In fact, given significant public concern and media attention around PFAS, as well as the lack of support for the 20% assumption, perhaps the 50% household adoption rate assumption should be used for the main analysis. This should be accompanied with a balanced sensitivity analysis where the current 20% rate is assumed as a lower bound, followed by an upper bound 75% adoption rate scenario. The upper bound rate is supported by the case study referenced in footnote 10 of the Delay Rule EA (US EPA 2026b, page 4-3).

Finally, my understanding of the Delay Rule EA is that the EPA does nothing to account for existing state regulations in the assumed baseline. This goes against the Agency’s own Economic Guidelines, which state that “State regulations that have been finalized should be included in the baseline” (US EPA 2024a, page 5-15). This is not necessarily a comprehensive list, but such states include Maine, Vermont, Wisconsin, and perhaps New

York, who have all codified the MCLs that EPA set under the 2024 rule.⁴ Several other states have related PFAS drinking water regulations in place, including Michigan, Massachusetts, New Jersey, New Hampshire, and several others (ASDWA 2025). Even if such regulations are less stringent than those promulgated under the Federal 2024 Rule, the state regulations should be accounted for in the baseline when analyzing the proposed Delay Rule. Depending on the timing for any final rule resulting from the proposed Delay Rule, the EPA should also check the status of related PFAS standards proposed in other states, including efforts in California, and in turn incorporate any other finalized state-level regulations into the baseline for the proposed Delay Rule. By not accounting for states that will still require compliance with the PFOA and PFOS MCLs by 2029, as well as other related drinking water PFAS regulations, the EPA is overestimating both the forgone benefits and the cost-savings of the proposed Delay Rule.

Rescission Rule

Rescission Rule Regulatory Text

The preamble text that argues the rationale for the rescission of standards for PFHxS, PFNA, HFPO-DA (GenX), and the mixture of these three PFAS plus PFBS, is based primarily on a procedural argument, but there is one incorrect point that is grounded in economic theory and benefit-cost analysis. This pertains to the SDWA requirement that revised regulations may not decrease health protection (US EPA 2026c, page 29418).

12. Relative to the current and economically correct baseline, the proposed Rescission Rule will lead to decreases in health protections.

The argued baseline in the Rescission Rule preamble text is incorrect, and is inconsistent with EPA's own economic guidelines (US EPA 2024a) and with the EA for the proposed Rescission Rule (US EPA 2026d). In the EA, the EPA reasonably assumes a baseline where the 2024 Rule goes into effect, including standards for PFHxS, PFNA, HFPO-DA (GenX), and the mixture of these three PFAS plus PFBS. In contrast, in the preamble the EPA claims that the “proposed [Rescission] rule maintains protection of the health of persons because the baseline for comparison is no regulation for these contaminants.” This same error and glaring inconsistency are made in the preamble text for the Delay Rule, as documented under comment #5 above. As detailed there, the EPA’s own economic guidelines state that the appropriate baseline for comparison is “the future state of the world without the regulation” (US EPA 2024a, page 5-7). In this case, the world without the proposed

⁴ Details for each of the listed states can be found as follows: Maine (<https://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP0861&item=3&snum=132>, accessed 28 Jun 2026), Vermont (<https://dec.vermont.gov/sites/dec/files/documents/Final%20Water%20Supply%20Rule%20Effective%201.1.2026.pdf>, accessed 28 Jun 2026), Wisconsin (<https://content.govdelivery.com/accounts/WIGOV/bulletins/40b862c>, accessed 28 Jun 2026), and New York (<https://www.nysenate.gov/legislation/bills/2025/A8634/amendment/B>, accessed 28 Jun 2026).

Rescission Rule is a baseline that includes the MCLs for PFHxS, PFNA, HFPO-DA (GenX), and the mixture of these three PFAS plus PFBS. In other words, as reasonably assumed in the Rescission Rule EA, if the Rescission Rule is not enacted, then the aforementioned MCLs remain in place. This is the economically valid baseline to assume.

The “no regulation” baseline argued in the preamble is also inconsistent with other parts of the same preamble. The adjacent column in the same Rescission Rule preamble states that “the April 2024 Final PFAS NPDWR.... represents the baseline for this proposed rule” (US EPA 2026c, page 29418). The critical point is that the proposed Rescission Rule will lead to decreases in human health protections. The EPA’s argument suggesting otherwise is the result of incorrectly changing the baseline for comparison in order to strategically fit a predetermined argument.

Rescission Rule Economic Analysis

Similar to my overarching assessment of the EA for the proposed Delay Rule, the main conclusion from the EA for the proposed Rescission Rule – that the cost-savings exceed the forgone benefits – is not adequately supported, as documented in the comments below.

13. The EPA again fails to present a sufficient number of regulatory options for policymakers and the public to evaluate.

The EPA presents just one regulatory option in the EA for the Rescission Rule, which is the proposed option to fully rescind the MCLs for PFHxS, PFNA, HFPO-DA (GenX), and the mixture of these three PFAS plus PFBS. In the EPA’s own economic guidelines, however, it is clearly stated that “At a minimum, the economic analysis should fully assess and present three options for consideration: the proposed or finalized option; a more stringent option; and a less stringent option” (US EPA 2024a, page 3-7). The EPA’s guidelines go on to state that:

“Assessing at least three options applies in *any circumstances*. It is not adequate to evaluate only the selected option, even for a final rule that establishes the option to be promulgated. Similarly, in cases where the design of the regulation is dictated by statute, presenting multiple options is still necessary when the regulation is proposed or finalized – even though the Agency may have no discretion in its design. Assessing multiple options helps inform the public about the anticipated benefits and costs of the Agency’s final action compared to options not pursued, it is *imperative that the analysis assesses multiple options* [emphasis added].” (US EPA 2024a, page 3-7)

The Agency’s economic guidelines are quite clear on this topic, and yet again EPA did not follow its own best practices for conducting economic analysis.

14. The introduction of the Rescission Rule Economic Analysis (EA) presents an unbalanced and biased characterization of the potential impacts of the rule.

The introduction describes the potential cost-savings, but says little about the quantified and unquantified forgone benefits. This goes against standard practice, and the Agency's own economic guidelines, which specify that all benefits and costs should be presented in a transparent and balanced manner (US EPA 2024a). Even if not legally mandated, presenting forgone benefits (a cost of the proposed Rescission Rule) in the introduction would increase transparency to the public, and facilitate more economically efficient regulatory decisions. In general, Exhibit 3 should also be presented upfront in the introduction, along with a balanced discussion of both the cost-savings and forgone benefits, including any unquantified impacts. The EPA's guidelines state the economic analysis should include a plain language executive summary that includes an accounting statement that summarizes the benefit and cost estimates (US EPA 2024a, page 1-5).

15. More could be done to quantify some of the key forgone benefits, and in general the discussion of the forgone benefits that cannot be quantified is lacking. This yields a biased characterization of how the proposed Rescission Rule will impact human health.

The Rescission Rule EA relies solely on the 2024 Rule EA when estimating the quantified forgone benefits. As described in the EA for the 2024 Rule, any quantified health benefits resulting from reductions in exposure to PFHxS, PFNA, HFPO-DA (GenX), and the mixture of these three PFAS plus PFBS, are based on co-occurring reductions in PFOA and PFOS. The ancillary benefits that were estimated included reductions in the risks of low birthweight and infant mortality, cardiovascular disease, and renal cell carcinoma (RCC). The benefits associated with reduced bladder cancer risks were also estimated as an ancillary benefit, resulting from co-occurring reductions in disinfection byproduct formation. There was one supplemental analysis in Appendix K of the 2024 Rule EA that examined how reduced PFNA exposure would lead to additional benefits in terms of reduced risks of low birthweight. This supplemental analysis is completely omitted from the Rescission Rule EA, and should be moved to the main analysis of forgone benefits from the proposed Rescission Rule. The 2024 Rule EA did not otherwise quantify any benefits directly associated with reductions in the other regulated PFAS and the corresponding Index, nor did it do so in the proposed Rescission Rule EA.

The Agency disregards recent scientific studies that may now allow for further quantification of the forgone health benefits related to the Rescission of the MCLs for PFHxS, PFNA, HFPO-DA (GenX), and the mixture of these three PFAS plus PFBS. These studies are described in detail by the accompanying comments from NRDC et al., but briefly, more recent evidence suggests that exposure to these other PFAS is associated with reduced immune function, adverse thyroid, liver, and kidney effects, male reproductive issues, increased risks of gestational diabetes mellitus and hypertensive disorders among pregnant persons, and negative impacts on neural systems.

Even when a particular forgone benefit endpoint cannot be quantified, the corresponding discussion of unquantified benefits in the Rescission Rule EA is significantly lacking. The discussion entails a brief few sentence paragraph that simply lists the potential adverse impacts on human health, stating that “... the scientific literature and the EPA’s health assessments have identified evidence linking these substances to adverse health effects. These include developmental and reproductive toxicity, immune system suppression, liver damage, thyroid disruption, and elevated risk of kidney and liver cancers.” But at the same time the EPA provides no detail, no context, and no supporting references to scientific studies. Providing more information as was thoroughly done in the original 2024 Rule EA (US EPA 2024b) is important so that the public and policymakers fully understand the implications of the proposed rule.

The Rescission Rule EA should be revised to incorporate much of the qualitative discussion from the original 2024 Rule EA, and be updated to reflect recent findings in the scientific literature. When possible based on more recent scientific evidence, additional forgone health benefit endpoints should be quantified. See the accompanying comments from NRDC et al. for further details.

16. EPA should use willingness to pay (WTP) estimates to monetize the forgone benefits due to the Rescission Rule and the resulting increases in non-fatal human health outcomes.

Similar to comment #9 above, in the original 2024 Rule EA the EPA used COI estimates to monetize the non-fatal human health benefits, and so the proposed Rescission Rule EA uses the same COI estimates to monetize the forgone health benefits. But as previously discussed, the Safe Drinking Water Act explicitly recognizes the appropriateness of using WTP estimates (42 U.S.C. § 300g–1 (2024), section 1412(b)(3)(C)(iii)).⁵ WTP estimates are more theoretically valid (US OMB 2003), and better account for “pain and suffering and other quality-of-life effects” (US OMB 2023, page 48). The EPA conducted a sensitivity analysis that found notably larger health benefits when applying more theoretically valid willingness to pay estimates (US EPA 2024b, page 6-4).

Following best practices, when possible the Agency should use WTP estimates to monetize forgone health benefits resulting from the proposed Rescission Rule. This is particularly important because the EPA’s primary conclusion that the cost-savings of the proposed Rescission Rule outweigh the forgone health benefits may be sensitive to the use of more economically valid WTP values. See comment #9 for further details.

⁵ Accessed 10 July 2026, at <https://www.govinfo.gov/content/pkg/USCODE-2024-title42/pdf/USCODE-2024-title42-chap6A-subchapXII-partB-sec300g-1.pdf>.

17. The sensitivity analysis for the Rescission Rule EA is unbalanced, presenting a biased characterization of the impacts of the rule.

A sensitivity analysis suggesting an additional \$82.4M in annual estimated cost-savings from the Rescission Rule is discussed, and even presented in the primary summary table of net benefits (Exhibit 3 in the Rescission Rule EA, US EPA 2026d), but surely there are assumptions that could be just as reasonably examined and presented in a sensitivity analysis that would suggest reductions in cost-savings, or perhaps increases in the forgone benefits. For example, in the original 2024 Rule EA, the EPA conducted a sensitivity analysis that estimated the benefits corresponding to reductions in low birth weight due to reduced exposure to PFNA (US EPA 2024b), and yet the Agency makes no such effort to incorporate such a sensitivity analysis in the Rescission Rule EA. Presenting such one-sided sensitivity analysis is a disservice to the public, and will lead to inefficient regulatory decisions. A sensitivity analysis should be balanced and unbiased in order to give policymakers, industry, and the general public more information and context when interpreting the results. The EPA’s own Economic Guidelines state that “sensitivity analysis can be used to explore a range of possible outcomes but should examine both higher and lower values rather than only one or the other” (US EPA 2024a, page 1-6).

Conclusion

The economic rationale outlined in the preamble texts for the Delay Rule and Rescission Rule, as well as the corresponding economic analyses, paint a biased picture of the potential impacts of the proposed deregulatory actions. In my best professional judgement, the economic analyses and economic rationale in the preamble texts appear to be strategically crafted to support a predetermined decision, rather than to inform that decision. This goes against the fundamental purpose of economic analysis. As the Agency’s own economic guidelines state: “The goal of the economic analysis is to provide *objective* information about the consequences of a policy decision [emphasis added]” (US EPA 2024a, page 1-6). The EPA does not present sufficient evidence that the cost-savings from the proposed Delay Rule and Rescission Rule outweigh the forgone benefits.

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- Guignet, Dennis, Matthew T. Heberling, Michael Papenfus, and Olivia Griot (2022), "[Property values, water quality, and benefit transfer: A nationwide meta-analysis](#)," *Land Economics*, 98(2), 191-218.
- Klemick, Heather, Dennis Guignet, Linda Bui, Ron Shadbegian, and Cameron Milani (2022), "[Cardiovascular Mortality and Leaded Aviation Fuel: Evidence from Piston-Engine Air Traffic in North Carolina](#)," *International Journal of Environmental Research and Public Health*, 19, 5941.
- Kung, Megan, Dennis Guignet, and Patrick Walsh (2022), "[Comparing Pollution Where You Live and Play: A Hedonic Analysis of Enterococcus in the Long Island Sound](#)," *Marine Resource Economics*, 37(1), 65-89.
- Guignet, Dennis, and Jonathan Lee (2022), "[State of the Art of Hedonic Pricing](#)," In J.R. Kahn (Ed.), *Oxford Research Encyclopedia of Environmental Economics*, Oxford University Press.
- Petrolia, Daniel R., Dennis Guignet, John Whitehead, Cannon Kent, Clay Caulder, and Kelvin Amon (2021), "[Nonmarket Valuation in the Environmental Protection Agency's Regulatory Process](#)," *Applied Economic Perspectives and Policy*, 43(3), 952-969.
- Shadbegian, Ron, Dennis Guignet, Heather Klemick, and Linda Bui (2019), "[Early Childhood Lead Exposure and the Persistence of Educational Consequences into Adolescence](#)," *Environmental Research*, 178, 108643.
- Walsh, Patrick, Charles Griffiths, Dennis Guignet, and Heather Klemick (2019), "[Adaptation, Sea Level Rise, and Property Prices in the Chesapeake Bay Watershed](#)," *Land Economics*, 95(1), 19-34.
- Guignet, Dennis, Robin Jenkins, Matthew Ranson, and Patrick Walsh (2018), "[Contamination and Incomplete Information: Bounding Implicit Prices using High-Profile Leaks](#)," *Journal of Environmental Economics and Management*, 88, 259-282.
- Guignet, Dennis, and Adan L. Martinez-Cruz (2018), "[The Impacts of Underground Petroleum Releases on a Homeowner's Decision to Sell: A Difference-in-Differences Approach](#)," *Regional Science and Urban Economics*, 69, 11-24.
- Moore, Chris, Dennis Guignet, Kelly Maguire, Nathalie Simon, and Chris Dockins (2018), "[Valuing Ecological Improvements in the Chesapeake Bay and the Importance of Ancillary Benefits](#)," *Journal of Benefit-Cost Analysis*, 9(1), 1-26.

PUBLICATIONS (cont.):

- Klemick, Heather, Charles Griffiths, Dennis Guignet, Patrick J. Walsh (2018), “[Improving Water Quality in an Iconic Estuary: An Internal Meta-analysis of Property Value Impacts Around the Chesapeake Bay](#)”, *Environmental and Resource Economics*, 69(2), 265-292.
- Walsh, Patrick, Charles Griffiths, Dennis Guignet, and Heather Klemick (2017), “[Modeling the Property Price Impact of Water Quality in 14 Chesapeake Bay Counties](#),” *Ecological Economics*, 135, 103-113.
- Guignet, Dennis, Charles Griffiths, Heather Klemick, and Patrick J. Walsh (2017), “[The Implicit Price of Aquatic Grasses](#),” *Marine Resource Economics*, 32(1), 21-41.
- Guignet, Dennis, Patrick J. Walsh, and Rachel Northcutt (2016), “[Impacts of Ground Water Contamination on Property Values: Agricultural Run-off and Private Wells](#),” *Agricultural and Resource Economics Review*, 45(2), 293-318.
- Guignet, Dennis and Anna Alberini (2015), “[Can Property Values Capture Changes in Environmental Health Risks? Evidence from a Stated Preference Study in Italy and the United Kingdom](#),” *Risk Analysis*, 35(3), 501-517.
- Guignet, Dennis (2013), “[What Do Property Values Really Tell Us? A Hedonic Study of Pollution from Underground Storage Tanks](#),” *Land Economics*, 89(2), 211-226.
- Guignet, Dennis (2012), “[The Impacts of Pollution and Exposure Pathways on Home Values: A Stated Preference Analysis](#),” *Ecological Economics*, 82, 53-63.
- Alberini, Anna, Milan Šcasný, Dennis Guignet, and Stefania Tonin (2012), “[Cancer VPFs, One Size Does Not Fit All: The Benefits of Contaminated Site Cleanups in Italy](#),” *Journal of the Air and Waste Management Association*, 62(7), 783-798.
- Zabel, Jeffrey and Dennis Guignet (2012), “[A Hedonic Analysis of the Impact of LUST Sites on House Prices](#),” *Resource and Energy Economics*, 34(4), 549-564.
- Guignet, Dennis and Anna Alberini (2010), “[Voluntary Cleanup Programs and Redevelopment Potential: Lessons from Baltimore, Maryland](#),” *Cityscape: A Journal of Policy Development and Research*, 12(3), 7-36.
- Ready, Richard, Ann Fisher, Dennis Guignet, Richard Stedman and Junchao Wang (2006). “[A Pilot Test of a New Stated Preference Valuation Method: Continuous Attribute-Based Stated Choice](#),” *Ecological Economics*, 59, 247-255.

SELECTED WORKING PAPERS:

Guignet, Dennis, and Anna Silva (2026), “[A Meta-analysis to Uncover the Effects of Drinking Water Pollution on Home Values](#),” Appalachian State University, Department of Economics Working Paper, 26-06, Boone, NC, May.

Cook, Karlee, Dennis Guignet, Robin R. Jenkins, and Margaret Sugg (2026), “[Disproportionate Environmental Risks: An Analysis of Chemical Facilities and Accidents in the U.S.](#),” Appalachian State University, Department of Economics Working Paper, 26-04, Boone, NC, March.

Guignet, Dennis, Linda Bui, Caroline Fehlman, Jennifer Runkle, Ron Shadbegian, Maggie Sugg, and Sarah Ulrich (2026), “[Hazardous Air Pollutants and Maternal Health](#),” Appalachian State University, Department of Economics Working Paper, 26-03, Boone, NC, March.

Guignet, Dennis, Kyle Vetter, Linda Bui, and Heather Klemick (2025), “[The Effects of Hazardous Chemical Cleanups on Birth Outcomes](#),” Appalachian State University, Department of Economics Working Paper, 25-10, Boone, NC, October.

Klemick, Heather, Ron Shadbegian, Dennis Guignet, Linda T. Bui, and Anh Hoang (2025), “[Does Special Education in Elementary and Middle School Mitigate the Effects of Early Childhood Lead Exposure](#),” US EPA National Center for Environmental Economics Working Paper, 25-04, Washington, DC, October.

Guignet, Dennis and Adan L. Martinez-Cruz (2022), “[Valuing the Impacts of Chemicals on Environmental Endpoints: A Scoping Study](#),” Organisation for Economic Co-operation and Development (OECD), Series on Risk Management, 75, Paris, France, December.

RECENT PRESENTATIONS:

“A Meta-analysis to Uncover the Effects of Ground and Drinking Water Pollution on Home Values,” Social Cost of Water Pollution Workshop, Washington, DC, September 2025.

“The Impact of Mitigating Hazardous Chemical Exposure on Infant Health,” Northeastern Agricultural and Resource Economics Association’s Annual Meeting, Burlington, VT, June 2025.

“Hazardous Air Pollutants and Effects on Maternal Health,” Southern Economic Association’s Annual Meeting, Washington, DC, November 2024.

“The Effects of Toxic Air Pollutants on Maternal and Newborn Health: A Study of Underserved Communities in North Carolina,” Northeastern Agricultural and Resource Economics Association’s Annual Meeting, Rehoboth Beach, DE, June 2024.

“Valuing the Impacts of Hazardous Chemicals on Environmental Endpoints: Challenges and Opportunities,” Social Cost of Water Pollution Workshop, Washington, DC, October 2023.

RECENT PRESENTATIONS (cont.):

“Sea-level Rise, Groundwater Quality, and the Impacts on Coastal Homeowners,” Northeastern Agricultural and Resource Economics Association’s Annual Meeting, Annapolis, MD, June 2023.

“Layers of Injustice: A Distributional Assessment of Toxic Chemical Facilities, Releases, and Cleanups,” Department of Economics Seminar Series, Appalachian State University, Boone, NC, December 2022.

“The External Costs of Industrial Chemical Accidents: A Nationwide Property Value Study,” US Department of Agriculture Economic Research Service Seminar Series, Kansas City, MO, September 2022.

“The Impacts of Mitigating Hazardous Chemical Exposure on Infant Health,” Association of Environmental and Resource Economists’ Annual Summer Conference, Miami, FL, June 2022.

“The Property Value Impacts of Industrial Chemical Accidents,” Centre for Environmental and Resource Economics Seminar Series, Umeå University and the Swedish University of Agricultural Sciences, Umeå, Sweden, September 2021.

“Hazardous Waste and Home Values: An Analysis of Treatment and Disposal Sites in the U.S.,” 2021 PLACES Webinar: Land, Water, and ZTRAX, Boston, MA, June 2021.

“Hazardous Waste and Home Values: An Analysis of Treatment and Disposal Sites in the U.S.,” Northeastern Agricultural and Resource Economics Association’s Virtual Conference, June 2021.

“Hazardous Waste and Home Values: A Nationwide Quasi-Experiment of RCRA Sites,” Department of Economics Seminar Series, University of Calgary, Calgary, Canada, April 2021.

“Hazardous Waste and Home Values: A Nationwide Quasi-Experiment of RCRA Sites,” Center for Health Economics and Policy Studies Seminar Series, San Diego State University, San Diego, CA, March 2021.

CONSULTING:

Organisation for Economic Co-operation and Development (OECD), France (2021-present)

Earthjustice, United States (2023-2026)

Natural Resources Defense Council (NRDC), United States (2026)

Southern Environmental Law Center, United States (2026)

Landcare Research, New Zealand (2018-2019)

SELECTED AWARDS:

Dean's Club Outstanding Mentor Award, Walker College of Business, Appalachian State University (2026)
Scientific and Technological Achievement Award: Level III Award, Office of Research and Development, US Environmental Protection Agency (2021, 2024)
Scientific and Technological Achievement Award: Honorable Mention, Office of Research and Development, US Environmental Protection Agency (2015, 2024 (3 awards))
Sywassink Award for Excellence in Research, Walker College of Business, Appalachian State University (2024)
Dean's Club Research Prize: 1st Place, Walker College of Business, Appalachian State University (2020, 2023)
Bronze Medal for Commendable Service, US Environmental Protection Agency (2016)
Partners of OW Award, Office of Water, US Environmental Protection Agency (2016)
Trudy A. Speciner Non-Supervisory Award for Advancing Environmental Protection, US Environmental Protection Agency (2014)
Superior Efforts and Contributions Award, Office of the Administrator, US Environmental Protection Agency (2012, 2014, 2016)
Award for Excellence and Innovation in Undergraduate Teaching in the Marquee Courses in Science and Technology, University of Maryland (2011)
Eagle Scout, Boy Scouts of America (2001)

SELECTED REFEREE EXPERIENCE:

Agricultural and Resource Economics Review (2022, 2019, 2015), *Ecological Economics* (2013), *Economics* (2017), *Energy Economics* (2024, 2021), *Environmental Research* (2025); *Environmental and Resource Economics* (2023, 2022, 2021, 2014), *Environment and Planning C: Government and Policy* (2013), *Environmental Economics and Policy Studies* (2018), *Health Affairs* (2011), *International Journal of Sustainable Transportation* (2016), *International Regional Science Review* (2014), *International Journal of Urban Sciences* (2017), *Journal of the Association of Environmental and Resource Economists* (2024, 2019), *Journal of Environmental Economics and Management* (2024, 2023, 2022, 2020, 2019, 2018, 2017, 2014, 2011, 2010), *Journal of Housing Economics* (2020), *Journal of Political Economy Microeconomics* (2024), *Journal of Regional Science* (2020), *Land Economics* (2026, 2022, 2020, 2017, 2016, 2015, 2014, 2012), *Leisure Sciences* (2015), *Marine Resource Economics* (2026, 2020), *Policy Sciences* (2012), *Proceedings of the National Academy of Sciences* (2019), *Regional Science and Urban Economics* (2024, 2011), *Resource and Energy Economics* (2019, 2018, 2015, 2014), *Science of the Total Environment* (2018), *Sustainability* (2017, 2015), *Water Economics and Policy* (2015).

SELECTED PROFESSIONAL SERVICE:

Associate Editor: Journal of Benefit Cost Analysis, 2026-present.
Guest Editor, PNAS Nexus, 2026.
Discussant: Resources for the Future Webinar on After Implementation: Impacts and Effects of Federal Environmental Regulations, 2025.

SELECTED PROFESSIONAL SERVICE (cont.):

Committee Member: Career Advancement and Mentorship (CAM) Program Committee, Northeastern Agricultural and Resource Economics Association, 2024-2027.

Chair: Selected Papers Committee, Northeastern Agricultural and Resource Economics Association's 2023 Annual Conference, 2022-2023.

Panel Review Member: National Science Foundation (NSF), 2022.

Session Chair: Pollution Exposure and Children's Cognitive and Health Outcomes session at the Association of Environmental and Resource Economists' Conference, Miami, FL, 2022.

Panel Review Member: US Environmental Protection Agency, 2022.

Session Co-organizer: 2021 PLACES Webinar: Land, Water, and ZTRAX, 2021.

Expert Reviewer: University of Wisconsin Water Resources Institute, 2019.

Expert Reviewer: Inter-American Development Bank, Workshop on Discrete Choice Experiment on Housing in Mexico City, 2019.

Program Committee Member: Association of Environmental and Resource Economists' sponsored sessions at the Southern Economic Association Annual Conference, 2019.

Reviewer: US Department of Agriculture sponsored workshop on Applications and Potential Ecosystem Services Valuation within USDA, 2018.

Session Chair: Benefit-Cost Analysis session sponsored by the Association of Environmental and Resource Economists at the Southern Economic Association's Annual Conference, Washington, DC, 2018.

Session Chair: Hedonic Price Studies and BCA session at the 10th Annual Conference of the Society for Benefit Cost Analysis, Washington, DC, 2018.

Book Reviewer: *Environmental & Natural Resource Economics* (11th ed.) by Tom Tietenberg & Lynne Lewis, Taylor & Francis, 2017.

Panel Review Member: US Department of Housing and Urban Development National Disaster Resilience Competition, 2015.

PROFESSIONAL ORGANIZATIONS:

Northeast Agricultural and Resource Economics Association

Association of Environmental and Resource Economists

COMPUTER SKILLS: ArcGIS Pro, Stata, R