ILLINOIS POLLUTION CONTROL BOARD
March 7, 2024

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	R22-18
GROUNDWATER QUALITY	)	(Rulemaking – Public Water Supplies)
35 ILL. ADM. CODE 620	)	

Proposed Rule. First Notice.

OPINION AND ORDER OF THE BOARD (by B.F. Currie and M. Gibson)

The Illinois Environmental Protection Agency (IEPA or Agency) filed a proposal to amend the Board's groundwater quality regulations. *See* 35 Ill. Adm. Code 620. IEPA filed this proposal in accordance with the policy of the Illinois Groundwater Protection Act – to ensure the preservation and protection of Illinois' groundwater and that the state's groundwater quality standards match current scientific data and methodologies.

After conducting three public hearings, receiving comments, and considering the entire record, the Board adopts for first notice publication the Agency's proposal amending Part 620 with a number of changes. Publishing the proposed rules in the *Illinois Register* begins a public comment period of at least 45 days. *See* 5 ILCS 100/5-40(b) (2022). The proposed rules appear in the addendum to this opinion with additions underlined and deletions struck through.

SUMMARY OF BOARD ACTIONS

Today, the Board proposes amendments to Part 620 of its groundwater quality regulations. This first notice opinion and order contains detailed technical and scientific discussions regarding each of the proposed amendments. To start, the Board summarizes the actions taken in today's order.

At first notice, the Board moves forward with IEPA's proposed standards for 10 new chemicals detected in Illinois groundwater, including five of the six per- and polyfluoroalkyl substances (PFAS) (PFOS, PFNA, PFBS, PFHxS, HFPO-DA), molybdenum, lithium, aluminum, and 1-methylnapthalene. For PFOA, the sixth proposed PFAS, the Board proposes a standard of 4 parts per trillion (ppt), rather than the 2 ppt standard proposed by IEPA. For PFOS, the Board asks whether the standard should be revised from 7 ppt to 4 ppt to reflect USEPA's proposed drinking water standards. Additionally, the Board adopts all of IEPA's proposed revisions to existing Class I and Class II standards, including cobalt, selenium, and vanadium. The Board directs several questions regarding these proposed standards to IEPA. Those questions can be found on page 68 of this order.

Regarding PFAS, the Board for several reasons moves forward with the groundwater standards before adopting drinking water standards. First, groundwater is a vital resource that needs to be protected for current and future uses. Second, adopting groundwater standards meets

the policy of the Illinois Groundwater Protection Act, which recognizes "the essential and pervasive role of groundwater in the social and economic well-being of the people of Illinois, and its vital importance to the general health, safety, and welfare" and directs the "state to restore, protect, and enhance the groundwaters of the State." 415 ILCS 55/2(b) (2022). Third, all six PFAS chemicals have been detected in the State's public water supplies that rely on community water supply wells to serve large populations. Further, thousands of Illinoisans depend on groundwater from private potable wells, usually without access to treatment technologies. Hence, it is imperative that the State's groundwater resources are adequately protected from PFAS contamination. Finally, USEPA has proposed drinking water maximum contaminant levels for PFAS in drinking water. Once USEPA finalizes that proposal, the Board will propose amendments to the Safe Drinking Water Regulations standards under Part 611 consistent with the federal rules. Based on these factors, the Board finds it is appropriate to proceed with the PFAS groundwater quality standards at this time.

The Board's first notice proposal also includes amendments to Part 620, Subpart F and Appendix A procedures and methodologies, which provide the basis for developing rulemaking proposals for new or revised numerical groundwater standards. These amendments include a change in the per capita daily water ingestion rate from an average adult rate of two liters per day to an average child rate of 0.78 liters per day. Additionally, the exposure population is updated from an average adult to a child aged 0-6 years old. The Board agrees with IEPA's reasons for these proposed changes: children are more sensitive receptors than adults and that protecting children ensures protecting all human populations.

The Board also adopts IEPA's revisions to Part 620 Appendix A that allow for the selection of toxicity values based on updates to the toxicity hierarchy. The proposed revisions also address the methodology used to calculate oral reference doses relied upon by USEPA.

Consistent with IEPA responses to Board questions during this rulemaking, the Board proposes to overhaul its 32-year-old groundwater management zone (GMZ) rules. The proposed changes will not alter the purpose of GMZs or how they work. Instead, the first-notice proposal fleshes out aspects of the GMZ process on which the current rules are silent and clarifies existing provisions that are vague or confusing. As proposed, the amended GMZ rules will make plain what a GMZ is, how to apply for a GMZ, what IEPA must consider in approving or rejecting a GMZ, what constitutes an IEPA approval, how and when a GMZ starts, what a GMZ does, and how and when a GMZ ends.

Throughout this order, the Board directs questions to IEPA. The full list of questions begins on page 68. The Board requests that IEPA respond in writing to these questions by 30 days after the proposed rules are published in the *Illinois Register*.

TABLE OF ACRONYMS AND ABBREVIATIONS

Below is a table of acronyms and abbreviations used in this opinion.

Act	The Illinois Environmental Protection Act
ADE	Acceptable Daily Exposure
ATSDR	Agency for Toxic Substances and Disease Registry
DNP	Dedicated Nature Preserve
GAC	Groundwater Advisory Council
GWQS	Groundwater Quality Standards
HBWC	Health-Based Water Concentration
HED	Human Equivalent Dose
HFPO-DA (Gen X)	Hexafluoropropylene Oxide-dimer Acid
HTAC	Human Toxicant Advisory Concentration
HNTAC	Human Nonthreshold Toxicant Advisory Concentration
HTTAC	Human Threshold Toxicant Advisory Concentration
ICCG	Interagency Coordinating Committee on Groundwater
IEPA	Illinois Environmental Protection Agency
IGPA	Illinois Groundwater Protection Act
IRIS	Integrated Risk Information System
LLOQ	Lower Limit Of Quantitation
LCMRL	Lowest Concentration Minimum Reporting Level
LOAEL	Lowest Observed Adverse Effect Level
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
NOAEL	No Observed Adverse Effect Level
NPDWR	National Primary Drinking Water Standards
NTU	Nephelometric Turbidity Unit
OSWER	Office of Solid Waste and Emergency Response
PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutane sulfonate
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PPRTV	Provisional Peer-Reviewed Toxicity Values
PQL	Practical Quantitation Limits
RfD	Reference Dose
RSC	Relative Source Contribution
RSL	Regional Screening Level
SDWA	Safe Drinking Water Act
TACO	Tiered Approach for Corrective Action Objectives
UCMR	Unregulated Contaminant Monitoring Rule
UF	Uncertainty Factor
USEPA	United States Environmental Protection Agency

PROCEDURAL BACKGROUND

On December 7, 2021, IEPA filed its rulemaking proposal. Accompanying the proposal were IEPA's Statement of Reasons (SR), pre-filed witness testimony for Ms. Carol Hawbaker (Ex. 2)[1] and Mr. Lynn Dunaway (Ex. 3), and proposed amendments to Part 620 (Prop.). On January 6, 2022, the Board accepted the proposal for hearing.

Also on January 6, 2022, the Board requested that the Department of Commerce and Economic Opportunity (DCEO) conduct an economic impact study of IEPA's proposal by February 20, 2022. *See* 415 ILCS 5/27(b) (2022). The Board did not receive a response to its request.

On February 18, 2022, the Board received pre-filed questions for IEPA's witnesses from the American Chemistry Council (ACC) (Ex. 4); the PFAS Regulatory Coalition (Ex. 5); the Illinois Environmental Regulatory Group (IERG) (Ex. 6); the National Waste and Recycling Association (NWRA) (Ex. 9); and Dynegy Midwest Generation, LLC, Electric Energy, Inc., Illinois Power Generating Company, Illinois Power Resources Generating, LLC, and Kincaid Generation, LLC (collectively, Dynegy) (Ex. 8). Also on February 18, 2022, a Board hearing officer order submitted questions to IEPA's witnesses (Ex. 7).

On March 4, 2022, IEPA pre-filed answers to the Board's pre-filed questions (Ex. 10). On March 7, 2022, IEPA pre-filed answers to Dynegy (Ex. 12), IERG (Ex. 11), PFAS Regulatory Coalition (Ex. 13), ACC (Ex. 14) and the NWRA (Ex. 15).

The Board held the first hearing on March 9, 2022, and received the transcript (Tr. 1) on March 14, 2022. The focus of this first hearing was IEPA testimony.

On March 10, 2022, a Board hearing officer order set a deadline of March 18, 2022, for additional pre-filed follow-up questions for IEPA witnesses. On March 11, 2022, a Board hearing officer order submitted follow-up questions (Ex. 20). On March 18, 2022, the Board received pre-filed follow-up questions from Dynegy, the PFAS Regulatory Coalition (Ex. 18), the ACC (Ex. 17), and the NWRA (Ex. 16). On May 6, 2022, IEPA filed responses to follow-up questions (Ex. 21).

The Board held the second hearing on June 21, 2022 and received the transcript (Tr. 2) on June 27, 2022. The focus of this second hearing was follow-up to IEPA testimony.

On September 15, 2022, the Board received pre-filed testimony from Sandra Carey on behalf of the International Molybdenum Association (Ex. 22), Ned Beecher, on behalf of the PFAS Regulatory Coalition (Ex. 33), Stephen P. Risotto on behalf of the ACC (Ex. 28), Thomas Hilbert and Eric Ballenger on behalf of the NWRA (Ex. 31, 32), Robyn Prueitt on behalf of 3M Company (Ex. 25), and Melinda Hahn and Lisa Yost on behalf of Dynegy (Ex. 23, 24).

[1] Please see the December 8, 2022, Final Hearing Exhibit List for all exhibit numbers and associated exhibit names.

On October 27, 2022, the Board received pre-filed questions from IEPA for various witnesses, the ACC for Robyn Prueitt, and 3M Company for Stephen Risotto. Also on October 27, 2022, a Board hearing officer order submitted questions to various witnesses (Board Questions 3). On November 23, 2022, the Board received pre-filed answers from the ACC (ACC Resp.), the International Molybdenum Association (IMOA Resp.), the NWRA (Ballenger Resp, Hilbert Resp.), Dynegy (Yost Resp., Hahn Resp.), the PFAS Regulatory Coalition (Beecher Resp.), and 3M Company (Prueitt Resp.).

The Board held the third hearing on December 7, 2022, and received the transcript (Tr. 3) on December 15, 2022.

On December 8, 2022, a Board hearing officer order set the public comment deadline as February 17, 2023, which was later extended to March 3, 2023. The Board received a post-hearing comment on February 14, 2023 from the ACC (PC 50). On February 24, 2023, the Board received a post-hearing comment from IERG (PC 51). On March 3, 2023, the Board received post-hearing comments from the Office of the Illinois Attorney General (PC 52), IEPA (PC 54), the NWRA (PC 53), the PFAS Regulatory Coalition (PC 55), 3M Company (PC 56), and Dynegy (PC 57).

In addition to the post-hearing comments noted above, the Board received a number of written public comments (*e.g.*, PC 13-18, 38-48), and seven oral public comments at hearing (*e.g.*, TR.2 at 68-75).

STATUTORY BACKGROUND

In 1987, the General Assembly adopted the Illinois Groundwater Protection Act (IGPA). The purpose of the IGPA is, "to restore, protect, and enhance the groundwaters of the State, as a natural public resource." 415 ILCS 55/2(b) (2022). The General Assembly found that:

> The State recognizes the essential and pervasive role of groundwater in the social and economic well-being of the people of Illinois, and its vital importance to the general health, safety, and welfare. It is further recognized as consistent with this policy that the groundwater resources of the State be utilized for beneficial and legitimate purposes; that waste and degradation of the resources be prevented; and that the underground water resource be managed to allow for maximum benefit of the people of the State of Illinois. *Id*.

The IGPA set a July 1, 1989, deadline by which IEPA was to propose comprehensive water quality standards to protect groundwater. 415 ILCS 55/8(a) (2022). The IGPA also set a deadline of two years after IEPA filed its proposal for the Board to promulgate the groundwater quality standards. 415 ILCS 55/8(b) (2022).

The Board adopted groundwater quality standards in 1991. Groundwater Quality Standards 35 Ill. Adm. Code 620, R89-14(B) (Nov. 7, 1991). In that rulemaking, the Board described the goal of the IGPA as, "an outgrowth of long-standing concern by the General Assembly and the citizens of the State that the State's rich and valued groundwater resources be

protected." *Id*. at 3. One particular mandate of the IGPA which informs this present rulemaking is, "[i]n promulgating these regulations, the Board shall, in addition to the factors set forth in Title VII of the Environmental Protection Act (Act), consider …. existing methods of detecting and quantifying contaminants with reasonable analytical certainty." 415 ILCS 55/8(b)(6) (2022). The Board noted in R89-14(B) that, "[a] historical difficulty with incorporation of numeric standards within regulations is the need to constantly revise the numbers as new information is developed. This difficulty has a particular presence in the instant matter because the USEPA is in the process of a major MCL promulgation effort." R89-14(B), (Nov. 7, 1991) slip op. at 19. To keep Part 620's numerical standards up to date with USEPA's actions, the Board expected from the Agency regular proposals to update the groundwater standards. *Id*.

Since the Board promulgated Part 620, it has received and adopted periodic updates to its numerical standards, consistent with current scientific methodologies and developments. *See* Proposed Amendments to Groundwater Quality Standards, 35 Ill. Adm. Code 620, R08-18; Proposed MTBE and Compliance Determination Amendments to Groundwater Quality Standards: 35 Ill. Adm. Code 620, R01-14; Groundwater Protection: Amendments to Groundwater Quality Standards (35 Ill. Adm. Code 620), R93-27.

In R93-27, the Board amended its groundwater quality regulations to add Class I and Class II standards for sixteen new chemicals for which standards had not previously been set. *See*, Groundwater Protection: Amendments to Groundwater Quality Standards (35 Ill. Adm. Code 620), R93-27, slip op. at 1 (March 17, 1994). In R01-14, in response to the Board's request to continually update its groundwater standards, the Agency proposed several changes, including adding Class I and Class II standards for methyl tertiary butyl-ether (MTBE), widely used as an octane-enhancing additive to gasoline. Proposed MTBE and Compliance Determination Amendments to Groundwater Quality Standards (35 Ill. Adm. Code 620), R01-14, slip op at 2 (Sept. 6, 2001). In R08-18, the Board recognized that in order to prevent degrading the State's groundwater resources, it is periodically necessary to account for new scientific data in proposing updates to the Board's groundwater quality standards. Proposed Amendments to Groundwater Quality Standards (35 Ill. Adm. Code 620), R08-18, slip op. at 5 (Oct. 2, 2012).

In this rulemaking, the Board proposes to add or update: definitions to maintain consistency with the current USEPA definitions; test methods, incorporations by reference, and procedures for selecting toxicity values to adhere to current scientific data and methods; and groundwater quality standards, including new standards for six per- and polyfluoroalkyl substances or PFAS and four other chemical constituents.

USEPA ACTIONS

Several participants argued that the Board should wait for USEPA to propose PFAS standards before moving forward with this rulemaking proposal. The PFAS Regulatory Coalition, for example, asks the Board to consider recent scientific developments in the area.

> During the time since this rulemaking commenced, there have been significant scientific developments on issues related to its proposed groundwater standards for PFAS,

> including recent health effects studies being considered by EPA and its Science Advisory Board, reports issued by the World Health Organization and other organizations concerning PFAS risk assessments, and new analytical methods that are currently undergoing validation testing by USEPA. While these developments could have a significant impact on any groundwater standards to be adopted in Illinois, those potential impacts on the pending Agency proposal have not been considered or assessed by IEPA. PC 55 at 3.

The Board notes that USEPA has taken several actions in recent years concerning PFAS and a summary of these actions can be found on USEPA's PFAS website[2]. In this Section, the Board summarizes significant USEPA actions that pertain to the proposed PFAS GWQS, including standards and advisories, analytical methods, and toxicity information. Most notably, since the Board accepted this rulemaking proposal for hearing, USEPA has proposed for public comment drinking water standards for several PFAS being considered in this rulemaking.

PFAS Standards

In June 2022, USEPA published lifetime drinking water health advisories for PFOA, PFOS, GenX and PFBS[3]. 87 Fed. Reg. 36,848 (June 21, 2022). Then in March 2023, USEPA proposed drinking water regulations for PFOA and PFOS, and additional standards for four PFAS chemical mixtures. 88 Fed. Reg. 18,638 (March 29, 2023). USEPA has proposed individual MCLs of 4.0 ppt for PFOA and PFOS. Additionally, USEPA proposed a unitless hazard index of 1.0 as MCL for a mixture of four PFAS chemicals - PFNA, PFHxS, PFBS, and GenX. *Id.* USEPA expects to finalize proposed regulations by early 2024[4]. USEPA's proposed MCLs and interim health advisories are summarized in table below with IEPA's proposed PFAS standards.

Constituent	USEPA		IEPA	
	Proposed MCL (mg/L) (2023)	**Interim Health Advisory (2022)**	**Class I: Potable Resource Groundwater (mg/L)**	**Class II: General Resource Groundwater (mg/L)**
PFOA	0.000004	0.000000004	0.000002	0.000002
PFOS	0.000004	0.00000002	0.0000077	0.0000077

[2] USEPA, Key EPA Actions to Address PFAS (visited December 14, 2023) https://www.epa.gov/pfas/key-epa-actions-address-pfas

[3] USEPA, Drinking Water Health Advisories (visited November 20, 2023) https://www.epa.gov/sdwa/drinking-water-health-advisories-has#published

[4] USEPA, EPA's PFAS Strategic Roadmap: Second Annual Progress Report (visited February 2, 2024) at page 3 https://www.epa.gov/system/files/documents/2023-12/epas-pfas-strategic-roadmap-dec-2023508v2.pdf

PFNA	0.00001*	Hazard Index 1.0		0.000012	0.000012
PFHxS	0.000009*			0.000077	0.000077
PFBS	0.002*		0.002	0.0012	0.0012
HFPO-DA (Gen X)	0.00001*		0.00001	0.000012	0.000012

*Health based water concentrations

Sampling and Analytical Methods

On December 7, 2021, USEPA promulgated amendments to SDWA rules. The amendments require including in the fifth Unregulated Contaminant Monitoring Rule (UCMR 5) all PFAS for which there is a validated drinking water testing method but that are not subject to national drinking water regulation. 86 Fed. Reg. 73,131-73,133 (Dec. 27, 2021). UCMR 5 requires all public water systems serving more than 10,000 people (and smaller systems as resources allow) to collect samples and test for 29 PFAS over a 12-month period between January 2023 and December 2025. *Id.* at 73,134. USEPA says that the UCMR program provides nationally representative occurrence data on emerging contaminants such as PFAS in drinking water. This data will allow science-based decision-making and help prioritize protection of disadvantaged communities. *Id.* 73,132.

Additionally, USEPA has recently published several analytical methods addressing PFAS chemicals included in the proposed rules.[5] Two drinking water methods are available for analyses of all six PFAS (GenX, PFBS, PFOA, PFOS, PFHxS, and PFNA) included in the proposed rules: Method 533 (published in November 2019) and Method 537.1[5] (published in March 2020). In July 2021, USEPA revised Method 8327[5], which is applicable to aqueous media (surface water, groundwater, and wastewater). This method includes an analyte list of 24 PFAS, including all PFAS in the proposed rules except for GenX. SW-846 Test Method 8327. Additionally, in December 2022 USEPA published draft Method 1633, which is expected to be finalized for 40 PFAS in aqueous media[5], including all six PFAS in the proposed rules. 3rd Draft Method 1633 at Table 1.

PFAS Toxicity Information

USEPA has updated the toxicity assessments for some of the PFAS chemicals included in the proposed rules, including the final toxicity assessments for PFBS (January 2021)[6] and GenX

[5] USEPA, PFAS Analytical Methods Development and Sampling Research (visited November 20, 2023) https://www.epa.gov/water-research/pfas-analytical-methods-development-and-sampling-research

[6] USEPA, PFOA, PFOS and Other PFASs Toxicity Assessment for PFBS (visited November 20, 2023) https://19january2021snapshot.epa.gov/pfas/toxicity-assessment-pfbs_.html

(October 2021)[7]. USEPA is developing toxicity assessments of PFNA[8] and PFHxS[9]. USEPA published a draft toxicity assessment for PFHxS for public comment on July 24, 2023. 88 Fed. Reg. 47,496 (July 24, 2023).

GENERAL COMMENTS

In addition to comments and testimony relating to specific proposed amendments to Part 620, several participants had general comments on the rulemaking. These comments most often questioned the proposed PFAS standards.

Groundwater Advisory Committee (GAC)

The NWRA cites a requirement under the Illinois Groundwater Protection Act (IGPA), 415 ILCS 55/1, that IEPA consult with the ICCG and the GAC before proposing any groundwater rule to the Board. 415 ILCS 55/8 (2022). NWRA argues that "[s]uch consultation has effectively and fully occurred in virtually every previous Part 620 rulemaking save this one, and in those prior rulemakings the Illinois EPA reported that the ICCG and GAC were consulted and generally supported the proposed rules." PC 53 at 5.

The GAC provided one comment to the Board. PC 1. The GAC's comment summarizes its interactions with IEPA while it developed its proposal. It then restates the comments it had provided IEPA, which GAC argues IEPA did not sufficiently address in its proposal. PC 1 at 2. Among its questions, the GAC asks IEPA to describe "the basis for not following the federal or surrounding state approaches, methodologies, and standards." *Id*. It also asks IEPA to justify why Illinois' standards are to be more stringent than federal and surrounding states, describe how testing will be performed at state laboratories, and describe methods that regulated entities should use to analyze PFAS. *Id*. The Board addresses each of these issues below.

During the March 9, 2022, hearing, IEPA Groundwater Section Manager Michael Summers testified that, before proposing the rule to the Board, IEPA had multiple comment periods, question and answer sessions, and public meetings regarding its proposal. TR. 1 at 179.

> At the time of the -- these were done, the Groundwater Advisory Council was not staffed with a quorum of individuals and members. The chairman had resigned, and we reached

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[7] USEPA, Human Health Toxicity Assessment for GenX Chemicals (visited November 20, 2023) https://www.epa.gov/system/files/documents/2023-03/GenX-Toxicity-Assessment-factsheet-March-2023-update.pdf

[8] USEPA, Science Inventory IRIS Toxicological Review of Perfluorononanoic Acid (PFNA) (External Review Draft) (visited November 20, 2023) https://cfpub.epa.gov/si/si_public_pra_view.cfm?Lab=CPHEA&dirEntryID=355409

[9] USEPA, Science Inventory IRIS Toxicological Review of Perfluorohexanesulfonic Acid (PFHxS) and Related Salts (Public Comment and External Review Draft) (visited November 20, 2023) https://cfpub.epa.gov/si/si_public_pra_view.cfm?Lab=CPHEA&dirEntryID=355410

> out to try and - essentially we reached out to the GAC members. We had multiple meetings with GAC[…]. We had specific meetings where we talked about the proposed changes. We had meetings where Miss Hawbaker and [Mr.] Dunaway were available to answer any questions from the GAC… We feel that we gave every opportunity for the GAC members to comment and provide recommendations to the proposed 620 regulations. And you've seen what their response was to us… they did not ask or provide any comments or recommendations specific to the proposed 620s, and they had ample opportunity to look at what we proposed and to look at the direction and how we were proposing things. *Id*. at 179-180.

Office of the Attorney General

The Office of the Illinois Attorney General (AG or People) commented, generally, that the proposed changes to Part 620 are consistent with the General Assembly's legislative directives. It added that they are also consistent with "the State's long-standing policy based on the prevention of groundwater contamination and preservation of the State's groundwater resources for current and future beneficial uses." PC 52 at 2. The AG cites the constitutional requirement to enact laws to "provide and maintain a healthful environment, which includes the protection of state groundwater". *Id.* Specifically, the AG notes that the General Assembly has enacted the Illinois Environmental Protection Act (Act) and the Illinois Groundwater Protection Act to enforce and implement the constitutional provisions. *Id.*

The AG asserts that "[g]roundwater standards for PFAS are particularly important because the chemicals can easily migrate between air and soil into water, including groundwater." PC 52 at 4. Citing the ubiquity of PFAS in the environment, the AG argues that "PFAS are widely used, can lead to adverse health effects through exposure to very small amounts, are resistant to typical environmental degradation – therefore known as 'forever' chemicals – and are bio-accumulative, meaning they tend to concentrate in tissues of living organisms, including humans." *Id*. The AG maintains that "by proposing these standards for PFAS and other chemicals, the Agency is carrying out its duty to restore, protect, and enhance the groundwaters of the State. For these reasons, the People support the proposed regulations and urge the Board to adopt them." *Id*. at 9. The AG argues that the proposal fulfills the requirement of the Constitution and the Act. *Id*. at 4.

National Waste and Recycling Association (NWRA)

The NWRA questions the effect the proposed GWQS on landfills. "On this record, the Illinois EPA indicated an intention to make its proposed GQSs immediately enforceable in landfill permits – as they are renewed." PC 53 at 3. NWRA notes the waste industry "(a) has not caused the PFAS problem; (b) must continue to accept PFAS containing products as part of the waste stream; and (c) cannot reasonably be expected to comply, given existing technology and costs, with regulations or permit conditions that presume an obligation to remediate groundwater to the very stringent standards proposed." *Id.* NWRA's expert, Eric Ballenger, asserts that most PFAS in landfill leachate comes from waste but most of that PFAS is remains in the landfills. Ballenger Resp. at 3. He notes that "PFAS contaminants in landfill leachate would derive from the legally authorized waste received by the landfill and disposed of therein,

which includes waste with PFAS-containing compounds." This includes many common household products, food packaging, commercial waste, WWTP [wastewater pretreatment] biosolids, and many other common MSW [municipal solid waste] Landfill waste streams." TR 3 at 109.

The Board recognizes NWRA's concerns regarding the application of the proposed PFAS GWQS to landfills. However, the Board notes that landfills under 35 Ill. Adm. Code 811 and 814 are subject to GWQS based on background concentrations described in Section 811.320. Further, Part 620 already accounts for groundwater within a zone of attenuation of a landfill regulated under Parts 811 and 814 by classifying such groundwater as Class VI groundwater, which is subject to Class IV GWQS. No substantive changes to Class IV GWQS have been proposed in this rulemaking. Rather, the proposed PFAS standards apply only to Class I, II and III groundwater. While the Class IV GWQS for groundwater with the zone of attenuation of landfills under Parts 811 and 814 are the same as Class II standards, the concentrations of constituents present in permitted landfill leachate are excluded from the standards. 35 Ill. Adm. Code 620.440(b). Finally, the Board agrees with IEPA's assessment that any changes to the proposed PFAS GWQS of Parts 811 and 814 landfills in the state must be considered in a separate rulemaking addressing the landfill program after the adoption of the PFAS GWQS. Ex. 15 at 7. In this regard, IEPA reports that it will identify and develop amendments needed in other rules addressing specific programs like the landfill rules. *Id.* The Board includes a question directed at IEPA on this issue on page 69 of this opinion.

Non-Substantive Changes

In 2016, to comply with Executive Order 2016-13, the Board began reviewing its rules to identify obsolete, unclear, or otherwise unnecessary language. In 2018, IEPA filed a proposal to amend numerous Board rules, including several within Subtitle F, the Board's public water supply regulations. On June 17, 2021, the Board proposed amendments to Subtitle F. *See* Amendments to 35 Ill. Adm. Code Subtitle F: Public Water Supply, R18-26. In a November 16, 2021 comment in that rulemaking, IEPA said that it planned to propose updates to Part 620 later that year. IEPA requested that any changes to Part 620 be addressed in this rulemaking.

For first-notice publication, the Board proposes non-substantive changes throughout Part 620, including removing redundant or unnecessary language, replacing outdated language, updating references, and other non-substantive clarifications.

DISCUSSION

During the hearing process and in comments, several participants questioned the proposed changes including the general scientific bases for developing GWQS (Subpart F and Appendix A procedures), the proposed GWQS for PFAS, molybdenum, cobalt, selenium, and vanadium, and proposed amendments to GMZ requirements. The Board first discusses these issues and make its findings.

A number of proposed changes did not generate significant questions through the hearing process or in comments. In some cases, the participants clarified IEPA's original proposal or

offered revised language that addressed questions. The Board addresses these beginning at page 57 in a section-by-section summary. At page 70, the Board concludes to submit those changes to first-notice publication.

General Scientific Bases for the Proposed GWQS

Part 620, Subpart F

The Board adopted Subpart F: Health Advisories and Appendix A procedures for determining health-based standards for Class I groundwaters: Human Threshold Toxicant Advisory Concentration (HTTAC) for noncancer effects in November 1991; and Human Nonthreshold Toxicant Advisory Concentration (HNTAC) for cancer risk in October 2012. Ex. 2 at 3. IEPA used these procedures to develop Class I standards for the contaminants found in groundwater that do not have MCLs or MCLGs. *Id.* For 39 of the 115 constituents with Class I GWQS, the Board has adopted those standards based on the procedures in Subpart F and Appendix A. *Id.* In this rulemaking, IEPA proposes to update the procedures of Subpart F and Appendix A to make them consistent with current scientific data and methods.

IEPA proposes revising Section 620.605(b)(1) to designate the more stringent toxicity value of the HTTAC or HNTAC as the guidance value for developing Class I GWQS in the absence of a MCL or MCLG, updating incorporation of drinking water methods, and replacing "PQL" with "LLOQ or LCMRL". SR at 12. IEPA also proposes to remove the HNTAC language and equation from Section 620.605(b)(2) and relocate it under Appendix A. *Id*.

IEPA argues that an HNTAC must be calculated when the constituent meets the definition of a "carcinogen" under 35 Ill. Adm. Code 620.110; and the "constituent has oral carcinogen toxicity data necessary to calculate an HNTAC." Ex. 10 at 2-3. If both criteria are met, then "an HNTAC must be calculated and compared with the result of the HTTAC calculation to determine the more stringent of the two concentrations." *Id*. at 3.

Participants' Concerns

The ACC asked IEPA to clarify the basis for calculating a HNTAC for a substance with a threshold dose. Ex. 4 at 3, Tr.1 at 161. IEPA explained that the basis for the proposed change is to ensure "that a person ingesting groundwater is protected from both cancer effects and noncancer adverse health effects." Ex. 4 at 8. IEPA said that the "method of choosing the lower of the concentrations is consistent with the methods prescribed in 35 Ill. Adm. Code 742 [TACO rules]." *Id*. Finally, ACC asked how IEPA would "approach developing a value for a substance like chloroform that EPA says is a threshold carcinogen." Tr. 1 at 165. IEPA replied that chloroform is classified as a carcinogen so it "would calculate it as a carcinogen with a nonthreshold calculation." *Id*. IEPA also stated that, because a threshold calculation does not use carcinogenic toxicity data, IEPA believes that it is "consistent with how USEPA does it with the regional screening levels." *Id*.

Board Findings

The Board finds that the Agency has justified the proposed changes to Section 620.605(b)(1) requiring the calculation of both HNTAC and HTTAC for a carcinogenic substance and selecting the more stringent of the two values. This process allows for developing Class I GWQS that ensure protection against both noncancer adverse effects and cancer effects. As noted by IEPA, this approach has already been adopted by the Board under Part 742 (Tiered Approach for Corrective Objectives or TACO) rules to develop groundwater remediation objectives. Thus, the Board propose the revisions to Section 620.605 at first notice.

Procedures for Determining Human Toxicant Advisory Concentration for Class I Potable Resource Groundwater (Part 620, Appendix A)

Part 620, Appendix A contains procedures for calculating Human Toxicant Advisory Concentration (HTAC) for Class I groundwater. IEPA proposes several changes to the Appendix A procedures. These changes include the use of child exposure factors in Section 620 Appendix A (a)(1) and (b)(1), and addition of HNTAC equation for calculating cancer risk under subsection (d). The Board proposes the changes at first notice. Below, the Board discusses participants' concerns regarding the use of child exposure factors, toxicity values hierarchy and relative source contribution (RSC).

Consideration of Child Exposure Factors. IEPA proposes several changes that require the consideration of exposure to a child rather than to an adult in the calculation HTTAC. Section 620 Appendix A(a)(1) includes the change of one of the values of the equation used to calculate the HTTAC. The value for W, which measures the per capita daily water consumption is changed from two liters per day (L/d) to 0.78 L/d to reflect the consumption by a child (0-6 years of age). *Id.* at 13. The Agency says it used a child per capita daily water consumption for evaluating noncarcinogenic effects because a child is a "more sensitive receptor than an adult when considering exposure via the oral, or ingestion, route." *Id.* IEPA adds that the child water ingestion rate accounts for the highest water ingestion rate of the populations evaluated and is protective for all populations. PC 54 at 15.

IEPA notes that the use of a child exposure population is consistent with the Board TACO rules under 35 Ill. Adm. Code 742. Similarly, IEPA updates Appendix A(b)(1) "the body weight for calculating the Acceptable Daily Exposure from an average adult (70 kg) to 15 kg, representative of a child 0-6 years of age." *Id.* Further, Section (b)(2) is modified to change the Acceptable Daily Exposure to equal the product of multiplying the toxicity value and the weight of a child 0-6 years of age rather than the average weight of an adult human.

The ACC argues that ADE based on a child is inappropriate for "PFNA and PFOS for which the ATSDR MRL is based on developmental effects among laboratory animals exposed *in utero*. For HFPO-DA and PFBS, USEPA's RfD is based on chronic exposure to the substance." Ex. 28 at 4. The ACC argues that the ADE for the applicable adult population is appropriate for calculating the HTTAC. *Id.*

Board Findings. The Board agrees with IEPA that exposure factors protective of the most sensitive population is appropriate for calculating HTTAC. The Board notes that protecting the most sensitive population from adverse effects of toxic chemicals in potable groundwater is consistent with USEPA's drinking water standards, which are designed to protect children and adults. The standards take into account the potential effects of contaminants on segments of the population that are most at risk. When EPA sets each standard, the agency conducts a risk assessment, in which scientists evaluate whether fetuses, infants, children, or other groups are more vulnerable to a contaminant than the general population. The standard is set to protect the most vulnerable group."[10] The Board finds that protecting the population aged 0-6 years (child) as the most vulnerable group affords protection to all human populations. Also, as noted by IEPA, the Board has already considered the use of the child exposure factors in developing Part 742 TACO noncancer remediation objectives.

Updates to Toxicity Hierarchy. IEPA proposes changes to Appendix A.(b)(2) to "allow for the selection of toxicity values based on various OSWER [USEPA's Office of Solid Waste and Emergency Response] directives issued over the years discussing hierarchies and procedures for selecting human health toxicity values in Superfund risk assessments." Ex. 2 at 6. IEPA proposes to update the toxicity hierarchy used to derive the oral reference dose, which is used in the calculation of HTTAC. IEPA notes that the hierarchy update is based on USEPA's changes from 2013 and 2021 to the original toxicity hierarchy cited by the Board in R08-18. SR at 13. In that docket, the Board found that "the Agency appropriately relied upon the revised toxicity hierarchy of the United States Environmental Protection Agency (USEPA) to account for new scientific data in proposing updates to the Board's groundwater quality standards." Ex. 2 at 8-9 *citing* Proposed Amendments to Groundwater Quality Standards (35 Ill. Adm. Code 620), R08-18, slip op. at 9-11 (Oct. 2, 2012).

IEPA notes that USEPA's updates to the toxicity hierarchy are incorporated into the RSL decision tree for selecting toxicity values to develop its screening levels. SR at 14. IEPA says that it uses toxicity values found in the RSL table "when calculating TACO Tier 2 remediation objectives and intends to utilize the RSLs when updating its TACO amendments. The toxicity values for calculating groundwater quality standards in Part 620 and remediation objectives in Part 742 need to be consistent." *Id.* IEPA used the following toxicity value hierarchy based on USEPA's 2013 update with a few exceptions:

Tier 1: USEPA Integrated Risk Information System ("IRIS");

Tier 2: USEPA Provisional Peer-Reviewed Toxicity Values ("PPRTV");

Tier 3: Other values ranked as:

1. United States Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) dose minimal risk levels (dose MRL);
2. California EPA, Office of Environmental Health Hazard Assessment (OEHHA) toxicity values;

[10] USEPA, "Children and Drinking Water Standards", Office of Water, December 1999.

3. PPRTV "Appendix" values;
Health Effects Assessment Summary Table ("HEAST"). Ex. 2 at 6-8.

IEPA notes that in May 2021, USEPA's Office of Land and Emergency Management (OLEM) issued a memorandum recommending the use of subchronic toxicity values in lieu of chronic values for five inhalation and 14 oral toxicity values. These values were chosen for the update because they are based on newer chemical studies, and the subchronic toxicity values are more stringent than older chronic toxicity values derived from a toxicity source listed higher on the Tier. PC 54 at 6.

Participant Comment. Several participants, including 3M, the ACC and the International Molybdenum Association questioned IEPA's reliance on the toxicity values hierarchy for Class I GWQS. IMOA also questioned relying on specific studies or values used to derive the standards.

3M's expert, Dr. Prueitt, argues that IEPA's reliance on the USEPA's toxicity value hierarchy results in PFAS standards that are "overly conservative, unreliable, and inappropriate as enforceable groundwater standards." Ex. 25 at 12. 3M argues that, instead of relying on the toxicity values developed by other agencies under the hierarchy and without any evaluation of the underlying work of those other agencies, IEPA should have followed "universally accepted human health risk assessment practices that the scientific community should follow to develop toxicity values for use in deriving regulatory standards." PC 56 at 3-4. Dr. Prueitt testified that standards derived using the hierarchy are unreliable because IEPA did not conduct "an independent evaluation of the scientific rigor and appropriateness of the available toxicity values to ensure that the most scientifically supported toxicity values are chosen as the basis for the proposed groundwater standards." Tr. 3 at 49. The ACC voiced similar concerns. Ex. 28 at 4-5.

IEPA Response. IEPA responds that the toxicity values selected using the hierarchy are scientifically supported values. PC 54 at 11. IEPA notes that Dr. Prueitt does not discuss why the selected toxicity values are not "scientifically supported toxicity values, nor does she recommend alternative toxicity values available that have undergone peer-review and public comment." *Id.* IEPA asserts that USEPA considers the hierarchy sources, including PPRTV, ATSDR, California EPA, and USEPA Office of Water, "as credible, as relying on best available science, and as having undergone a high degree of scrutiny and peer review." *Id.*

IEPA argues that it selected the same PFAS toxicity values included in the USEPA's RSL table except for the PFOA cancer toxicity value. PC 54 at 11, *citing* Ex. 2 at 11. IEPA explains that RSLs are health-based levels calculated to protect human health that when not met require additional actions because the concentrations found may not protect human health. *Id.* at 12. They are equivalent to the Board's Part 742 TACO Tier 1 health-based remediation objectives, which are enforceable standards in Illinois. IEPA has relied on USEPA's toxicity hierarchy for developing GWQS under Part 620 since 2008 and for calculating Part 742 remediation objectives. IEPA argues that Class I GWQS calculated using the Appendix A methods are based on the protection of human health when ingesting groundwater. Thus, whether a health-based objective is called a screening level, remediation objective, or a standard, the intent to protect human health is the same. *Id.* at 12-13.

Board Discussion and Findings. The Board agrees with IEPA that USEPA's toxicity value hierarchy is a scientifically supported approach for selecting toxicity values. Each one of the hierarchy sources is credible, relies on best available science, and undergoes a high degree of scrutiny and peer review. Also, the sources have been accepted by USEPA. As noted by IEPA, the Board has adopted both Part 620 Class I GWQS and part 742 Tier 1 groundwater remediation objectives based on the toxicity values selected by using the hierarchy. The Board disagrees with 3M and the ACC's position that states should independently evaluate "the scientific rigor and appropriateness" of the available toxicity values rather than rely on the toxicity values developed by other agencies under the hierarchy. Like many other states, Illinois routinely relies on USEPA's standards and guidance levels, as well as methodologies like the toxicity hierarchy when developing standards. As in R08-18, the Board finds that, for purposes of updating the Part 620 groundwater quality standards to account for new scientific information, IEPA appropriately relied upon the USEPA's revised toxicity hierarchy.

Selection of Relative Source Contribution Value (RSC)

IEPA explains that RSC "is the proportion of an individual's total exposure to a contaminant that is attributed to drinking water ingestion when calculating a health-based noncancer drinking water level." PC 54 at 15. RSC reflects the percentage of the total daily intake of a chemical derived from drinking water when all other sources of exposure such as food and air are considered. Section 620.Appendix A(a) requires using an RSC value of 20 percent for calculating Human Threshold Toxicant Advisory concentration for noncarcinogenic compounds in Class I groundwaters.

Participant Concerns. The ACC questioned selecting a default RSC value of 20 percent for calculating the PFOA standard. ACC Pre-filed Quest. at 7. ACC argues that the default RSC value is inappropriate due to the reduction of PFOA and other long-chain PFAS in the environment as they have been phased out since the early 2000s. *Id.* Rather, ACC maintains that an RSC value of 50 percent is more reasonable. *Id.* 3M argues that when considering noncancer effects, IEPA "improperly incorporates a default relative source contribution ("RSC") from drinking water of 20%, despite uncontroverted available data on PFAS exposure that supports a higher and less stringent RSC." PC 56 at 6.

IEPA Response. IEPA notes that the default RSC value is based on USEPA's methodology, which recommends the use of a value of 20 percent. PC 54 at 16-18. Regarding PFAS standards, IEPA decided against using a less conservative value because PFAS is ubiquitous in the environment and there is not enough information on the effects of PFAS to select a different value. IEPA Response to ACC at 9. Regarding Michigan and Minnesota selecting an RSC value of 50 percent, IEPA said that the 50 percent RSC value is based on predicted blood serum data from the National Health and Nutrition Examination Survey covering ages 3-11 and 12 and older. PC 54 at 19. Those data were used to apportion serum level due to water ingestion and determine the percentage of serum levels attributed to water ingestion. *Id.* (Box 13 of decision tree). IEPA rejected this method because it is insufficient to quantify exposure from other sources. IEPA also clarifies that the RSC value only applies to non-cancer health drinking water levels. PC 54 at 15. The RSC value is not relevant to the proposed PFOA GWQS, which is based on cancer risk. *Id.*

Board Discussion and Findings. The Board finds the continued use of the default RSC value of 20 percent for deriving the HTTAC for PFAS and other constituents is appropriate because adequate data is not available to select an alternate value. While some PFAS like PFOS, PFNA and PFHxS have been phased out, the Board agrees with IEPA that many PFAS in the environment may become exposure sources due to breakdown and transformation processes. Also, the Board agrees with IEPA's reasoning for not relying on higher RSC value used by other states.

Adopting PFAS Groundwater Quality Standards and Analytical Methods

IEPA proposed Class I and Class II GWQS for six PFAS chemicals: PFOA, PFOS, PFNA, PFBS, PFHxS, and HFPO-DA. *See* 35 Ill. Adm. Code 620.410(b) and 420(b). Among the six, PFBS, PFHxS, PFOS and PFOA, have been detected in finished water of public water supplies across Illinois. Ex. 2 at 15. HFPO-DA (also known as GenX) has been detected in groundwater during sampling conducted under the statewide PFAS sampling initiative. *Id.* at 16. Based on the record in this rulemaking, the Board adopts IEPA's proposed PFAS GWQS for first notice, however, revises the proposed standard for PFOA.

In the following sections the Board will discuss and make its findings on the need for PFAS GWQS and on analytical methods for PFAS. This is followed by the Board's discussion and findings on each of the six proposed PFAS GWQS.

Adopting of PFAS GWQS Before Adopting Drinking Water MCLs

Several participants argued that the Board should begin the process for developing PFAS standards with drinking water rather than groundwater. In pre-filed testimony and at hearing, a witness for the NWRA, Thomas Hilbert, suggested that "the most appropriate starting point would be develop an MCL for drinking water until the impacts of regulating groundwater quality at the levels proposed have undergone further review." TR 3 at 87. The witness for the PFAS Regulatory Coalition argued that "IEPA has maybe done groundwater standards first for other things, but in this case we strongly believe that it is important to do the MCL – the drinking water standards first because it takes into account feasibility costs and impacts. It appears IEPA is going forward with the groundwater standards cause they don't have to do that in this process." *Id.* at 109. IERG also asked why IEPA chose to move forward with the groundwater rulemaking before developing drinking water MCLs. TR 1 at 19.

IEPA Position

IEPA described the different strategies it is taking towards drinking water and groundwater.

> Though groundwater may be used for drinking, groundwater is not the same as drinking water. Drinking water is water that has been treated and is being served to customers of a Public Water Supply. Groundwater quality standards are designed for the protection of human health during the consumption of groundwater under circumstances when no

> treatment is provided, such as in private wells. More importantly, groundwater standards are designed to protect the groundwater resource for future use. PC 54 at 4.
>
> IEPA's witness, Carol Hawbaker said that:
>
> [t]he groundwater standards for the 620 revisions were proceeding on a different track, and that's where we're at today. The MCLs waiting until we were completed with our community water system sampling project. And while I mentioned that we are starting to work on the MCLs for the community water system, we are in the very, very beginning stages of that ... So they're in totally different places. TR 1 at 24-25.

Board Discussion and Findings

As explained by IEPA, to meet the directives of the Illinois Groundwater Protection Act, the Board recognized the Agency's position that to prevent the degradation of groundwater resources, it is periodically necessary to amend the Board's groundwater quality standards to address additional parameters that have been discovered. *See* R08-18, at 4. To this end, IEPA has proposed, and the Board has adopted numerous amendments to Part 620.

In this rulemaking, IEPA highlights the need for PFAS groundwater quality standards by noting that "PFAS have been detected in the finished water of public water supplies that provide drinking water for over 2 million consumers (16.1 percent of the population in Illinois, based on the 2020 census), with over 910,000 of those consumers receiving drinking water from community water supply wells." Ex. 2 at 15. IEPA adds that thousands more residents depend on groundwater from private potable wells, usually without access to treatment technologies. *Id.* Therefore, it is imperative that the State's groundwater resources are adequately protected from PFAS contamination. Also, IEPA has issued statewide Health Advisories for PFAS constituents in response to detections in community water supply wells. Thus, there is a significant need for PFAS GWQS to protect the state's potable groundwater resources for existing and future uses.

As to the question of whether IEPA should have proposed statewide PFAS drinking water MCLs before addressing groundwater quality standards, the Board agrees that it would be ideal if drinking water MCLs were available to be used as the basis for GWQS. However, the Board defers to IEPA's expertise in terms of what standards must be developed first at the state level. While the Board has the authority under the Act to adopt "state MCLs", USEPA usually promulgates drinking water MCLs under SDWA and then adopted by the Board in identical in substance rulemakings. For constituents with federal MCLs, the Board has adopted Class I GWQS based on the MCLs with a few exceptions. For constituents of concern with no federal MCLs, the Board's groundwater rules include procedures for developing GWQS consistent with USEPA methodology. IEPA has used the Part 620 procedures for developing PFAS standards because of the need for those standards to protect the state's groundwater and persons who use it for potable purposes. The GWQS also serve as a benchmark for developing corrective action objectives for remediating contaminated groundwaters under the state's remediation programs such as TACO. *See* 35 Ill. Adm. Code 742. Given the detection of PFAS in community water supply wells, the Board agrees with IEPA that the prudent approach is to move forward with the proposed GWQS rather than wait for the promulgation of federal MCLs.

The Board appreciates the participants' concerns regarding costs associated with these proposed standards and addresses the issue in depth on page 67 of this opinion. However, Part 620 establishes groundwater quality standards that are then used by cleanup programs. The appropriate time to evaluate costs will be when those separate program rules are updated. As always, regulatory relief mechanisms, such as adjusted standards, are available to affected participants.

However, the Board recognizes USEPA's. March 2023 proposed PFAS drinking water regulations, which include individual MCLs for two PFAS and a Hazard Index for mixtures of four other PFAS. Although USEPA's action is a proposal, the Board has reviewed USEPA's findings to see how the proposed GWQS compares with the USEPA's proposed MCLs and health-based water concentrations. *See* 88 Fed. Reg. 18,650 (March 29, 2023). In this regard, the Board welcomes comments from IEPA, other participants, and the public regarding USEPA's PFAS proposal.

Analytical Methods for PFAS

With proposed GWQS, IEPA identified the following analytical methods as available for the six PFAS with proposed GWQS: USEPA SW 846 8327, USEPA 537.1, ASTM D7979-20, USEPA 533, and Draft USEPA 1633. In the table below, the Board summarizes these methods along with the applicable sample matrices and the method's LLOQ/LCMRL (lowest levels at which a chemical concentration can be quantified through analysis using a specific method) for all six PFAS.

Available USEPA Analytical Methods and Their Detection Limits for Selected PFAS

Sampling Method	Matrices	PFOA LLOQ (mg/L)	PFOS LLOQ (mg/L)	PFNA LLOQ (mg/L)	PFBS LLOQ (mg/L)	PFHxS LLOQ (mg/L)	HFPO-DA LLOQ (mg/L)
USEPA SW 846 8327	Non-potable groundwater; surface water; wastewater	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
USEPA 537.1	Finished drinking water; source drinking water	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002
ASTDM D7979-20	Non-potable groundwater; surface water; wastewater; sludge	0.00001	0.00001	0.00001	0.00001	0.00001	N/A

USEPA 533	Finished drinking water; source drinking water	0.0000034	0.0000044	0.0000048	0.0000035	0.0000037	0.0000037
USEPA Draft Method 1633[11]	Non-potable groundwater; surface water; wastewater; landfill; leachate; soil; sediment; sludge; fish tissue	0.000002	0.000002	0.000002	0.000002	0.000002	0.000005

Participants Concerns

Analytical Methods and Laboratory Capability. Participants raised concerns that current analytical methods cannot detect PFAS at the proposed levels. *See*, NWRA Pre-filed Questions at 1-2 (Mar. 18, 2022), ACC Pre-filed Questions at 1 (Mar. 18, 2022).

Detection Limits. The expert witness for 3M, Dr. Prueitt, questioned standards close to the detection limits. Dr. Prueitt Pre-filed Test. at 14. Additionally, NWRA expressed concern that after Draft Method 1633 is finalized it will still have a Method Detection Limit (MDL) of 2 ppt. NWRA Pre-filed Test. at 9. NWRA contends that, to reach an MDL of 2 ppt, it would require a "rigorously controlled laboratory procedure" that would be difficult to accomplish. *Id.*

Possible Contamination from Sampling Equipment. NWRA also questions whether the instruments and equipment used for groundwater and non-public water supplies sampling may be composed of Teflon or PFAS containing plastics and may skew the samples. NWRA Pre-filed Test. at 4.

USEPA Actions. Since the start of this rulemaking, USEPA has updated draft Method 1633. In July 2023, USEPA published a 4th Draft of Method 1633, which has been validated for analysis of wastewater, groundwater, and surface water. 4th Draft Method 1633 at 3. Also, USEPA's March 2023 proposed PFAS drinking water rules address reporting levels for the six PFAS chemicals. USEPA says that the evaluation of the UCMR 3 data and recently collected state data demonstrate that, with improved analytical methods and increased monitoring the minimum reporting thresholds have been lowered. 88 Fed. Reg. 18,650 (March 29, 2023). USEPA notes that "[a]ll six PFAS proposed for regulation can be measured by both EPA Methods 533 and 537.1 and both methods are acceptable for meeting the monitoring requirements of this regulation." 88 Fed. Reg.18,680 (Oct. 31, 2023). In addition, USEPA has

[11] The 4th Draft of Method 1633 was finalized on July 1, 2023. This draft incorporates final QC acceptance criteria for all aqueous matrices, wastewater, surface water, groundwater. 4th Draft Method 1633 at 3.

proposed the following PQL for the six PFAS regulated under USEPA's proposal. The Board notes that IEPA's proposal replaces PQL with LLOQ/LCMRL.

USEPA's Proposed PQL for PFAS

PFAS	PQL (ppt)
PFOA	4.0
PFOS	4.0
HFPO-DA (GenX)	5.0
PFHxS	3.0
PFNA	4.0
PFBS	3.0

IEPA Response. IEPA argues that concerns about laboratory capabilities of using Method 1633 are unfounded because "technical capability is available and has already been demonstrated by several accredited labs." Ex. 21 at 28. Additionally, under IEPA's Scope of Accreditation the proposed PFAS standards can be met through methods USEPA 537.1, USEPA 533, SW-846 8327, and SW-846 3512. *Id.* at 55. IEPA also cites USEPA's recommendation to use Draft Method 1633 when analyzing the applicable matrices. PC 54 at 33. Regarding potential contamination resulting from sampling equipment containing Teflon or PFAS containing plastics, IEPA says that the analytical and sampling methods should be consulted for guidance. Ex. 21 at 34. Also, the proposed Class I GWQS for PFBS, PFHxS, PFNA, and HFPO-DA are greater than the LCMRLs/LLOQs for all analytical methods, PFOS is greater than the LCMRL/LLOQs for Methods 533, 537.1, and Draft 3 Method 1633; and PFOA is set at an LCMRL of 2 ng/L. PC 54 at 33-34.

Board Discussion and Findings. IEPA has shown that it is possible to detect all six PFAS at or below the proposed standards. Except for PFOA, the proposed standards for all five of the PFAS are set above the lowest detection limit as shown in the table below. As for PFOA, the proposed standard is set at the lowest detection level because the health-based concentration (HNTAC of 0.175 ppt) is below that level (LLOQ of 2 ppt). The health-based concentrations of the remaining five PFAS are above the LLOQ of available methods. The table below summarizes the proposed GWQS and the lowest detection limit.

Comparison of Proposed Illinois PFAS to the Lowest Detection Limits

Constituent	Proposed Illinois Standard (mg/L)	Lowest Detection Limit (mg/L)	Sampling Method
PFOA	0.000002	0.000002	USEPA 537.1
PFOS	0.0000077	0.000002	Draft Method 1633
PFNA	0.000012	0.000002	Draft Method 1633
PFBS	0.0012	0.000002	Draft Method 1633
PFHxS	0.000077	0.000002	Draft Method 1633
HFDO-DA	0.000012	0.000002	USEPA 537.1

Additionally, the 4th Draft Method 1633 has been validated for use in wastewater, groundwater, and surface water matrices. 4th Draft Method 1633 at 3. With this validation, all six proposed PFAS constituents have a laboratory method capable of detecting the PFAS in groundwater samples at or below the proposed standards. Method 8327 can also be used for detecting PFBS, PFHxS, PFNA, and HFDO-DA (GenX) in groundwater samples at or below the proposed GWQS. For finished water matrices, all six PFAS constituents can be analyzed using USEPA Method 537.1. The Board also notes that USEPA's proposed PQL for PFOA is higher than the LLOQ relied upon by IEPA to set the GWQS. This issue is addressed below under the discussion of PFOA. Therefore, the Board finds that adequate analytical methods are available to measure PFAS at the proposed GWQS.

The Board shares participants' concerns regarding potential contamination of groundwater samples from sampling equipment containing PFAS. While IEPA notes that analytical and sampling methods would likely provide guidance to minimize or eliminate contamination from sampling equipment, the Board believes that this concern would be better addressed by specifying sampling requirements in the rules. Possible requirements may include prohibiting the use of PFAS containing sampling equipment made of Teflon®, and requiring the use of sampling equipment made from stainless steel, high-density polyethylene (HDPE), acetate, silicone, or polypropylene. To assist in considering these requirements, the Board directs IEPA and other participants to recommend PFAS sampling requirements, including proposed rule language, to address potential contamination of samples from sampling equipment.

Proposed PFAS Standards

As noted above, IEPA proposed Class I and Class II GWQS for six PFAS chemicals. *See* 35 Ill. Adm. Code 620.410(b), 620.420(b). These chemicals are of concern because they are harmful to human health and they have been detected in Illinois in public water supplies and in groundwater.

In the following sections, for each of the six proposed PFAS standards, the Board discusses the scientific bases, USEPA's drinking water proposal, participants' concerns, IEPA's response and then make its findings.

PFOA

IEPA proposes Class I and II Groundwater standards of 2 ppt (0.000002 mg/L) for PFOA. IARC classifies PFOA as Group 2B possibly carcinogenic to humans, and it meets the definition of carcinogen under the Board rules at 35 Ill. Adm. Code 620.110. *Id*. Exposure to PFOA has been linked to several non-cancer effects, including increased levels of cholesterol, increased liver enzyme activity, decreased vaccination response, incidence of thyroid disorders, and incidence of pregnancy-induced hypertension and preeclampsia. Ex. 2, Attach. 1D3 at ES-1.

To develop the proposed standards, IEPA relied on the procedures of Part 620 Subpart F, and Appendix A as revised as revised by this proposal. These procedures allow the Class I standard to be set at the lower value calculated from either the HTTAC noncancer equation or

the HNTAC cancer equation. Ex. 2 at 3. IEPA calculated both the HNTAC and HTTAC for PFOA as described below.

For cancer effects, IEPA used California EPA's peer reviewed oral slope factor (SF_o) of 143 mg/kg/day to calculate the HNTAC based on a cancer risk of one in one million. Ex. 2 at 11. IEPA selected the California EPA value because it is based on more recent studies than the those relied upon for determining PFOA cancer risks in the USEPA 2016 Drinking Water Health Advisory. *Id., citing* Attach. 1D. Based on the formula in Part 620.Appendix A(d)(1) for HNTAC, the cancer-based health value for PFOA is approx. 0.175 ppt[12].

For non-cancer effects, IEPA used the ATSDR intermediate dose minimum risk level (MRL) of 3 x 10^{-6} mg/kg/day to calculate the HTTAC. Ex. 2 at 11. Based on the formula in Part 620.Appendix A(a) for HTTAC, IEPA calculated the noncancer-based value of 11.5 ppt[13] for PFOA. However, the cancer-based health value (HNTAC of 0.175 ppt) was chosen to set the standard because it is lower than the non-cancer effects value. Because the cancer-based health value is below the LLOQ of2 ppt[14], IEPA clarified that the standard is set at 2 ppt. IEPA Resp. to IERG at 2-3 (Mar. 7, 2022).

USEPA's Proposed PFOA Drinking Water MCL

On March 29, 2023, USEPA proposed National Primary Drinking Water Regulations (NPDWR) for six PFAS (USEPA PFAS Proposal), including a MCL of 4 ppt for PFOA. 88 FR 18,638 (March 29, 2023). Based on a systematic review of animal and epidemiological studies, USEPA determined that PFOA is a carcinogen. *Id*. at 18639. Because there is no dose that can be considered "safe" for a carcinogen, USEPA proposed a MCL goal (MCLG) for PFOA of zero. *Id.* For this reason, USEPA decided to set a separate MCL for PFOA rather than as mixtures of PFAS with a hazard index. *Id.* USEPA's proposed MCL for PFOA is based on the analytical constraints, that is, the "lowest feasible quantitation level." *Id.*

Non-cancer Effects. USEPA determined there is evidence that oral PFOA exposure is linked with liver damage, immunosuppression, low birth weight and high cholesterol. 88 Fed. Reg. 18,657 (March 23, 2023).

Cancer Effects. USEPA notes that there has been high and medium level evidence of PFOA acting as a carcinogen in both animals and humans particularly in relation to liver and kidney cancers. 88 Fed. Reg. 18,656 (Mar. 23, 2023). Since USEPA's 2016 Assessment there has been more evidence of a "plausible" role of PFOA in incidences of kidney and testicular

[12] This value is based on Target Cancer Risk (TR) of one-in-one million (1 E-06), Averaging Time (AT) of 70 years, Oral Slope Factor (SF_o) of 143 mg/kg/day, Age-Adjusted Mutagenic Drinking Water Ingestion Rate ($IFWM_{adj}$) equal to 1,019.9 liters/kg (L/kg).

[13] This value is based on RSC of 0.2, Acceptable Daily Exposure (ADE) of 0.000045 mg/d, and daily water consumption for a child *(0-6* years of age) of 0.78 L/d.

[14] LLOQ is the reporting limit for USEPA Method 537.1.

cancers in the general human population. *Id.* Due to PFOA's classification as a carcinogen, the MCL goal is set at zero. *Id.* at 18659.

Analytical Methods. USEPA evaluated Methods 537.1 and 533 to determine the lowest concentration at which PFOA "can be reliably quantified within specific limits of precision and accuracy during routine laboratory conditions." 88 Fed. Reg. at 18,666 (March 29, 2023). USEPA determined that 4.0 ppt as the "minimum quantitation level that, with 95 percent confidence, can be achieved by capable analysts at 75 percent or more of the laboratories using a specified analytical method." *Id.* This level ensures that it can be uniformly achieved across laboratories nationwide. *Id.* However, USEPA noted that "49 of the 54 laboratories seeking EPA approval included a lowest PFAS calibration standard level at 1 ppt or lower, with the median lowest calibration level among all laboratories is at 0.5 ppt." *Id.* at 18,667. This capability allows for the possibility of PFAS monitoring to employ a trigger level of approximately one-third of the MCL to alert utilities they may be approaching the PFOA MCL and use them to "make informed treatment decisions about managing their systems." *Id.*

Participants Concerns

Classification of PFOA as a Carcinogen. Several participants questioned IEPA's classification of PFOA as a carcinogen. The ACC argued that the classification is inappropriate because the studies cited by California EPA relied on reports of liver and pancreatic tumors in mice via a mechanism of action "less relevant to humans" known as PPARα activation[15]. Ex. 28 at 20. "[M]ultiple peer-reviewed studies previously published by USEPA and outside scientists indicates that liver effects occurring in rodents via PPARα have limited to no human relevance." *Id.* at 5.

The expert witness for 3M, Dr. Prueitt, also argues that animal studies do not provide sufficient evidence of PFOA's carcinogenicity. Ex. 25 at 16. 3M argues that "human data also do not support the conclusion that PFOA is a human carcinogen". *Id., citing* Raleigh *et al*. [2014], Steenland *et al*. [2015], and Steenland and Winquist [2021. Dr. Prueitt argues that IEPA incorrectly assumes that PFOA is mutagenic when the mode of action is neither mutagenic nor genotoxic. Ex. 25 at 15, *citing* Crebelli et al., 2019; Kennedy and Symons, 2015; EFSA CONTAM, 2018; ATSDR, 2021. Dr. Prueitt argues that it is inappropriate to use California EPA's cancer slope factor to derive the PFOA GWQS because it was developed using a linear multistage dose-response model, which is used for substances that act as carcinogens via a mutagenic mode of action. *Id.*

IEPA Response. IEPA maintains that PFOA should be classified as a carcinogen, asserting that the Act defines a contaminant that is classified as such by multiple medical or public health groups including the World Health Organization's International Agency for Research for Cancer (IARC). Ex. 21 at 12. Additionally, California EPA's assessment used to

[15] Peroxisome proliferator-activated receptor-alpha (PPARα) is a ligand-activated transcriptional factor that belongs to the family of nuclear receptors. PPARα regulates the expression of genes involved in fatty acid beta-oxidation and is a major regulator of energy homeostasis.

support the proposed PFOA GWQS is classified as a Tier 2 source, which is considered as an acceptable source under USEPA hierarchy. Ex. 14 at 3. USEPA's 2016 Lifetime Health Advisory has shown that PFOA is a potent carcinogen. PC 54 at 11. Recent studies have shown that liver tumors can develop via "multiple modes of action, in addition to the PPARα responses in rats." *Id.* Regarding 3M's concerns about relying on studies with animal strains, IEPA maintains that established pharmacokinetic models are used when evaluating animal toxicity to convert to a human equivalency dose. *Id.* at 10-11.

Board Discussion and Findings. The Board finds that IEPA has justified the classification of PFOA as a carcinogen for the purposes of developing the proposed GWQS. As noted by IEPA, it relied on California EPA's peer-reviewed oral slope factor of 143 mg/kg/d as the cancer toxicity value to calculate a HNTAC based on a cancer risk of one in one million. This California EPA value is based on more recent studies than the studies used for determining cancer risks for the USEPA's 2016 Drinking Water Health Advisory. The Board also agrees with IEPA's position that it is appropriate to rely on assessments based on animal studies, especially in the absence of peer-reviewed alternative toxicity values based on human studies. Further, using California EPA as a source of the value falls within the toxicity hierarchy recommended by USEPA, and the Board has previously found it acceptable for developing GWQS. Additionally, as noted above, USEPA's recent proposed National Primary Drinking Water Regulation addressing PFAS classifies PFOA as a carcinogen. Finally, PFOA is classified as Group 2B "possibly carcinogenic to humans" by IARC. Therefore, the Board finds that PFOA meets the definition of a carcinogen under the Act.

Use of Minimum Reporting Level (LLOQ or LCMRL). The proposed changes to Section 620.605(b)(1) replace the term practical quantitation limit (PQL) with the terms Lower Limit of Quantitation (LLOQ) and Lowest Concentration Minimum Reporting Level (LCMRL). These "terms represent the lowest levels at which a chemical concentration can be quantified through analysis using a specific method." PC 54 at 31. IEPA says that for those constituents that have calculated standards less than each constituent's applicable lowest detection level, the LLOQ or LCMRL is the Class I standard. Ex. 2 at 14. Under IEPA's proposal, PFOA is the only PFAS for which the lowest calculated health-based concentration (HNTC of 1.75 ppt) was below the detection level (LLOQ of 2 ppt for USEPA Method 537.1). Ex. 11 at 3. Therefore, IEPA proposes Class I and II PFOA GWQS of 2 ppt.

Participants Concerns. The ACC argues that the proposed groundwater standard for PFOA is below USEPA's Unregulated Contaminant Monitoring Rule (UCMR) of minimum reporting level of 4 ppt. Ex. 28 at 21-22. Therefore, ACC argues that, if the Board relies on California EPA's assessment of PFOA as a carcinogen, the proposed PFOA standard must be revised to reflect the LLOQ in the USEPA's UCMR.

IEPA Response. IEPA notes that when selecting the lowest LLOQ for PFOA, it compared the LLOQs/LCMRLs of five PFAS analytical methods: Methods 533, 537.1, D7979-20, 8327 and Draft 3 Method 1633. PC 54 at 32-33. Both Method 537.1 and Draft Method 1633 had LLOQ/LCMRL of 2 ppt. IEPA proposes a 2 ppt standard, "because laboratories contacted by Illinois EPA could consistently meet the 2 ng/L [ppt] MRL using Method 537.1" *Id.* at 34.

Board Discussion and Finding. Because the cancer based health value is below the lowest LLOQ/LCMRL for the available analytical methods, the Board finds that IEPA appropriately proposed PFOA standards based on the lowest LLOQ of 2 ppt, the reporting value. While the ACC notes that USEPA's UCMR includes a higher reporting level of 4 ppt, Section 620.605 requires the use of the lowest LLOQ/LCMRL. IEPA has confirmed that laboratories it contacted consistently meet the reporting level of 2 ppt using Method 537.1

However, as noted above, USEPA's recent proposed PFAS drinking water rules determined 4 ppt as the lowest reporting level for PFOA. While USEPA notes most of laboratories seeking approval included a PFAS calibration standard level of 1 ppt or lower, the 4 ppt reporting level is based on the minimum level that can be achieved with 95 percent confidence using Methods 537.1 and 533. Because IEPA proposes the PFOA standard based on the capability of analytical methods, the Board finds that it would be appropriate to set the standard based on the minimum reporting level that can be achieved with a high level of confidence considering the many laboratories questioned by USEPA. Based on these factors, the Board revises the proposed PFOA GWQS from 2 ppt to 4 ppt.

PFOS

IEPA proposes 7.7 ppt (0.0000077 mg/L) as the Class I and II Groundwater standards for PFOS. Human epidemiological studies have identified PFOS exposure as a risk factor for pregnancy induced hypertension/preeclampsia, liver damage, increases in total cholesterol and LDL cholesterol, decreased immune response to vaccines, and decreased birth weight. Ex. 2, Attach. 1D3 at A-6. The proposed PFOS standard was developed using the ATSDR intermediate reference dose of 2×10^{-6} mg/kg/day. Ex. 2 at 10. ATSDR value is based on "delayed eye opening and transient decrease in F2 body weight during lactation." Ex. 2, Attach. 1D3 at A-40. ATSDR applied an uncertainty factor of 30 (3 for the difference between animals and humans and 10 for human variability) and a modifying factor of 10 to the intermediate dose of PFOS. *Id.* IEPA also reviewed the USEPA Office of Water's May 2016 PFOS Drinking Water Health Advisory in developing the standard. *Id.*

USEPA's Proposed PFOS Drinking Water MCL

USEPA's PFAS Proposal includes a MCL of 4 ppt for PFOS. 88 Fed. Reg. 18,638 (Mar. 29, 2023). Based on a systematic review of animal and epidemiological studies, USEPA determined that PFOS is a carcinogen. *Id.* at 18,639. Because there is no dose at which there is a "safe" exposure for a carcinogen, USEPA proposed a MCL goal for PFOS at zero. *Id.* For this reason, USEPA decided to set a separate MCL for PFOS instead of including it in the mixtures of PFAS with a hazard index. *Id.* USEPA's proposed MCL for PFOS is based on the analytical constraints, i.e., the "lowest feasible quantitation level." *Id.*

Non-cancer Effects USEPA has determined that there is "consistent evidence of a positive association between PFOS serum concentrations and ALT (alanine transaminase), a liver enzyme marker." 88 Fed. Reg. 18,661 (Mar. 29, 2023). Additionally, there is evidence of an "association between PFOS serum concentrations and reduced antibody response to vaccination in children." *Id.* USEPA also found mixed evidence of an association between

PFOS exposure and hypersensitivity and asthma. *Id.* Also, there is evidence linking PFOS serum concentrations and "low birth weight, preterm birth, and gestational age" as well as "serum total cholesterol and low-density lipoproteins" and "blood pressure and hypertension in adults." *Id.*

USEPA identified four candidate-critical effects to determine the non-cancer RfD: "decreased antibody production in response to vaccinations (immune), low birth weight (developmental), increased serum total cholesterol (cardiovascular), and elevated ALT (hepatic)." *Id.* For all selected candidate RfDs, "the composite UF [uncertainty factor] was 10 (10X for intraspecies variability)." *Id.* Because the "available evidence indicates there are effects across immune, developmental, cardiovascular, and hepatic organ systems at the same or approximately the same level of PFOS exposure," the USEPA decided to select an overall reference dose for PFOS of $1x10^{-7}$ mg/kg/day. *Id.* at 18,663.

Cancer effects. USEPA considered several medium and high confidence human epidemiological studies that link chronic PFOS exposure to carcinogenicity particularly in incidence of bladder, prostate, kidney, and breast cancers. 88 Fed. Reg. 18,660 (Mar. 29, 2023). However, USEPA notes that the "study designs, analyses, and mixed results preclude a definitive conclusion." *Id.* Additionally, because the epidemiological evidence of the relationship between PFOS and cancer "found mixed results across tumor types, the available study findings support a plausible correlation between PFOS exposure and carcinogenicity in humans." *Id.* The only chronic cancer bioassay in rats demonstrated that "statistically significant increases in the incidences of hepatocellular adenomas or combined hepatocellular adenomas and carcinomas were observed in both male and female rats." *Id.* This evidence is consistent with "multiple potential mechanism of action (MOA) for this tumor type" and therefore may be "relevant to humans." *Id.* This study also "reported incidences of pancreatic islet cell tumors with a statistically significant dose-dependent positive trend," and "increases in the incidence of thyroid follicular cell tumors." *Id.*

USEPA notes that the observation of multiple tumor types lends "additional support for potential multi-site tumorigenesis" from PFOS. 88 Fed. Reg. 18,660 (Mar. 29, 2023). Further, "structural similarities between PFOS and PFOA" also supports that PFOS is carcinogenic. *Id.* To derive their cancer slope factor for PFOS, USEPA selected the hepatocellular adenomas and carcinomas in female rats due to the "statistically significant increase in tumor incidence in the highest dose group," and because "it was the most health-protective value." *Id.* The cancer slope value is 39.5 mg/kg/day. *Id.* USEPA notes that the selection of hepatocellular tumors as the basis of the cancer slope factor is supported by a 2022 study that was published after USEPA's literature review that reported, "associations between hepatocellular carcinomas and PFOS serum concentrations in humans." *Id.*

Analytical Methods. USEPA evaluated Methods 537.1 and 533 to determine the lowest concentration at which PFOS "can be reliably quantified within specific limits of precision and accuracy during routine laboratory operating conditions." 88 Fed. Reg. 18,666 (Mar. 29, 2023). USEPA determined that 4.0 ppt is the "minimum quantitation level that, with 95 percent confidence, can be achieved by capable analysts at 75 percent or more of the laboratories using a specified analytical method." *Id.* This ensures that the minimum quantitation level can be

uniformly achieved in laboratories nationwide. *Id.* However, USEPA noted that "49 of the 54 laboratories seeking EPA approval included a lowest PFAS calibration standard level at 1 ppt or lower, with the median lowest calibration level among all laboratories at 0.5 ppt." *Id.* at 18,667. This capability may allow PFAS monitoring employing a trigger level of approximately one-third of the MCL. This may alert utilities that they are approaching the PFOS MCL and allow them to "make informed treatment decisions about managing their systems." *Id.*

Participant Concerns

The PFAS Regulatory Coalition questioned why IEPA chose to use the ATSDR values instead of USEPA's oral reference dose when developing the PFOS standard. Ex. 5 at 5. The ACC raised similar questions regarding using of toxicity values from the ATSDR when a value from the USEPA's Office of Water – a higher tier source – is available. Ex. 4 at 6.

ACC argues that ATSDR did not appropriately apply the data and conclusions from their source studies and incorrectly calculated the NOAEL and LOAEL for PFOS. Ex. 28 at 17. ACC argues it was inappropriate for ATSDR to adopt a LOAEL of 0.4 mg/kg when the key study it relied upon used a LOAEL of 1.6 mg/kg. *Id*. ACC also highlighted that ATSDR recognizes the uncertainty regarding the human half-lives used to develop their standards for PFOS. *Id*. 3M argues that ATSDR disregarded multiple studies evaluating multiple endpoints because they lacked pharmacokinetic model parameters. Ex. 25 at 13. 3M also asserts that ATSDR inappropriately applied a modifying factor of 10 over concerns of possible sensitivity of immunotoxicity. *Id.* at 17. The ACC agrees that the application of the uncertainty factor is inappropriate because it is intended to be used "when reproductive and developmental toxicity studies are missing since they have been found to provide useful information" for developing the LOAEL. Ex. 28 at 13. USEPA guidance recommends the application of an uncertainty factor of 3 if either reproductive studies or developmental studies are missing, or 10 if both types of studies are missing. *Id.* The ACC argues that, since there is a good deal of data relating to PFOS, applying an uncertainty factor is not necessary. *Id.* at 14.

IEPA Response

IEPA argues that the selection of the ATSDR MRL instead of the 2016 USEPA Office of Water oral reference dose is appropriate because in June 2022, USEPA published more stringent health advisory levels that demonstrated adverse outcomes for PFOS exposure occur at levels lower than what was considered in 2016. PC 54 at 10. Considering the 2022 health advisory levels, IEPA argues that the 2016 health advisory levels are no longer technically sound when calculating a PFOS health-based standard. *Id.* IEPA disagrees with 3M's characterization that ATSDR's decision to exclude certain animal studies is scientifically inappropriate. IEPA argues that "when evaluating animal toxicity to convert to a human equivalency dose using a pharmacokinetic model, animal strains with established pharmacokinetic model parameters are used." *Id.* at 10. IEPA maintains that in cases of animal studies "without pharmacokinetic model parameters from an animal strain, a pharmacokinetic model cannot be used to predict serum concentrations to calculate human-equivalency doses." *Id.* at 10-11. Moreover, IEPA argues that the USEPA's 2016 Health Advisory for PFOS is an unranked tier 3 source while ATSDR is a top ranked tier 3 source, which lends it higher weight. Ex. 14 at 4. As to

participant's concerns regarding the validity of ATSDR's application of uncertainty factors, IEPA says that those questions are best directed to ATSDR. Ex. 15 at 20-21.

Board Discussion and Findings

The Board agrees with IEPA regarding the selection of ATSDR's MRL to develop the PFOS standard. As noted by IEPA, USEPA has published more stringent health advisory levels for PFOS since the publication of the 2016 Advisory. Also, ATSDR is a top-ranked tier 3 source in the USEPA hierarchy for developing health-based standards. Regarding omission of any animal studies by ATSDR, IEPA correctly notes that animal strains with established pharmacokinetic model parameters are used for establishing MRLs. The Board also notes that the ATSDR's MRL development is open for public comment and subject to external peer review by experts in the field. Therefore, the Board finds the ATSDR MRL for PFOS to be a reliable benchmark for deriving the groundwater quality standard. The Board adopts the proposed PFOS GWQS of 7.7 ppt for first notice.

However, USEPA has proposed a drinking water MCL for PFOS of 4 ppt, which is more stringent than IEPA's proposed standard. This standard – like the proposed MCL for PFOA – is based on the minimum reporting level for PFOS. This is because USEPA classified PFOS as a carcinogen with a proposed MCLG of zero. While USEPA notes most laboratories seeking approval to test for PFAS included PFOS calibration level of 1 ppt or lower, the 4 ppt reporting level is based on the minimum level that can be achieved with 95 percent confidence using Methods 537.1 and 533. Because the Board has adopted Class I groundwater quality standards at the same level as federal MCLs for constituents with MCLs, the Board invites comments from the participants on whether the proposed PFOS standard should be revised to 4 ppt to reflect the proposed USEPA MCL.

PFNA

IEPA proposes 12 ppt (0.000012 mg/L) as the Class I and II groundwater quality standard for PFNA. Human epidemiological studies have identified PFNA exposure as a risk factor for decreased body weight and developmental delays as well as increases in total cholesterol and LDL cholesterol and a decreased immune system response to vaccines. Ex. 2, Attach. 1D3 at A-6. IEPA developed the PFNA groundwater quality standard using ATSDR's PFAS toxicological profile. Ex. 2 at 12. The ATSDR intermediate-duration oral MRL for PFNA is 3×10^{-6} mg/kg/day. Ex. 2, Attach. 1D3 at A-63. In deriving the MRL, ATSDR applied an uncertainty factor of 30 (a factor of 3X for the difference between animals and humans and a factor of 10X for human variability) and a modifying factor of 10 to account for database limitations. *Id*.

USEPA's PFNA Health-Based Water Concentration (HBWC)

USEPA's PFAS proposal regulates PFNA in mixtures with HFPO-DA, PFHxS, and PFBS through a hazard index (HI). 88 Fed. Reg. 18,639 (Mar. 29, 2023). In the proposed rules, USEPA relies on a HBWC of 10 ppt as the health reference value for PFNA. 88 Fed. Reg. 18,647 (Mar. 29, 2023). While USEPA has not yet characterized the carcinogenicity of PFNA, it

reports that it is currently updating the toxicology assessment of PFNA and published a draft assessment of PFNA in May of 2023. *Id.* at 18,646 and 88 Fed. Reg. 47,496 (July 24, 2023). Also, since IEPA filed its proposal, USEPA added PFNA to its restricted substance list in May 2022.

PFNA exposure has been linked to adverse "development, reproduction, immune function, and liver" effects. 88 Fed. Reg. 18,646. USEPA determined PFNA's HBWC by relying on an ATSDR intermediate oral reference dose MRL that was based on observed developmental effects in mice after oral PFNA exposure. *Id.* The most sensitive non-cancer effects from the study were "decreased body weight (BW) gain and developmental delays (i.e., delayed eye opening, preputial separation, and vaginal opening)." *Id.* ATSDR derived a human equivalent dose (HED) of 0.001 mg/kg/day from the NOAEL of 1 mg/kg/day. *Id.* ATSDR then applied a total uncertainty (UF) and modifying factors (MF) of 300X (UF of 30X and MF of 10X for "database deficiencies") to reach their intermediate oral reference dose MRL of $3x10^{-6}$ mg/kg/day. *Id.* USEPA opted not to apply an additional UF to "adjust for subchronic-to-chronic duration to calculate the chronic reference value because the critical effects were observed during a developmental life stage." *Id.*

Based on the critical effects, USEPA identified life stages that may be particularly sensitive to PFNA exposure: "women of childbearing age (13 to < 50 years of age), pregnant women, and lactating women." 88 Fed. Reg. 18,646. USEPA selected lactating women to calculate the HBWC because they had the highest water consumption rate and that stage "is anticipated to be protective of the other two sensitive life stages." *Id.* USEPA used the default RSC value of 20 percent because it determined the available data on PFNA "did not permit quantitative characterization of PFNA exposure." *Id.* at 18647.

Participant Concerns

Methodology. Several participants questioned the validity of the methods used by IEPA to derive the PFNA standard. The ACC argues that using of a child between the ages of 0-6 years as the basis for acceptable daily exposure is inappropriate because ATSDR's MRL is based on *in utero* exposures. Ex. 28 at 5. Additionally, ACC disagrees with IEPA's use of the default RSC value and the application of the uncertainty factor of 10 based on the lack of comprehensive reproductive studies and concerns of immune system sensitivity. *Id.* at 12. 3M argues that IEPA should have used a higher RSC value noting that there is sufficient evidence that blood serum levels of PFNA have decreased since its production was phased out. PC 56 at 11. 3M's expert also maintains that applying the interspecies uncertainty factor is overly conservative because the uncertainty factor is to ensure protection "in case humans are more sensitive than the test animals to the adverse effect." *Id.* IERG also raised concerns of how the update to the PFNA IRIS profile will affect IEPA's proposed standard. Ex. 6 at 4. Finally, 3M notes that the proposed PFNA standard is very close to LLOQ of 10 ppt for Method 8327. Ex. 25 at 6.

ATSDR's Development of the MRL. Regarding the developmental effects cited by ATSDR, the ACC argues that the reported liver and thyroid effects are not relevant to humans. Ex. 28 at 12. 3M echoes these concerns, arguing that IEPA relies on mechanisms "less relevant to human than to rodents, if relevant at all." PC 56 at 15. 3M says, "the MRL could be higher

and still protective of human health" as humans are likely less sensitive to the PPARα mechanism. Ex. 25 at 10.

IEPA Response

IEPA argues that the methodology used to develop the proposed standard is consistent with previous accepted methods to develop groundwater standards. The use of ATSDR's MRL is consistent with USEPA's toxicity hierarchy as it is a top ranked tier 3 source. PC 54 at 5-6. Also, IEPA maintains that the selection of acceptable daily exposure based on a child aged 0-6 years is consistent with the development of non-cancer health-based standards. *Id.* at 15. Regarding the relevancy of animal study results to humans, IEPA notes that, "more recent studies provide evidence that liver tumors may be formed via multiple modes of action, in addition to the PPARα response in rats, as noted in evaluations conducted by International Agency for Research on Cancer". *Id.* at 11. IEPA also highlights that other states have set standards for PFNA lower than the proposed 12 ppt in this rulemaking. *Id.* at 23. For example, Michigan's MCL for PFNA is 6 ppt, New Hampshire's PFNA standard is 11 ppt and Washington's is 9 ppt. *Id.* IEPA also notes that, if a state has taken multiple actions, those actions show a trend of decreasing standard values. *Id.* at 24. IEPA reports that IRIS is assessing PFNA and that any IRIS update of PFNA will be considered for a potential update of the proposed GWQS. Ex. 11 at 7.

Board Discussion and Findings

The Board finds that IEPA has adequately justified the proposed PFNA GWQS of 12 ppt. IEPA's methodology for developing the proposed standard is consistent with methods previously considered by the Board in adopting Part 620 GWQS. Also, the use of ATSDR's MRL is acceptable because it is a top ranked tier 3 source under USEPA's toxicity hierarchy. The Board notes that USEPA also relied on the same ATSDR MRL in deriving the HBWC for PFNA.

In this rulemaking, the Board has found that using a child's exposure is appropriate to determine the acceptable daily exposure that would be protective for all populations. The Board has also found that using an RSC value of 20% is appropriate. Regarding ATSDR's reliance on animal study results to derive a MRL for PFNA, the Board notes that the principal study used by ATSDR (Das et. al. (2015)) measured the gene expression of PPARα and CAR mechanisms to gain insight on their role in developmental effects. Ex. 2, Attach. 1D3 at A-66. Further, ATSDR evaluated the 2010 study cited by the ACC and decided against its use. *Id.* at 64. Also, the ATSDR MRL was also subject to external peer review and public comment prior to being published.

The proposed PFNA GWQS is higher than the LCMRLs/LLOQs for all the analytical methods considered in this rulemaking. PC 54 at 33. Therefore, the Board adopts the proposed standard of 12 ppt at first notice. However, the Board welcomes comment on using USEPA's HBWC of 10 ppt as the basis for the PFNA GWQS.

PFBS

IEPA proposed 1200 ppt (0.0012 mg/L) as the Class I and II GWQS for PFBS. *See*, proposed Sections 620.410(b) and 620.420(b). Animal studies have reported PFBS health effects on the thyroid, reproductive system, development, and kidney following oral exposure. PC 54, Attach. 2 at 3. The proposed PFBS standard was developed using USEPA's Provisional Peer-Reviewed Toxicity Value (PPRTV), due the absence of available "physiologically based pharmacokinetic (PK) parameters." Ex. 13 at 6. IEPA relied on a PFBS chronic reference dose of 0.0003 mg/kg/day with a child (0-6 years) exposure factor and a default RSC value of 20 percent. *Id.* at 4.

USEPA's PFBS Health-Based Water Concentration

USEPA's PFAS proposal regulates PFBS in mixtures with PFNA, HFPO-DA, and PFHxS through a hazard index (HI). 88 Fed. Reg. 18,639 (Mar. 29, 2023). USEPA notes that the final toxicology assessment for PFBS was published in January 2021. This assessment studied oral PFBS exposures in animals and reports that there were "adverse health effects on development, as well as the thyroid and kidneys." 88 Fed. Reg. 18,647 (Mar. 29, 2023). Additionally, PFBS is not considered a carcinogen as there is, "inadequate information to assess carcinogenic potential". *Id.* USEPA relied on a HBWC of 2000 ppt for PFBS based on a, "chronic RfD that is based on thyroid effects observed following gestational exposure of mice". *Id.* The most sensitive effect from the critical developmental toxicity study was decreases in serum total T4. *Id.* A total UF of 300 was applied, including a factor of 10 for intraspecies uncertainty, 3 for interspecies uncertainty, and 10 for database uncertainty. *Id.* USEPA selected an RSC value of 20 percent because "the available data on PFBS exposure routes and sources did not enable a quantitative characterization of PFBS exposure." *Id.* USEPA says that it selected the exposure population of women of childbearing age rather than pregnant women because it was the "higher and therefore more health protective" of the relevant populations. *Id.*

Participant Concerns

Several participants questioned regarding IEPA's methodology for developing the PFBS groundwater quality standards. 3M questioned using the PPRTV reference dose because the principal study did not identify the cited decreases in thyroid hormones as a developmental effect and was uncertain whether the effect was "toxicology relevant". PC 56 at 16. 3M claims that the developmental effect is likely less relevant to humans because "rodents are vastly more suspectable to thyroid hormone disturbances than humans due to their smaller reserve capacity of thyroid hormones." *Id., citing* Ex. 25 at 19.

The ACC argued that using USEPA's PFBS RfD to develop the proposed standard is problematic because the benchmark response (BMR) rate of 0.5 standard deviation is inappropriate. Ex. 28 at 8. USEPA guidance is to use a 0.5 standard deviation for severe effects, but the ACC claims that severe effects are not suggested in the data for PFBS. *Id.* The ACC argues that a benchmark response default value of 1 standard deviation would be more appropriate for deriving the reference dose because it recognizes significant differences in thyroid function between rodents and humans. The ACC also argues that applying an

uncertainty factor of 10 for a "lack of information on neurodevelopmental and immunotoxicity effects" is inappropriate because robust information is available. *Id.* at 9. Moreover, the concern with immunotoxicity of PFBS is "based entirely on suggestions of immunotoxicity related to other PFAS." *Id.*

The PFAS Regulatory Coalition voices concern that the PFBS GWQS is the only standard in this proposed rulemaking that is based on USEPA-derived PPTRV. Ex. 5 at 5. The Coalition argues that this method is scientifically preferred and less stringent than the other proposed standards. The Coalition asks the Board whether other proposed PFAS standards would also be less stringent if they were derived using PPRTVs instead of other toxicological profiles. *Id.*

IEPA Response

IEPA says the PFAS toxicity values selected including PPRTV are considered by USEPA as "credible, relying on best available science, and having undergone a high degree of scrutiny and peer review." PC 54 at 11. IEPA asserts that using PPRTV to develop the proposed PFBS standard is scientifically supported. *Id.*

As to the PFAS Regulatory Coalition's comment that PPRTV is the preferred source to derive the proposed standards, IEPA says that it used the PPRTV because there was a lack of available physiologically-based pharmacokinetic parameters. Ex. 13 at 6. IEPA highlights that the MRLs recommended by ATSDR for PFHxS, PFNA, PFOS, and PFOA also include these parameters. *Id.* Additionally, the USEPA Office of Water used pharmacokinetic models in the Office's 2016 Health Advisories. *Id.* IEPA also notes that PFBS is a shorter chain PFAS which tends to have less adverse effects than longer chain PFAS. *Id.* at 7. IEPA explains, "PFBS has a four-carbon chain, PFHxS has a six-carbon chain, PFOA and PFOS have 8-carbon chains, and PFNA has a 9-carbon chain. Longer-chain PFAS generally cause adverse effects at lower doses, as they are more likely to bioaccumulate, or build up, in an organism, resulting in longer half-lives. Longer half-lives result in higher toxicity and lower reference doses." *Id.*

Board Discussion and Findings

Unlike other PFAS chemicals, there is a lack of physiologically-based pharmacokinetic parameters for PFBS. USEPA used the PPTRV to develop the individual health-based water concentrations for PFBS in its March 2023 proposed drinking water standards. The Board finds that IEPA's reliance on USEPA's PPTRV to develop groundwater quality standards for PFBS is appropriate.

Regarding concerns about IEPA's reliance on USEPA's PFBS chronic reference dose of 0.0003 mg/kg/day, the Board finds that the reference dose is appropriate as it was also used by USEPA to develop the drinking water health advisory for PFBS that was published in June of 2022. PC 54, Attach. 2 at 4. While USEPA used a population exposure factor of women of childbearing age, as discussed above, the Board finds that IEPA's more conservative approach of selecting child (0-6 years) exposure factor for deriving the PBFS GWQS is appropriate because it accounts for the highest water ingestion rate and is most protective for all populations. Also,

using the child exposure factor is consistent with the exposure factor used to develop TACO noncancer remediation objectives under Part 742. Therefore, the Board adopts the PFBS groundwater quality standard of 1,200 ppt for first notice.

PFHxS

IEPA proposed 77 ppt (0.000077 mg/L) as the Class I and II Groundwater standards for PFHxS. *See*, proposed Sections 620.410(b) and 620.420(b). Human epidemiological studies have identified PFHxS exposure as a risk factor for liver damage due to increases in serum hepatic enzymes and decreases in serum bilirubin levels as well as decreased antibody response to vaccines, and increased risk of early menopause. Ex. 2, Attach. 1D5 at 6-7, App. A at A-6. IEPA developed the PFHxS GWQS using ATSDR's PFAS toxicological profile. Ex. 2 at 12. The ATSDR intermediate-duration oral MRL for PFHxS is 2 x 10^{-5} mg/kg/day, which is based on "thyroid follicular epithelial hypertrophy/hyperplasia in adult male rats." Ex. 2, Attach. 1D5, App. A at A-54. The principal study determined a NOAEL of 1 mg/kg/day and a LOAEL of 3 mg/kg/day. *Id.* at A-55. The MRL is based on the Human Equivalent Dose $NOAEL_{\text{Human Equivalent Dose (HED)}}$ of 0.0047 mg/kg/day, which was calculated on the "assumption that humans would have similar effects as the laboratory animal at a given serum concentration." *Id.* at A-56. The derivation of the MRL also included the application of an uncertainty factor of 30 (3 for extrapolation from animals to humans with dosimetric adjustments and 10 for human variability) and a modifying factor of 10 to account for database limitations and the limited number of studies examining immunotoxicity. *Id.* at A-56-57. Also, there was some uncertainty regarding the "selection of thyroid alternations as the critical effect" based on thyroid alternations as secondary effects of observed liver effects. *Id.*

USEPA's PFHxS Health-Based Water Concentration

Like PFNA, USEPA's PFAS proposal regulates PFHxS in mixtures with PFNA, HFPO-DA, and PFBS through a hazard index (HI). 88 Fed. Reg. at 18,639 (Mar. 29, 2023). In the proposed rules, USEPA relies on a HBWC of 9 ppt as the health reference value for PFHxS. *Id.* Studies have linked PFHxS exposure to "adverse health impacts on the liver, thyroid, and development." 88 Fed. Reg. 18,645 (March 29, 2023). USEPA's HBWC value is based on ATSDR's intermediate-duration oral MRL for PFHxS. *Id.* In addition to the uncertainty factors (UFs) applied by ATSDR discussed above under PFNA, USEPA applied an "additional UF of 10 to adjust for subchronic-to-chronic duration (UFs) because the effect was not in a developmental life-stage." *Id.* This resulted in a chronic RfD of 2 x 10^{-6} mg/kg/day. *Id.* at 18,646. A sensitive population was not selected because the critical effect was based on adult male rats. *Id.* USEPA elected to select the default RSC value of 20 percent because "the available data on PFHxS exposure routes and sources did not permit quantitative characterization of PFHxS exposure." *Id.* While there is now no USEPA RfD for PFHxS, IRIS toxicity assessment is ongoing and expected "to undergo public comment and external peer review in 2023." 88 Fed. Reg. 18,664 (March 29, 2023).

Participant Concerns

Several participants questioned using ATSDR MRL to develop the PFHxS standards. 3M argues that using ATSDR's PFHxS profile is inappropriate because it is based on a study that reported thyroid effects due to "increase in liver hypertrophy and enzymes (observed in this study) and in turn induce the metabolism of thyroid hormones." Ex. 25 at 17. 3M argues that the thyroid effects are incorrect because the study did not measure thyroid hormones, which makes the scope of the effects unknown. *Id.* 3M notes that other studies reviewed by ATSDR did not find adverse thyroid effects. *Id.* at 18. 3M requested that "the Board not adopt or issue IEPA's proposed standard for PFHxS for first notice because IEPA failed to consider the important evidence before it in selecting a toxicity value for PFHxS." PC 56 at 11.

The ACC echoed questions regarding the relevance of thyroid effects cited by ATSDR. Ex. 28 at 10. The ACC argues that there is not enough available information to propose a groundwater standard for PFHxS because the observed thyroid effects from ATSDR's principal study may be linked to PPARα activity and may not be relevant to humans. *Id.* The ACC points to information regarding a 28-day study in rats released by the National Toxicology Program after ATSDR's publication of MRL. The ACC argues that the study observed increases in liver weight, decreases in thyroid hormones, and a significant increase in PPARα activity. *Id.* Given the likely association of hepatic and thyroid effects in laboratory animal exposed to PFHxS with PPARα activity in the liver, which cannot be reliably extrapolated to humans, the ACC argues that IEPA "should withdraw the proposed standard for PFHxS until more robust data are available," or, update its analysis to reflect the information from the National Toxicology Program study. *Id.*

IEPA Response

While IEPA provided testimony and comment in support of the proposed PFHxS GWQS, it did not specifically respond to participants' questions regarding the ATSDR MRL used to develop the standards.

Board Discussion and Findings

3M and the Council have questioned the effects of PFHxS on the thyroid, USEPA considers the available toxicity information satisfactory to warrant regulation of PHFxS. USEPA has relied on the ATSDR MRL to derive a HBWC for PFHxS of 10 ppt, which is lower than the proposed Class I and Class II GWQS of 77 ppt. As noted above, the ATSDR MRL serves as a reliable benchmark for deriving the groundwater quality standard because the MRL development is open for public comment and subject to external peer review by experts in the field. Also, the proposed standards are above the LCMRLs/LLOQs of PFAS analytical methods. Therefore, considering USEPA's reliance on PFHxS ATSDR MRL value to develop a HBWC, the Board finds that there is sufficient information in the record to move forward with the proposed PFHxS GWQS to first notice. However, the Board directs IEPA to more fully address participants' questions regarding the thyroid effects of PFHxS and whether the proposed standard should be based on USEPA's HBWC.

HFPO-DA (GenX)

IEPA proposed 12 ppt (0.000012 mg/L) as the Class I and II GWQS for GenX. To develop the proposed GenX standards, IEPA reviewed USEPA's Office of Water October 2021 Human Toxicological Profile of HFPO-DA. Ex. 2 at 12. USEPA evaluated hepatocellular hypertrophy and single cell/or focal necrosis (liver), anemic conditions (blood), increases in maternal gestational weight and decreased thyroid hormones (developmental), and immune suppression, and determined there is "suggestive evidence of carcinogenic potential." Ex. 2, Attach 1D7 at 76-77; 80-82. Available data indicate multiple modes of action for HFPO-DA's effects on liver, including support for a role for PPARα, cytotoxicity, mitochondrial dysfunction, and PPARγ. *Id.* at 75.

USEPA developed the reference dose for HFPO-DA using data from reproductive and developmental studies in mice. *Id.* at 92. Uncertainty factors with a total value of 3000 were applied for chronic reference dose, including an interspecies factor of 3 due to the lack of PBPK models and 10 to account for differences between humans, a LOAEL to NOAEL factor of (1), for the extrapolation from a subchronic to chronic duration (10), and a database uncertainty factor (10). *Id.* at 92-93. The RfD was based on a constellation of liver effects (cytoplasmic alteration, apoptosis, single-cell necrosis, and focal necrosis) from a 2010 Dupont study, which USEPA notes is supported by several other studies noting that "the liver is the primary target organ" from oral exposure to HFPO-DA. *Id.* at 98. USEPA determined a chronic RfD of 3×10^{-6} mg/kg/day for HFPO-DA. *Id.* at 99.

USEPA's HFPO-DA Health-Based Water Concentration

USEPA's PFAS proposal regulates HFPO-DA in mixtures with PFNA, PFHxS, and PFBS through a hazard index. 88 Fed. Reg. 18,639 (March 29, 2023). USEPA calculated a HBWC of 10 ppt for HFPO-DA. *Id.* at 18,646. While HFPO-DA is classified as "Suggestive Evidence of Carcinogenic Potential", USEPA notes that there is insufficient data to derive a cancer risk concentration. *Id.* at 18,646.

HFPO-DA exposure has been linked to adverse liver, kidney, immune system, hematological, reproductive, and developmental effects. 88 Fed. Reg. 18,646 (March 29, 2023). The reference dose is based on liver lesions in "parental female mice" from the DuPont reproductive/developmental study. *Id.* The reference dose was derived from a Human Equivalent Dose (HED) of 0.01 mg/kg/day from the NOAEL of 0.1 mg/kg/day from the principal study. *Id.* Four uncertainty factors (UF) were applied for: intraspecies variability (10), interspecies differences (3), extrapolation from a subchronic reference dose to a chronic reference dose (10), and database deficiencies (10). *Id.* The mice were exposed to HFPO-DA from "pre-mating through lactation" which corresponds to "women of childbearing age, pregnant women, and lactating women". *Id.* Of the three populations, USEPA selected lactating women as the exposure population as it is protective of the other two candidate populations. *Id.* USEPA opted to use the default RSC value of 20 percent due to a lack of information to calculate an alternate value. *Id.*

Participants Concerns

Both 3M and the ACC questioned "uncertain science" in the principal study relied upon by IEPA in developing the HFPO-DA GWQS. Ex. 25 at 19. 3M argues that the reference dose is based on an unpublished DuPont study conducted under a consent order. Ex. 25 at 19. The NOAEL and LOAEL were based on "single-cell necrosis in the livers of male mice" but the critical effect chosen to derive the RfD was a "constellation of liver lesions" in male and female mice. *Id.* Within the constellation of these effects there is "uncertainty as to the adversity of some of these effects." *Id.* 3M argues that the pathological slides from the Dupont study "were re-evaluated by other investigators, using more current diagnostic criteria," and it was determined that the single cell necrosis is more likely to be apoptosis that was mediated by PPARα activation. *Id.* Additionally, several other mouse and rat studies have not observed the "same constellation of effects in the liver at such a low dose." *Id.* at 20. 3M also notes that a re-evaluation requested by USEPA "generally supported the original study findings of single-cell necrosis but also observed liver cell apoptosis in some animals." *Id.* at 19.

The ACC argues that the analysis is based on "new and unprecedented toxicological endpoint and misapplies scientific criteria" and that the assessment, "uses improper and unwarranted uncertainty factors in calculating the RfD." Ex. 28 at 6. Additionally, the ACC notes that the available evidence supports the conclusion that the observed liver effects occur through the PPARα pathway. *Id.* Moreover, the ACC claims that USEPA's decision to combine the four liver effects "into a never-before-used toxicological endpoint" is at odds with the available science. They further argue that criteria to determine whether the effects were adverse were misapplied. *Id.* at 7. The ACC takes issue with the application of a total uncertainty factor of 3000 as well as the application of UF of 10 for subchronic to chronic. The ACC argues this was unnecessary because there is "no indication of a progression in the rodent liver lesions with longer exposure." *Id.* Furthermore, the database UF of 10 is inappropriate due to the "impressive amount of data available for HFPO-DA." *Id.* The application of the database UF was applied due to "concerns about reproductive and developmental effects" which is inappropriate because RfDs from available reproductive and developmental studies are higher than those for liver effects. *Id.*

IEPA Response

IEPA provided testimony and comment in support of the proposed HFPO-DA GWQS. The Board below asks a question regarding IEPA's reliance on the USEPA's Office of Water October 2021 Human Toxicological Profile of HFPO-DA to develop the proposed standards.

Board Discussion and Findings

The Board disagrees with 3M and the ACC's position that the proposed HFPO-DA GWQS are based on uncertain science. While IEPA has not provided a specific response to concerns raised by 3M and the ACC, IEPA's supporting documents address the mode of action of HFPO-DA. USEPA's HFPO-DA toxicological profile indicates multiple modes of action for HFPO-DA's effects on liver, including support for a role for PPARα, cytotoxicity, mitochondrial

dysfunction, and PPARγ[16]. Ex. 2 at Attach. 1D7. Also, USEPA's March 2023 proposed PFAS drinking water rules rely on the same Dupont study in deriving the reference dose used to develop the health based water concentration for HFPO-DA. Regarding the uncertainty factors, the Board notes that USEPA applied the same factors as IEPA to derive the HBWC as the factors used in deriving the proposed HFPO-DA groundwater quality standards.

Both IEPA and the Board rely on USEPA's standards and guidance to develop groundwater quality standards. USEPA has relied on the same study underlying IEPA's proposed HFPO-DA GWQS and has used the same uncertainty factors in developing the HBWC for HFPO-DA. USEPA's action supports the scientific basis of IEPA's proposed HFPO-DA GWQS. Therefore, the Board finds that the proposed HFPO-DA groundwater quality standard is scientifically justified and moves forward to first notice with the proposed HFPO-DAGWQS. However, the Board directs IEPA to address participants questions and explain why the proposed HFPO-DA standard of 12 ppt is higher than USEPA's HBWC of 10 ppt.

Proposed GWQS for Molybdenum

IEPA proposes molybdenum standards for Class I groundwater of 0.019 mg/L and Class II groundwater of 0.05 mg/L. *See* proposed 35 Ill. Adm. Code 620.410(a) and 620.420(a)(1). The Class I molybdenum standard is based on proposed procedures under Part 620 Subpart F and 620.Appendix A, and the Class II standard is based on the beneficial use for irrigation of crops and produce. Ex. 2 at 25, 29. Several participants, including the International Molybdenum Association (IMOA), have questioned the toxicological information and livestock and irrigation criteria IEPA relied upon to support the proposed standards.

Participant Concerns

The proposed Class I molybdenum standard is based on toxicity value derived from USEPA's Integrated Risk Information System (IRIS). The International Molybdenum Association raised several questions and presented testimony and comments regarding the standard. Sandra Carey of IMOA argues that the IRIS value is outdated as it relates to molybdenum. PC 2 at 1. IMOA states that "[t]he key study in US EPA's IRIS for the molybdenum reference dose is the Koval'skiy study (1961) which for many years now is widely recognized by the regulatory community as unsuitable for regulatory purposes." *Id.* Specifically, "the NAS [National Academy of Science] Institute of Medicine 2001 publication concluded the Koval'skiy study is unreliable science, and this is also reflected by US ATSDR in its publication." *Id*. at 1-2. Ms. Carey argues that instead of IRIS, IEPA should use the ATSDR toxicological profile for molybdenum. "The ATSDR Toxicological Profile and the MRL underwent an Inter-Agency peer review that included representatives from the US EPA Office of Water. ATSDR notes that screening values can be as much as 100-fold below levels shown to be non-toxic in laboratory animal studies, and consequently even screening level MRL's are not an appropriate basis for state groundwater quality standards." *Id*., Tr. 3 at 10-11.

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[16] PPAR*γ* (peroxisome proliferator activated receptor *γ*) is a ligand activated transcription factor of the nuclear receptor superfamily that controls the expression of a variety of genes involved in fatty acid metabolism, adipogenesis, and insulin sensitivity.

Ms. Carey requests that the Board use the ATSDR minimum risk level of 0.06 mg/kg/d for molybdenum for calculating the Class I standard instead of the IRIS reference dose of 0.005 mg/kg/d used by IEPA. Ms. Carey questions whether "economic considerations relating to the proposed value of 0.019 mg Mo/L have been adequately addressed in terms of the ability for the impacted facilities to achieve such a highly challenging mandatory standard." PC 2 at 3. In addition, IMOA argued that molybdenum is a "recognized bio-essential trace nutrient for humans." *Id.* at 2. IMOA is concerned that setting the standard based on the drinking water consumption of a child aged 0-6 years old might be too conservative. *Id*.

IMOA argues that the Board should defer "any ruling about molybdenum until such time as this substance can be assessed on current best available science instead of the US IRIS database entry for molybdenum which is vastly out-of-date and thereby a wholly unsuitable and misleading scientific basis for assessment." PC 11 at 4.

Dynegy also argues that the IRIS toxicity information is "outdated and flawed." PC 57 at 4. Dynegy asks that the Board wait until IRIS data for molybdenum is updated or "set a Class I standard using the currently superior [ATSDR] toxicity information, which would result in a standard of 0.2 mg/L." *Id.* Dynegy notes that IEPA is proposing a Class II molybdenum standard of 0.05 mg/L based on irrigation of forage consumed by livestock. *Id. citing* SR at 9. However, Dynegy argues that IEPA has not provided any evidence that the proposed Class II standard is representative of irrigation and soil conditions in Illinois. *Id.* Dynegy contends that the proposed Class II standards is more representative of conditions in the Western United States. Dynegy argues that a Class II standard for molybdenum is unnecessary in Illinois and should not be adopted by the Board. Alternatively, Dynegy asks the Board to set the Class I and Class II standards for molybdenum at 0.1 mg/L which would make the standards consistent with the groundwater protection standard for molybdenum under the Illinois rules governing coal combustion residual surface impoundments. *Id. See* 35 Ill. Adm. Code 845.600.

IEPA Response

IEPA provides several reasons why it relied on the IRIS reference dose. PC 54 at 7-8. IEPA says that IRIS is the Tier 1 toxicity source listed in the USEPA hierarchy, while the ATSDR toxicity value is a Tier 3 source. IEPA further argues that the "IRIS toxicity value is based on chronic exposure, which is the exposure type used in calculating health-based standards for noncancer health effects for residential populations" while the ATSDR toxicity value is based on subchronic exposure. *Id*. at 7. While USEPA's 2021 update of the hierarchy allows the selection of subchronic values for certain chemicals when more recent data is available from Tier 3 sources, IEPA notes that USEPA did not review molybdenum's subchronic toxicity value to replace the present IRIS chronic toxicity value. *Id.* Further, USEPA used the IRIS toxicity value for developing chronic health-based screening levels for residential populations and the ATSDR toxicity value for developing subchronic health-based screening levels for construction worker populations. *Id.* at 7-8.

IEPA also notes that "ATSDR's subchronic toxicity value is not derived from benchmark dose (BMD) or pharmacokinetic (PK) models using time-weighted averages." *Id.* at 8. Given that the ATSDR's intermediate dose MRL is calculated by dividing the selected study's NOAEL

(17 mg/kg-day) by uncertainty/modifying factors equaling 300, IEPA argues that it is inappropriate "to use the subchronic value for evaluating chronic exposure without applying an additional uncertainty factor of 10 for subchronic to chronic extrapolation." *Id.* Finally, IEPA notes that the use of the IRIS toxicity value is specifically protective for those with marginal copper intakes for increased uric acid levels. *Id.* This is an important factor because, when a higher amount of molybdenum is ingested, more copper is excreted from the body which increases the buildup of uric acid. IEPA notes that "the Koval'skiy, et al., study selected by IRIS is a human health study conducted in a region selected specifically for its high molybdenum content in plants and its low copper content due to this inverse relationship." *Id.* However, the ATSDR's toxicity value assumes that the average copper intake of the U.S. population exceeds dietary requirements. *Id.* Although ATSDR included a modifying factor of 3 to address potential reproductive/developmental effects in populations with marginal copper intakes, IEPA maintains that the IRIS toxicity value is specifically protective for those with marginal copper intakes for increased uric acid levels.

Board Discussion and Findings

While IMOA and Dynegy questioned using an IRIS toxicity value from 1991, IEPA persuasively argues why the Board should adopt the proposed Class I molybdenum standard of 0.019 mg/L based on the IRIS value. As noted by IEPA, the IRIS toxicity value is based on a human health study conducted in a region selected specifically for its high molybdenum content in plants and its low copper content due to their inverse relationship in humans. Thus, the toxicity value addresses concerns of exposure for a population with marginal copper intakes. Also, USEPA's reliance on the IRIS value for developing chronic health-based screening levels for residential populations indicates that the 1991 IRIS reference dose is still valid. Additionally, as noted by IEPA, if an uncertainty factor of 10 for subchronic to chronic extrapolation is applied to the standard based on the ATSDR toxicity value of 0.2 mg/L suggested by Dynegy, the standard would be approximately the same as the proposed Class I standard of 0.019 mg/L. Therefore, the Board finds adequate scientific justification to adopt the Class I molybdenum GWQS of 0.019 mg/L based on IRIS toxicity value at first notice.

Regarding the proposed Class II molybdenum groundwater quality standard of 0.05 mg/L, the Board agrees with Dynegy that the record is not clear if the standard is representative of Illinois soils. While IEPA's supporting documentation recommends a maximum concentration of molybdenum of 0.05 mg/L for short term use on soils that react with this element, it does not indicate if these soils are prevalent in Illinois. Ex. 2, Attach. 1J3 at 2. The Board proposes the Class II molybdenum standard at 0.05 mg/L for first notice but directs IEPA to provide additional justification to support the adoption of the proposed standard for protection of beneficial use for irrigation of crops and produce.

Proposed GWQS for Cobalt

IEPA proposes updating the cobalt Class I groundwater standard to 0.0012 mg/L. *See*, proposed 35 III. Adm. Code 620.410(a). This update changes the basis for the cobalt standard from protecting beneficial uses for livestock to a more stringent value that is protective of human health. Ex. 2 at 25.

Participant Concerns

Dynegy requests that the Board set the cobalt Class I standard at the natural background level of 0.02 to 0.03 mg/L, arguing that the proposed standard is below naturally occurring background levels. Ex. 23 at 4. Dr. Hahn, Dynegy's expert, says that it is common for cobalt background levels to be 0.001 mg/L in Illinois. Ex. 23 at 2. Among the filtered samples collected by the United States Geological Survey (USGS), approximately 24% were above the proposed standard for cobalt. *Id.* at 4. The background level for cobalt in Illinois groundwater is approximately between 0.02 and 0.03 mg/L. *Id.* Dr. Hahn argues that even in remedial cleanup programs it not required to treat contaminants to reach below background levels. *Id.* at 1.

Dr. Hahn also questions how close IEPA's proposed Class I cobalt standard is to the reporting limits especially for unfiltered samples. Ex. 23 at 4-5. Dynegy asserts that IEPA inappropriately relies on cobalt LLOQ of 0.0001 mg/L using USEPA Method 200.8 to support the proposed cobalt GWQS. *Id.* at 5. Dynegy argues that using this method is problematic because verifying LLOQ normally requires "spiking clean control water (e.g., reagent water or method blanks) that does not have issues with matrix interference," meaning these samples do not have the turbidity issues that are common in field groundwater samples. *Id.* Therefore, the LLOQ presented by IEPA is "not relevant to or achievable in real world groundwater samples with turbidity above 1 NTU." *Id.* Instead, Dynegy says the method detection limit for cobalt in unfiltered groundwater samples is closer to 0.004 mg/L. *Id.* at 5-6.

IEPA Response

IEPA says that USEPA's third unregulated contaminant monitoring rule included a minimum reporting limit for cobalt of 0.001 mg/L using USEPA Method 200.8, which is less than the proposed cobalt standard. PC 54 at 36. Therefore, IEPA argues that the health-based standard still applies. *Id.*

Board Discussion and Findings

The Board finds that IEPA has demonstrated cobalt can be analyzed below the level of the proposed standard using USEPA Method 200.8. Regarding Dynegy's concern regarding higher background levels, the Board notes the proposed groundwater quality standard is a statewide health-based standard. Thus, the Board finds it inappropriate to adopt a statewide potable resource groundwater standard based on background levels that were developed by USGS to address a regional issue. Part 620 recognizes that groundwater in certain parts of the state may exceed the groundwater quality standards due to natural causes. Sections 620.410 and 620.420 apply the Class I and II standards "except due to natural causes." *See* proposed 35 Ill. Adm. Code 620.410 and 620.420. As noted by IEPA, program-specific regulations are able to address situations where background levels are higher than the groundwater quality standard. Ex. 12 at 4. Therefore, the Board adopts the proposed cobalt Class I GWQS of 0.0012 mg/L at first notice.

Proposed GWQS for Selenium

IEPA proposes revising the existing Class I and Class II selenium standard of 0.05 mg/L to 0.02 mg/L. *See*, proposed 35 Ill. Adm. Code 620.410(a) and 620.420(a)(2). IEPA's proposal shifts the basis of the selenium standard from the health based USEPA MCL to beneficial use for irrigation of crops. IEPA reports the change is due to the more stringent irrigation value, and crops may be irrigated with Class I potable resource groundwater. Ex. 2 at 25.

Participant Concerns

Dynegy raises several concerns regarding the proposed selenium standards. One of Dynegy's experts, Lisa Yost, states that the proposed GWQS of 0.02 mg/L is not appropriate for Illinois since continuous irrigation is not practiced here. She notes that the proposed standard is based on 3 acre-feet water use per acre, per year. Ex. 24 at 7. This irrigation level is higher than the average 1.5-acre-foot of water used on cropland in the entire United States as well as the estimated 0.5 acre-foot per acre for Illinois cropland water usage. *Id., citing* USDA (2018[17]). Ms. Yost notes that IEPA previously rejected "guidelines based on continuous watering in the 1991 rulemaking, but now relies on the same reference to propose a 0.02 mg/L guideline for selenium." *Id.* at 8.

Next, Ms. Yost argues that Illinois soil types are not consistent with those considered by USEPA in developing the 1972 selenium irrigation criterion relied upon by IEPA. Ex. 24 at 8. She notes that USEPA said that the 1972 USEPA selenium standard is recommended until additional information is obtained on soil reactions. It added that the 0.02 mg/L irrigation criterion for selenium is appropriate for use on neutral and alkaline fine textured soils. *Id.* Ms. Yost maintains that IEPA failed to discuss whether fine textured soils in Illinois are neutral or alkaline. *Id.* Generally, many agricultural soils in Illinois have particle sizes that are relatively fine textured, but soils are not predominantly neutral or alkaline. *Id.*

Dynegy argues that "evidence demonstrates that this standard is not appropriate for the type of irrigation that occurs in Illinois, or the type of soils located in Illinois. On the contrary, evidence suggests livestock in Illinois require selenium as a supplement in feed to prevent selenium deficiency." PC 57 at 3. Dynegy asks the Board to maintain the current standard for selenium, 0.05 mg/L, as it is consistent with USEPA's MCL. *Id.*

IEPA Response

IEPA says that the proposed standard for selenium "is taken from the same source for irrigation standards that has been relied upon since the Board's first promulgation of the 35 Ill. Adm. Code Part 620 groundwater quality regulations in 1991." PC 54 at 20. Regarding Ms.

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[17] USDA, Census of Agriculture, 2018 Irrigation and Water Management Survey, Table 7 Irrigation by Estimated Quantity of Water Applied: 2018 and 2013, https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Farm_and_Ranch_Irrigation_Survey/fris_1_0007_0007.pdf (visited on February 8, 2024).

Yost's position that the proposed standard is only appropriate for croplands with continuous irrigation, IEPA argues the proposed selenium GWQS is based on "use of irrigation water for up to 20 years on fine textured soils with a pH between 6.0 and 8.5." *Id. citing* Attach. 1I. IEPA notes that, "according to ISWS [Illinois State Water Survey] in Attachment 8 of Illinois EPA's May 6, 2022, pre-filed responses, average soil pH values in Illinois vary from mildly alkaline (7.0-7.5) primarily in central west and northwest regions of the State to strongly acidic (5.2-5.5) in extreme southern Illinois." *Id.* at 21. Thus, IEPA argues that "contrary to Ms. Yost's statement, ISWS does not conclude that soil in Illinois in predominantly acidic." *Id.* Regarding Ms. Yost's contention that selenium value was based on geographical areas with range crops that grow in arid climates, IEPA notes that the 1972 Water Quality Criteria document specifically recommends the 0.02 mg/L value for use on forage crops, and not range crops. *Id.* IEPA maintains that "Illinois agriculture supports crop yield for forage crops, such as corn, which are known to be grown in fine textured soils in Illinois." *Id*. at 22.

Regarding the application of irrigation-based standard to Class I potable resource groundwater, IEPA argues that Class I groundwater is used for both "irrigation and drinking water and should be protected for both applications." *Id.* at 22. IEPA notes that the current "Boron Class I standard of 2 mg/L is based on irrigation for use up to twenty years on fine-textured soils of pH 6.0 – 8.5 from the same source as the proposed selenium standard." *Id.* Finally, regarding the need for selenium supplementation of food for animals, IEPA says it cannot evaluate the claim as Dynegy did not provide any references for review. *Id.*

Board Discussion and Findings

The Board finds that IEPA has adequately justified revising the current selenium groundwater quality standard from the health-based concentration of 0.05 mg/L to a more stringent irrigation-based concentration of 0.02 mg/L for both Class I and II groundwater. While concerns were raised with applying irrigation-based guidance levels to Illinois cropland, the Board finds that IEPA's response sufficiently addresses those concerns. The 1972 USEPA guidance document recommends an irrigation-based concentration of 0.02 mg/L for continuous use on all soils at rate of 3 acre-feet of water per acre per year. The guidance also recommends the same limit "for neutral and alkaline fine textured soils until greater information is obtained on soil reactions." Ex. 2, Attach. 1I-20. As noted by IEPA, Illinois agriculture supports forage crops on fine textured soils with pH ranging from neutral to alkaline. Therefore, the proposed selenium standard is consistent with the 1972 guidance recommendations. Thus, the Board will move the proposed Class I and Class II standards for selenium to first notice.

Proposed Groundwater Quality Standard for Vanadium

IEPA proposes updating the Class 1 vanadium groundwater quality standard from 0.049 mg/L to 0.00027 mg/L. *See* proposed 35 Ill. Adm. Code 620.410(a). To develop this standard, IEPA used USEPA's provisional peer-reviewed toxicity value oral reference dose of 7×10^{-5} mg/kg/day issued in September 2009. Ex. 2 at 10. IEPA notes that the current standard needs to be updated because it is based on the RSL derived using a reference dose for vanadium pentoxide that was issued in June 1988. *Id.* at 9. The value for the proposed new Class I standard was calculated using the procedures in Part 620 Subpart F and Appendix A. *Id.* at 23.

Based on vanadium's toxicological profile, the proposal includes vanadium in Part 620 Appendix E as a similar-acting substance on the kidney. *Id.* at 32.

Participant Concerns

Dynegy's expert, Dr. Hahn, argues that it would be more appropriate to set the Class I vanadium standard at the background levels of vanadium in groundwater of 0.02 to 0.03 mg/L rather than based solely on health effects. Ex. 23 at 3-4. USGS groundwater data indicates that, "more than 50% of collected groundwater samples in humid areas exceed 0.00027 mg/L for vanadium." *Id.* at 3. Dynegy argues that the background levels of vanadium in Illinois range between 0.02 and 0.03 mg/L, which would make a more appropriate standard. *Id.* at 4. Dynegy highlights that remedial programs such as CERCLA do not require clean up below background levels. *Id.* at 1.

Dynegy argues that laboratories currently operating in Illinois would have difficulty meeting the proposed Class I groundwater standard for three reasons. First, the groundwater samples analyzed in the USGS program are filtered while monitoring under Part 620 is conducted using unfiltered samples. PC 57 at 12. Second, none of the unfiltered samples in the USGS database had reporting limits below the proposed vanadium standard. *Id.* Third, it would be difficult to reach the LLOQ/LCMRL in real world samples when turbidity exceeds 1 Nephelometric Turbidity Unit or NTU. *Id.* at 5.

IEPA Response

IEPA relied on USEPA's 2009 PPTRV RfD to derive the proposed vanadium standard because the health effects assessment summary table (HEAST) toxicity value for vanadium, which is the basis for the current groundwater standard has been retired and is no longer available. PC 54 at 36. Further, IEPA notes that USEPA's Third UCMR lists a MRL of 0.0002 mg/L for vanadium using USEPA Method 200.8. This MRL is less than IEPA's proposed Class I vanadium GWQS of 0.00027 mg/L *Id.* IEPA also asserts that health based GWQS "for metals are based on total, or unfiltered sampling; therefore, no insight can be gained with a discussion of dissolved or filtered samples." *Id.* at 36-37. Finally, IEPA argues that if a laboratory is unable to meet the USEPA Method 200.8 MRL, another laboratory capable of meeting the MRL should be selected for analyzing groundwater samples. *Id.*

Board Discussion and Findings

The Board agrees with IEPA that revising the Class I vanadium GWQS based on USEPA's 2009 PPTRV toxicity value is warranted as the HEAST value, which is the basis for the current GWQS, is obsolete. The Board notes that while both PPTRV and HEAST toxicity values are under Tier 3 of the toxicity hierarchy used by IEPA, PPTRV is ranked higher than HEAST. Ex. 2 at 6-8. Thus, the Board finds that IEPA has adequately justified the use of the PPTRV toxicity value to develop the vanadium standard.

Regarding analytical capability to measure vanadium at the level of the proposed standard, the Board notes that USEPA's method 200.8 is available with a lower reporting limit of

0.0002 mg/L. Also, as noted by IEPA, the Board's health based GWQS for metals are based on total sampling values, so analysis must be done using unfiltered samples.

Finally, regarding Dynegy's concern with background levels higher in certain parts of the state than the proposed standard, the Board finds that IEPA has adequately justified the proposed vanadium as a statewide groundwater quality standard for the same reasons the Board found the proposed cobalt standard to be appropriate. Considering these factors, the Board will adopt the proposed vanadium Class I groundwater quality standard of 0.0002 mg/L for first notice.

Groundwater Management Zones

IEPA's proposal seeks to add a rule specifying requirements for the contents of groundwater management zone (GMZ) "applications." In response to questions posed during this rulemaking, IEPA provided helpful information on GMZs and proposed further amendments designed to clarify the GMZ rules. At first notice, in addition to incorporating IEPA's proposed amendments, the Board proposes numerous changes to clarify the operation of the GMZ provisions adopted by the Board more than 30 years ago. These clarifying changes reflect IEPA practice as described in this record and are consistent with the original concept of GMZs. Below, using the following framework, the Board discusses how its proposed first-notice amendments will clarify how GMZs work:

- What is a GMZ?
- Are there *two* paths to establishing a GMZ under Section 620.250(a)?
- What conditions must be met to establish a GMZ?
- What if an applicable corrective action process requires more information than called for by the GMZ application or requires using a different form?
- How and when does a GMZ end?
- Which groundwater quality standards apply within a GMZ?
- What GMZ information must be published in the *Environmental Register*?

Three provisions of Part 620 are central to GMZs: Section 620.250; Section 620.450; and Section 620.Appendix D. First, Section 620.250 addresses the establishment of a GMZ; the expiration of a GMZ when corrective action is complete and applicable groundwater quality standards have been attained; and IEPA's review of the on-going adequacy of controls and management when corrective action is complete but applicable groundwater quality standards have not been attained. *See* 35 Ill. Adm. Code 620.250(a)-(c). Second, Section 620.450(a) covers the groundwater quality standards that apply within a GMZ before corrective action is complete and those that apply after corrective action is complete. *See* 35 Ill. Adm. Code 620.450(a)(1)-(a)(4). And third, Appendix D is a form template entitled, "Confirmation of an Adequate Corrective Action Pursuant to 35 Ill. Adm. Code 620.250(a)(2)." It has four parts: Part I ("Facility Information"); Part II ("Release Information"); Part III ("Remedy Selection Information"); and Part IV ("Completion Certification"). *See* 35 Ill. Adm. Code 620.Appendix D.

What is a GMZ?

A GMZ is a three-dimensional region containing groundwater that is being managed to mitigate impairment caused by the release of one or more contaminants. *See* 35 Ill. Adm. Code 620.250(a). A GMZ may be established within any of the four classes of groundwater: Class I "Potable Resource Groundwater"; Class II "General Resource Groundwater"; Class III "Special Resource Groundwater"; or Class IV "Other Groundwater." *See* 35 Ill. Adm. Code 620.250(a); 35 Ill. Adm. Code 620.201.

Are there *two* paths to establishing a GMZ under Section 620.250(a)?

Current Section 620.250(a), adopted in 1991, suggests *two* paths to establishing a GMZ—one under subsection (a)(1) and the other under subsection (a)(2). *See* 35 Ill. Adm. Code 620.250(a). But, as explained below, the distinction is unnecessary and has led to confusion.

First, subsection (a)(1) of Section 620.250 states that it applies when the release is from a site "[t]hat is subject to a corrective action process approved by the Agency." 35 Ill. Adm. Code 620.250(a)(1). A "corrective action process" is defined as "those procedures and practices that may be imposed by a regulatory agency when a determination has been made that contamination of groundwater has taken place, and are necessary to address a potential or existing violation of the [groundwater quality] standards" for Class I, Class II, Class III, or Class IV groundwater. 35 Ill. Adm. Code 620.110; *see also* 35 Ill. Adm. Code 620.201. Second, subsection (a)(2) of Section 620.250 states that it applies when the release is from a site "[f]or which the owner or operator undertakes an adequate corrective action in a timely and appropriate manner and provides a written confirmation to the Agency." 35 Ill. Adm. Code 620.250(a).

Subsection (a)(1) accounts for an owner or operator starting corrective action only after receiving IEPA approval of that corrective action. Subsection (a)(2), on the other hand, accounts for an owner or operator starting corrective action without that prior IEPA approval and then submitting to IEPA a "confirmation" of the adequacy, timeliness, and propriety of the corrective action taken and to be taken. But even in the subsection (a)(2) scenario, a GMZ, which must include some period of corrective action, would not be established until IEPA approves it. *See* 35 Ill. Adm. Code 620.250(b); Ex. 10 at 27 ("The Agency will have issued written approval of a GMZ, which necessarily incudes some type of corrective action under subsection (a)(1) or (a)(2) which was approved by the Agency."); 35 Ill. Adm. Code 620.450(a)(1), (a)(3), (a)(4) ("completion" of "corrective action" "described in Section 620.250(a)"). Once IEPA concurs with the "confirmation" of the owner or operator, IEPA will have approved a "corrective action process," putting the subsection (a)(2) scenario on the same footing as the subsection (a)(1) scenario. There is no need to distinguish between the two. Even if an owner or operator voluntarily undertakes corrective action, when IEPA approves the GMZ, it imposes, as a condition of the GMZ, procedures and practices to address the potential or existing violation of groundwater quality standards due to contamination. The release is subject to a "corrective action process," by definition.

Accordingly, whatever the circumstances under which an owner or operator seeks to establish a GMZ—being "subject to a corrective action process approved by the Agency" or

undertaking "adequate corrective action, equivalent to a corrective action process approved by the Agency" and confirming that with IEPA—a GMZ cannot come into existence without an IEPA-approved "corrective action process." 35 Ill. Adm. Code 620.250(a)(1), App. D. This is further evidenced by Section 620.505(a)(4) on compliance determinations, which provides that "[c]ompliance with standards at a site is to be determined . . . [f]or a groundwater management zone, as specified in *a corrective action process*." 35 Ill. Adm. Code 620.505(a)(4) (emphasis added); *see also* 35 Ill. Adm. Code 620.510(a) ("A representative sample shall be taken from locations as specified in Section 620.505"). "In any management zone, the goal is remediation, if practicable, of the groundwater to the level of the standards applicable to that class of groundwater." Groundwater Quality Standards (35 Ill. Adm. Code 620), R89-14(B), slip op. at 14 (Nov. 7, 1991). This is so regardless of whether the GMZ is established under subsection (a)(1) or subsection (a)(2) of Section 620.250.

The two paths set out in Section 620.250(a) have also led to misinterpretation (*see* Sierra Club v. Midwest Generation, LLC, PCB 13-15, slip op. at 9-13 (Feb. 6, 2020)), as well as use of Appendix D to establish GMZs under subsection (a)(1) despite Appendix D's language referring only to subsection (a)(2) (*see* Ex. 10 at 7). Moreover, IEPA said that it is unaware of a GMZ ever having been established or even applied for under Section 620.250(a)(2). Ex. 10 at 7, 21.

In sum, what matters for establishing a GMZ under Part 620 is that IEPA approve the GMZ, including its corrective action. IEPA-approved corrective action for GMZs has included "groundwater collection and discharge under NPDES [National Pollutant Discharge Elimination System] Permit, groundwater extraction and treatment prior to permitted discharge, capping waste and monitored natural attenuation with a modeled compliance date, lining previously unlined impoundments, slurry walls and source material removal for beneficial use." IEPA 3/4/22 Resp. at 7. IEPA explained that "[s]ome of these methods are used together or have been used serially." *Id*.

Therefore, for first notice, the Board proposes amending subsection (a) of Section 620.250(a) to simply describe what a GMZ is.

a) Within any class of groundwater, a groundwater management zone (GMZ) may be established as a three-dimensional ~~three-dimensional~~ region containing groundwater being managed to mitigate impairment caused by a ~~the~~ release of one or more contaminants ~~from a site:~~

~~1) That is subject to a corrective action process approved by the Agency; or~~

~~2) For which the owner or operator undertakes an adequate corrective action in a timely and appropriate manner and provides a written confirmation to the Agency. Such confirmation must be provided in a form as prescribed by the Agency~~.

As discussed in the next part of this opinion, the Board also proposes amending subsections (b) and (c) of Section 620.250. After subsection (a) answers the threshold question—"What is a

GMZ?"—the provisions proceed in a logical sequence. Specifically, subsection (b) will address how the owner or operator applies for a GMZ with IEPA. And subsection (c) will address what constitutes IEPA approval of a GMZ, which must include corrective action, and precisely when the GMZ is established.

The Board also proposes removing excess language from the definition of "corrective action process" in 35 Ill. Adm. Code 620.110:

> "Corrective action process" means the ~~those~~ procedures and practices that a regulatory agency may impose or perform ~~may be imposed by a regulatory agency when a determination has been made that contamination of groundwater has taken place, and are necessary~~ to address a potential or existing violation of any ~~the standards set forth in~~ Subpart D standard due to a release of one or more contaminants to groundwater.

These amendments also add "or perform" to the definition. This change accounts for Section 620.310(d) on preventive response activities, which provides that "[n]othing in this Section shall in any way limit the authority of the State or of the United States to require *or perform* any corrective action process." 35 Ill. Adm. Code 620.310(d) (emphasis added).

What conditions must be met to establish a GMZ?

IEPA proposes adding a new subsection (i) to Section 620.250, specifying ten items that must be included in all GMZ "applications": (1) facility information; (2) identification of specific units (operating or closed) present at the facility; (3) maps and engineering drawings showing the facility and the units at the facility; (4) statement of the groundwater classification or classifications at the facility; (5) identification of the chemical constituents released to the groundwater; (6) description of how groundwater will be monitored to determine the rate and the extent of the release, and if it has migrated off-site; (7) schedule for the investigation of the extent of the release; (8) results of available soil testing and groundwater monitoring associated with a release, locations and depths of samples, and monitoring well construction details with well logs; (9) the remedy; and (10) other information requested by IEPA that is necessary for its review of the GMZ application. PC 52 at 3-4.

A threshold problem with IEPA's proposed content requirements for a GMZ application is that Part 620 does not expressly require an "application" to establish a GMZ. IEPA explained that it uses Appendix D to function as the GMZ application. *See* Ex. 10 at 19-20. But, by its terms, Appendix D is a "confirmation" of "adequate corrective action" for establishing a GMZ under subsection (a)(2) of Section 620.250. Appendix D is neither an "application" nor is it technically applicable to establishing a GMZ under subsection (a)(1) of Section 620.250.

IEPA also proposes that, in addition to its ten specified items, an application must include the information required by Part I ("Facility Information"), Part II ("Release Information"), and Part III ("Remedy Selection Information") of Appendix D. PC 52 at 3. This proposed change would provide a connection in the rules between the application concept and Appendix D, but Appendix D would still not be called an "application" and, more importantly, much of the

information that Appendix D calls for is repeated in IEPA's proposed contents for applications. The overlap is confusing.

To address these concerns, the Board adds rule text that makes Appendix D (Parts I, II, and III) the GMZ "application." *See* IEPA 12/16/22 Resp. at 7; Ex. 21 at 8; Ex. 10 at 19-20. The Board amends Appendix D to have it require information from IEPA's ten specified items that is not already required by Appendix D. *See* proposed Section 620.Appendix D. In this way, no less information is required to apply, but it is all in one place. The Board also requires that the application include scaled drawings identifying the horizontal and vertical boundaries of the proposed GMZ. *See* proposed Section 620.Appendix D; IEPA 5/6/22 Resp. at 4, link to IEPA's "Establishment of Groundwater Management Zones at RCRA Facilities" (Oct. 12, 2001) at 4. In addition, the Board clarifies that the operating or closed units must be identified regardless of whether they are considered sources of groundwater contamination. *See* proposed Section 620.Appendix D; Ex. 10 at 21.

As noted, within Section 620.250, the Board addresses the GMZ application in subsection (b), following the description of what a GMZ is in subsection (a). For first notice, new subsection (b) reads in relevant part:

> b) Before a GMZ may be established, the owner or operator of a site at which there has been a release of one or more contaminants to groundwater must submit to the Agency a GMZ application. The application must contain the information specified in Section 620.Appendix D, Parts I, II, and III, as well as any other information requested in writing by the Agency that is relevant to its review under subsection (c).

And as pertinent here, the Board also changes the title of Appendix D to: "Groundwater Management Zone Application under ~~Confirmation of an Adequate Corrective Action Pursuant to~~ 35 Ill. Adm. Code 620.250(b) ~~620.250(a)(2)~~".

The Board also proposes a new subsection (b)(1) to clarify that if a GMZ would extend off-site, the GMZ application must include each affected property owner's written permission to the establishment of the GMZ on its property. This common-sense addition reflects IEPA practice. *See* IEPA 5/6/22 Resp. at 4, link to IEPA's "Establishment of Groundwater Management Zones at RCRA [Resource Conservation and Recovery Act] Facilities" (Oct. 12, 2001) at 2.[18] Part 620 already defines "off-site" and "on-site." *See* 35 Ill. Adm. Code 620.110.

In response to Board questions, IEPA confirmed that when it approves a GMZ, it issues a *written* determination to that effect. *See* Ex. 10 at 8. IEPA also confirmed that the GMZ is established *when* IEPA issues its written approval. The current rule is silent on both those questions. The Board fills these omissions at first notice. The Board also complies with Section 5-20 the Illinois Administrative Procedure Act (5 ILCS 100/5-20 (2022)) by articulating

[18] The Board directs the Clerk to add "Establishment of Groundwater Management Zones at RCRA Facilities" (Oct. 12, 2001) to this rulemaking record as a public comment. *See* 35 Ill. Adm. Code 101.1030(e).

standards for IEPA's exercise of its discretion in approving or rejecting a GMZ. The standards are drawn from core principles within the existing GMZ rules. Accordingly, the Board proposes a new subsection (c) of Section 620.250, amending the text of current subsection (b) as follows:

c) The Agency must review each GMZ application submitted under subsection (b) and issue a written determination approving or rejecting the GMZ.

1) In determining whether to approve a GMZ, the Agency must consider the completeness of the GMZ application, the technical sufficiency of the GMZ, the likelihood that the GMZ will protect public health and the environment, and the likelihood that the GMZ's corrective action will, in a timely manner, result in compliance with the applicable standards in Section 620.410, 620.420, 620.430, or 620.440 or otherwise minimize exceedances to restore beneficial use as appropriate for the class or classes of groundwater. If the Agency rejects a GMZ, the Agency must, in its written determination, specify the reasons for the rejection.

2) A GMZ ~~groundwater management zone~~ is established when the Agency issues a written determination approving ~~upon concurrence by the Agency that~~ the GMZ, including its corrective action ~~conditions as specified in subsection (a) are met and groundwater management continues for a period of time consistent with the action described in that subsection~~. Once a GMZ is established, the Agency may, as new information warrants, issue written determinations amending any part of the GMZ, including its size, the contaminants that are subject to it, and its corrective action.

In addition to cross-referencing the GMZ application under new subsection (b), this amendment clarifies the current rule's description of IEPA's approval of a GMZ. The current rule describes that approval as a "concurrence" that the "conditions as specified in subsection (a) are met" and "groundwater management continues for a period of time consistent with the action described in that subsection". Besides not specifying which "conditions" in subsection (a) must be met, this language is vague about whether groundwater management is already underway when IEPA concurs and whether the GMZ is established at some point after IEPA concurs. *See* Ex. 21 at 5. As amended, both what IEPA approves and when the GMZ goes into effect are clear.

The Board also proposes adding a sentence to this new subsection (c) that articulates what has been implicit under Part 620 but was made explicit in 1997 for GMZs established under the Site Remediation Program (SRP) (*see* 35 Ill. Adm. Code 740.530), namely, that as new information warrants, IEPA may modify the size of a GMZ, the contaminants that are the subject of a GMZ, and the GMZ's corrective action. *See* Ex. 10 at 27-28.

What if an applicable corrective action process requires more information than called for by the GMZ application or requires using a different form?

The proposed amendments to Section 620.250 and Appendix D specify the information that must be submitted to IEPA to establish a GMZ under Part 620. And Part 620 allows for the establishment of a GMZ only if IEPA issues a written approval of the GMZ, including its corrective action. But Part 620 does not itself impose a corrective action process, as the Board explained when it adopted the rules:

> [T]he instant regulations do *not* create or require any new corrective action program; all such programs are part of *other* regulations already in place or proposed (*e.g.*, RCRA, CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act], LUST [Leaking Underground Storage Tank], waterwell setback regulations, etc.). Groundwater Quality Standards (35 Ill. Adm. Code 620), R89-14(B), slip op. at 25 (Nov. 7, 1991) (emphasis in original).

An applicable corrective action process might require *more information* to establish a GMZ than what the GMZ application calls for under proposed Section 620.250(b). In that case, the proposed amendments require the owner or operator to include the additional information in its GMZ application. *See* proposed Section 620.250(b)(2); Ex. 21 at 4.

And, as proposed for first notice, a GMZ application must be in the form of Appendix D, Parts I, II, and III. Again, however, an applicable corrective action process might require a *different form*, such as a plan, an agreement, a report, or a permit application. In that case, under the proposed amendments, the owner or operator must submit the information in that form, but the submittal would still be considered a GMZ application for Part 620. *See* proposed Section 620.250(b)(3).

Finally, the Board adopted SRP (35 Ill. Adm. Code 740) in 1997, simultaneously adding subsections (d) through (f) of Section 620.250 (35 Ill. Adm. Code 620.250(d)-(f)) to distinguish GMZs established under SRP from those established under Part 620. *See* Site Remediation Program and Groundwater Quality (35 Ill. Adm. Code 740 and 35 Ill. Adm. Code 620), R97-11, slip op. at 82 (June 5, 1997); Ex. 21 at 22-23. Except for GMZs established under SRP, all GMZs are established under Part 620. *See* 35 Ill. Adm. Code 620.250. For example, IEPA establishes GMZs under Section 620.250(a)(1) at RCRA hazardous waste management sites. *See* Ex. 21 at 4, link to IEPA's "Establishment of Groundwater Management Zones at RCRA Facilities" (Oct. 12, 2001) at 1; Ex. 21 at 6, 23-24, Atts. 4, 13; *id*. at 25 (IEPA has "no intention to regulate GMZs at RCRA sites in a manner that is distinct from the Part 620 provisions.").

How and when does a GMZ end?

Only the current subsection (c) of Section 620.250 addresses how or when a GMZ ends. Subsection (c) contains three sentences. Its first sentence states that a GMZ "expires" when IEPA receives documentation confirming that "action taken pursuant to subsection (a)" has been completed and groundwater quality standards have been attained. Subsection (c) does not otherwise mention a GMZ ending. Its final two sentences describe IEPA review when elevated

concentrations of chemical constituents remain after completion of "such action." Subsection (c) reads in its entirety:

> A groundwater management zone expires upon the Agency's receipt of appropriate documentation which confirms the completion of the action taken pursuant to subsection (a) and which confirms the attainment of applicable standards as set forth in Subpart D. The Agency shall review the on-going adequacy of controls and continued management at the site if concentrations of chemical constituents, as specified in Section 620.450(a)(4)(B), remain in groundwater at the site following completion of such action. The review must take place no less often than every 5 years and the results shall be presented to the Agency in a written report. 35 Ill. Adm. Code 620.250(c).

The first sentence of this subsection (c) could be read as though the GMZ expires when IEPA *receives* the appropriate confirmatory documentation from the owner or operator. It makes no mention of a written determination of IEPA's review of that documentation. IEPA told the Board that it does issue written determinations in these situations and that the GMZ expires when IEPA issues that determination, not when IEPA receives the documentation. *See* Ex. 21 at 6, Att. 4. The Board's first-notice proposal includes language to reflect this understanding more precisely. *See* proposed Section 620.250(d)(1).

Turning to the rest of current subsection (c)'s first sentence, what are the "applicable standards as set forth in Subpart D" that have been attained? The Board asked IEPA how it interprets this phrase. IEPA maintained that the "applicable standards as set forth in Subpart D" mean the applicable Class I, Class II, Class III, or Class IV groundwater quality standards. *See* Ex. 10 at 9. Subpart D of Part 620, however, contains not only Class I, Class II, Class III, and Class IV standards, but also the "Alternative Groundwater Quality Standards" of Section 620.450. Subsection (a)(4)(B) of Section 620.450 provides that under specified circumstances, the "standard" for a released chemical constituent is the monitored concentration *exceeding* the standard for the appropriate class of groundwater. *See* 35 Ill. Adm. Code 620.450(a)(4)(B).

At first notice, the Board amends the phrase "applicable standards as set forth in Subpart D" to avoid misunderstanding. In the context of GMZ termination, the phrase means only the Class I, Class II, Class III, or Class IV standards for the appropriate class under subsection (a)(4)(A) of Section 620.450, not the exceedance concentrations under subsection (a)(4)(B) of Section 620.450. Therefore, the Board changes the phrase to read: "the applicable standards in Subpart D, as specified in Section 620.450(a)(4)(A)." *See* proposed Section 620.250(d)(1). In this situation, the first-notice rule requires the owner or operator to demonstrate that it has completed the approved corrective action, the applicable standards in Subpart D, as specified in Section 620.450(a)(4)(A), have been attained, and the groundwater within the GMZ no longer requires controls or management to mitigate impairment caused by the release. *Id.*; *see also* IEPA 3/3/23 Resp. at 2. If IEPA accepts this demonstration, IEPA must terminate the GMZ, at which point the Class I, Class II, Class III, or Class IV standards for the appropriate class apply to all released chemical constituents within the three-dimensional region formerly encompassed by the GMZ that were the subject of the GMZ. *See* proposed Sections 620.250(d)(1), 620.450(a)(2), (a)(4)(B).

The Board asked IEPA whether it interpreted the final two sentences of current subsection (c) of Section 620.250 as also involving GMZ termination—that is, where the completed corrective action does *not* achieve Class I, Class II, Class III, or Class IV groundwater quality standards. This might be viewed as a plausible interpretation, if the first sentence's mention of GMZ expiration signals that GMZs ending is the subject of the subsection. But the better reading, and the one that squares with IEPA's (PC 54 at 1), is that the GMZ does not end when the completed corrective action results in exceedance concentrations. The text supports this interpretation. Neither of the last two sentences refers to the GMZ expiring, but they do mention the "on-going" adequacy of controls and "continued" management, along with requiring reports at least every five years. And Section 620.450(a)(4)(B) specifies that, when its conditions have been met, the exceedance concentrations become the standards *after completion of the corrective action*, not after the GMZ ending.

At first notice, the Board amends the rule to remove any ambiguity—the GMZ remains in effect when the completed corrective action fails to attain Class I, Class II, Class III, or Class IV standards. *See* proposed Section 620.250(d)(2). The Board also clarifies that in this situation, the owner or operator must demonstrate compliance with Section 620.450(a)(4)(B)(i) and (ii), *i.e.*, to the extent practicable, each exceedance has been minimized and beneficial use, as appropriate for the groundwater class, has been returned, and any threat to public health or the environment has been minimized. *Id*.; *see also* PC 54 at 1-2. The owner or operator must also demonstrate the on-going adequacy of controls and management to mitigate impairment caused by the release to groundwater within the GMZ. *See* proposed Section 620.250(d)(2). If IEPA accepts this demonstration, the exceedance concentrations become the standards by operation of Section 620.450(a)(4)(B) as noted above; the Board clarifies but does not alter this fundamental concept, which has been in Part 620 since its 1991 adoption. *See* Groundwater Quality Standards (35 Ill. Adm. Code 620), R89-14(B), slip op. at 56-57 (Nov. 7, 1991). Additionally, reflecting IEPA practice, the Board specifies the timing of the "on-going adequacy" reports and reviews, and clarifies that IEPA must issue written determinations of its reviews. *See* proposed Section 620.250(e); Ex. 21 at 7.

The Board also adds language specifying that when an owner or operator has completed corrective action, regardless of whether the Class I, II, III, or IV standards were attained, the documentation submitted to IEPA must include the information required by Part IV of Appendix D, renamed the "Corrective Action Completion Certification." *See* proposed Section 620.250(d); proposed Section 620.Appendix D; Ex. 21 at 8, Att. 3. Of course, if IEPA rejects a completion demonstration from the owner or operator, IEPA must, in its written determination, specify the reasons for the rejection, which may include IEPA's basis for amending the GMZ to require additional corrective action. *See* proposed Section 620.250(d)(1), (d)(2).

Finally, the Board asked IEPA whether the rules should address GMZ termination when initiated by IEPA, such as when an owner or operator fails to perform corrective action, rather than addressing GMZ termination only when initiated by an owner or operator submittal documenting attainment Class I, Class II, Class III, or Class IV standards. IEPA believes its ability to terminate a GMZ is implied in its ability to establish one but agrees with making that explicit. *See* Ex. 21 at 5-6. The first-notice proposal identifies grounds for GMZ termination based on deficiencies by the owner or operator in carrying out the GMZ. The first-notice

proposal also states that a GMZ termination takes effect when IEPA issues a written determination specifying the grounds for termination. *See* proposed Section 620.250(f).

Which groundwater quality standards apply within a GMZ?

Based on the first-notice proposal's clarifications of when and how GMZs are established, corrective action is considered complete, and GMZs are terminated, corresponding changes are needed in Section 620.450(a), which is entitled "Groundwater Quality Restoration Standards." These changes, touched upon above, are detailed below.

Current subsection (a)(1) of Section 620.450 states that "[a]ny chemical constituent in groundwater within a groundwater management zone is subject to this Section." 35 Ill Adm. Code 620.450(a)(1). But this language fails to account for the fact that not every chemical constituent in groundwater within a GMZ is necessarily the subject of the GMZ. Nor does it account for a GMZ ever ending.

Current subsection (a)(2) of Section 620.450 states that, "[e]xcept as provided in subsections (a)(3) or (a)(4), the standards as specified in Sections 620.410, 620.420, 620.430, and 620.440 apply to any chemical constituent in groundwater within a groundwater management zone." 35 Ill Adm. Code 620.450(a)(2). At first, this seems merely like an unnecessary truism, saying that except as provided here, the Class I, Class II, Class III, and Class IV groundwater quality standards apply within a GMZ. But the text is confusing for three reasons. First, there are other exceptions to the applicability of the Class I, Class II, Class III, and Class IV standards, such as for chemical constituent concentrations present "due natural causes." *See*, *e.g.*, 35 Ill. Adm. Code 620.410(a). Second, under subsection (a)(4)(A) of Section 620.450, Class I, Class II, Class III, or Class IV standards for the appropriate class *do* apply after corrective action is complete. And third, when subsection (a)(4)(A) applies, the GMZ has been terminated. On the other hand, the GMZ is still in effect when subsections (a)(3) and (a)(4)(B) of Section 620.450(a) apply.

Amended for clarity, subsections (a)(1) and (a)(2) of Section 620.450 read as follows for first notice:

1) Subsections (a)(3) and (a)(4)(B) apply to all released ~~Any~~ chemical constituents ~~constituent~~ in groundwater within a groundwater management zone (GMZ) that are the ~~is~~ subject of the GMZ approved under Section 620.250(c)(2) ~~to this Section~~.

2) Subsection ~~Except as provided in subsections (a)(3) or~~ (a)(4)(A), ~~the standards as specified in Sections 620.410, 620.420, 620.430, and 620.440 apply~~ applies to all released ~~any~~ chemical constituents ~~constituent~~ in groundwater within a three-dimensional region formerly encompassed by a GMZ that were the subject of the GMZ approved under Section 620.250(c)(2) ~~groundwater management zone~~.

Generally, which groundwater quality standards apply, if any, depends on whether corrective action is complete and, if so, how successful that corrective action was. And, as discussed, how successful that corrective action was largely dictates whether the GMZ will be terminated or remain in effect. Subsection (a)(3) of Section 620.450 provides a primary benefit to the owner or operator from establishing a GMZ:

> 3) Prior to completion of a corrective action described in Section 620.250(a), the standards as specified in Sections 620.410, 620.420, 620.430, and 620.440 are not applicable to such released chemical constituent, provided that the initiated action proceeds in a timely and appropriate manner. 35 Ill. Adm. Code 620.450(a)(3).

Accordingly, *before* corrective action "described in Section 620.250(a)" is completed, the Class I, Class II, Class III, and Class IV standards do *not* apply to released chemical constituents within the GMZ if the "initiated action proceeds in a timely and appropriate manner." *Id*.

Above, the Board discussed rule clarifications on what constitutes completed corrective action, including requiring a written determination to that effect from IEPA. The Board also confirmed with IEPA that the phrase "initiated action proceeds in a timely and appropriate manner" should be made less subjective. *See* Ex. 10 at 27. Accordingly, for first notice, the Board amends subsection (a)(3) of Section 620.450 to clarify the circumstances under which none of the Class I, II, III, or IV standards apply:

> 3) Before the Agency issues a written determination approving the demonstration of the owner or operator under Section 620.250(d)(1) or (d)(2) ~~Prior to completion of a corrective action described in Section 620.250(a)~~, none of the standards ~~as specified~~ in Section ~~Sections~~ 620.410, 620.420, 620.430, or ~~and~~ 620.440 apply ~~are not applicable~~ to any ~~such~~ released chemical constituent if the owner or operator performs and complies with the schedule for all parts of the GMZ~~, provided that the required initiated action proceeds in a timely and appropriate manner~~.

Again, as proposed for first notice, this subsection (a)(3) applies within the GMZ before correction action is complete. *See* proposed Section 620.450(a)(1). Subsection (a)(3) therefore applies to all released chemical constituents in groundwater within a GMZ that are the subject of the GMZ approved under Section 620.250(c). *Id*.

The Board makes corresponding first-notice changes to subsection (a)(4) of Section 620.450:

> 4) After the Agency issues a written determination approving the demonstration of the owner or operator under Section 620.250(d)(1) or (d)(2) ~~completion of a corrective action as described in Section 620.250(a)~~, the standard for each ~~such~~

released chemical constituent is:

A) The standard ~~as set forth~~ in Section 620.410, 620.420, 620.430, or 620.440~~,~~ if the concentration of the constituent, as determined by groundwater monitoring, ~~of such constituent~~ is less than or equal to the standard for the appropriate class of groundwater ~~set forth~~ in one of those Sections; or

B) The concentration of the constituent, as determined by groundwater monitoring, if the ~~such~~ concentration exceeds the standard for the appropriate class of groundwater ~~set forth~~ in Section 620.410, 620.420, 620.430, or 620.440 ~~for such constituent,~~ and:

i) To the extent practicable, the exceedance ~~exceedence~~ has been minimized and beneficial use, as appropriate for the class of groundwater, has been returned; and

ii) Any threat to public health or the environment has been minimized.

As proposed for first notice, this subsection (a)(4)(A) of Section 620.450 applies where the GMZ has been *terminated* by IEPA written determination under Section 620.250(d)(1). Accordingly, subsection (a)(4)(A) applies to all released chemical constituents in groundwater within a three-dimensional region *formerly* encompassed by a GMZ that *were* the subject of the GMZ approved under Section 620.250(c). *See* proposed Section 620.450(a)(1). But subsection (a)(4)(B) of Section 620.450 applies where the GMZ *remains in effect* by IEPA written determination under Section 620.250(d)(2). Subsection (a)(4)(B) therefore applies to all released chemical constituents in groundwater *within* a GMZ that *are* the subject of the GMZ approved under Section 620.250(c). *See* proposed Section 620.450(a)(2).

What GMZ information must be published in the *Environmental Register*?

At the Board's request, IEPA agreed to adding a rule requiring IEPA to have published, at least annually, in the Board's *Environmental Register* a list of all GMZs that have not been terminated, along with a brief statement of each GMZ's status. *See* proposed Section 620.450(j); Ex. 21 at 8, Att. 3. The Board also proposes amending Section 620.450(a)(5) to require that IEPA's list of exceedance concentrations developed under Section 620.450(a)(4)(B) also identify the corresponding GMZs. To date, IEPA has not approved any exceedance concentrations under Section 620.450(a)(4)(B). *See* Ex. 10 at 27-28.

SECTION-BY-SECTION SUMMARY OF PROPOSAL

Board Findings

The following sections summarize, section-by-section, the proposed changes to Part 620. Changes which elicited comment from participants, or changes proposed by the Board, are described in detail in the above sections. Accompanying those discussions are detailed Board findings. Below, the Board proposes to adopt all the remaining changes proposed by IEPA to Part 620 at first notice and submits them for first-notice publication.

Subpart A: General

Section 620.110 Purpose

In the Statement of Reasons, IEPA describes the proposed amendments to Section 620.110 as updating and adding several definitions. First, the definition of "carcinogen" is updated to maintain consistency with the current USEPA IRIS. SR. at 6. The proposal also updates the definition of "detection" to include language currently used in test methods. *Id*. Further, the proposal adds a definition of "Chemical Abstract Service Registry Numbers or CASRN" and "mutagen". Additionally, the definitions of "lowest observable adverse effect level" and "no observable adverse effect level" are updated. The Board also proposes removing excess language from the definition of "corrective action process", and is described in detail above, at page 48.

The proposal also eliminates the definition of practical quantitation limit (PQL) and replaces it with two terms – lower limit of quantitation (LLOQ) and the lowest concentration minimum reporting level (LCMRL). SR at 6. IEPA says that this change conforms to the definition used in USEPA's publication SW-846.

Section 620.125 Incorporations by Reference

Section 620.125 contains updates and additions to the list of materials incorporated by reference in this Part. The proposal adds new test methods related to per- and polyfluoroalkyl substances (PFAS) and also updates Federal Register publication dates and Code of Federal Regulations references. Several USEPA documents and test methods are proposed additions as well.

SUBPART B: GROUNDWATER CLASSIFICATION

Section 620.210: Class I: Potable Resource Groundwater

IEPA proposes to remove "permeameter" test method that can be used to test hydraulic conductivity. SR. at 6. IEPA also proposed to include "the wellhead protection area of a community water supply well or well field" as Class I groundwater. SR at 7.

NWRA asked IEPA if it intended for all conditions of Section 620.210(a)(1-5) to be met for groundwater to be considered a potable resource groundwater. Ex. 9 at 6 . IEPA responded that the change is a drafting error and that "the final 'or' following the semi-colon after the words 'pump test' should not have been stricken." Ex. 15 at 9. IEPA says that it intended for any of the listed conditions to be Class I groundwater. *Id*. The Board includes this revision in its first-notice proposal.

IERG asked IEPA to "provide an illustration of how the addition of proposed subsection (a)(5) to Section 620.210 will be implemented." Ex. 6 1. IEPA responded that persons "conducting remedial activities must already use the Source Water Protection Area mapping tool available on the Agency's website to identify potable wells and setback zones." Ex. 11 at 3. IEPA then provided the steps a person would need to take to use the tool to identify Class I groundwater. *Id*.

IERG also asked IEPA what "additional areas, not currently defined as Class I waters, will become Class I waters as a result of the proposed change." Ex. 6 at 1. IEPA responded that Class I groundwaters will include the additional areas of those that are "immediately adjacent to community water supply wells." Ex. 11 at 3.

The Board asked IEPA whether the "in-situ tests, i.e., the slug test and pump test, can be conducted under all site conditions." Ex. 7 at 3. If not, the Board asked IEPA if it "would be appropriate to retain the use of permeameter when site conditions prevent in-situ hydraulic conductivity testing." *Id*. IEPA responded that a slug test or pump test can be run any time groundwater is present. Ex. 10 at 5.

The Board also asked IEPA "whether the Board Note under Section 620.210 should be codified as a requirement." Ex. 7 at 11. IEPA does not oppose to codifying the Board note but requests that "any such codified subsection reflect the discussion provided in the Board's Final Order, Opinion and Order of the Board R89-14(B), Page 12, which was the origin of the Board Note." Ex. 10 at 19.

Subpart C: Nondegradation Provisions for Appropriate Groundwaters

Section 620.302 Applicability of Preventative Notification and Preventative Response Activities

The proposed amendments to Section 620.302(b)(1) include additional citations to both the Board regulations and Department of Natural Resource regulations that provide examples of owners or operators of regulated entities for which groundwater quality monitoring must be performed. In its Statement of Reasons, IEPA says that the additional citations make the list of examples of persons that conduct groundwater monitoring more comprehensive. SR at 7.

Section 620.310: Preventative Response Activities

IEPA proposes to update "the table in Section 620.310(a)(3)(A)(i) to include the Chemical Abstracts Service Registry Numbers (CASRN) for each constituent" and proposed to

add "a table at Section 620.310(a)(3)(A)(ii) depicting the constituents in the subsection." SR at 8. IEPA proposed to not include "chemicals in the table that now utilize LLOQs/LCMRLs as the Class I standard because they cannot be reliably detected at lower concentrations." *Id*. Lastly, IEPA proposed to remove the Board Note. *Id*.

At the first hearing, the PFAS Regulatory Coalition asked IEPA whether a party may be required to take action to bring the PFAS levels down to 50% of the applicable numeric standard. Tr.1 at 76-77. IEPA responded that preventative response actions may be required if there is a statistically significant exceedance of the PFAS background concentration. *Id*. at 77. IEPA said that, once "those actions are taken and those actions have minimized to the extent practicable, then the value may exceed 50 percent of the applicable standard." *Id*. According to IEPA, "the purpose of this section is nondegradation. . . the goal is not to allow contamination up to the standard." *Id*.

The ACC asked IEPA how it defines background and determines statistical significance. Ex. 4 at 1. IEPA responded "the definition of background derives from the specific program requirements." Ex. 14 at 2. IEPA also responded that "statistical significance is method and program specific." *Id*.

At the first hearing, the ACC followed-up and asked IEPA if the background value is zero or could it be above zero for an anthropogenic, manmade substance. Tr. 1 at 78-79. IEPA responded that there would not be a natural background for an anthropogenic, manmade substance. *Id*. at 79. IEPA said that "on a site specific basis, a particular individual may not be responsible for meeting zero because there are other sources" and if "they can demonstrate that they are not contributing to that concentration." *Id*. The ACC also asked IEPA about statistical significance and how often to do groundwater monitoring. *Id*. at 79-80. IEPA responded that it has "incorporated the unified guidance reference into the groundwater quality standards." *Id*. at 80. IEPA said that typically, "the minimum requirement would be that you would have eight samples in order to establish background, but from that point statistical significance would be based on the statistical method that's actually employed to . . . evaluate your background and compliance." *Id*.

The Board asked IEPA whether "the reason for removing para-dichlorobenzene and ethylbenzene from the list under Section 620.310(a)(3)(A)(i) is because they were added under Section 620.310(a)(3)(A)(ii). Ex. 7 at 12. IEPA responded that it removed the two constituents because: 1) "both constituents now meet the definition of a carcinogen" and therefore their "placement in the table are no longer appropriate"; and 2) as "carcinogens with proposed health-based Class I GQS, their criteria should be based on a statistically significant increase above background for triggering a preventative response, based on proposed amendments to Section 620.310(a)(3)(A)." Ex. 10 at 23.

The Board next asked IEPA whether "all groundwater monitoring programs in the state include determination of background to determine statistically significant increases" and, if not, "whether the list under Section 620.310(a)(3)(A)(i) should be amended to include more chemical constituents to afford higher degree of protection to groundwater." Ex. 7 at 12. IEPA responded that it is "not aware of all groundwater monitoring programs at all agencies. However, every

groundwater monitoring program should require the collection of background data." Ex. 10 at 24.

Finally, the Board asked IEPA to provide a list of regulatory agencies that may make determinations as specified in Section 620.310 and "whether the rule should include a list of appropriate regulatory agencies." Ex. 7 at 12. IEPA responded that, since it "is not aware of all groundwater monitoring programs within the State[,] it is hesitant to provide a listing of appropriate regulatory agencies for fear that exclusion could be construed as rendering unincluded agencies as exempt." Ex. 10 at 24. However, IEPA said that it would not oppose including a list of example agencies. *Id*.

Subpart D: Groundwater Quality Standards

Section 620.410 Groundwater Quality Standards for Class I: Potable Resource Groundwater

IEPA proposes striking the table of inorganic chemical constituents in Section 620.410(a) and replacing it with a table that adds four constituents: aluminum, lead, lithium and molybdenum. The revised table also adds the CASRN number for each constituent and adds footnotes with citations. In the Statement of Reasons, IEPA says that it, "proposes to add footnotes detailing the basis of the groundwater quality standards – this allows users to easily identify the sources of the standards." SR at 9. The proposed table sets the Class I groundwater quality standard for aluminum at 1.9 mg/L; lead at 0.0075 mg/L; and molybdenum at 0.019 mg/L. IEPA proposes combining the standard for Radium 226 and Radium 228 into one groundwater quality standard that contains both Radium 226 + 228. IEPA says this change is necessary to maintain consistency with USEPA's standard. SR at 9. The proposed combined standard for radium is 5 pCi/L. Additionally, IEPA proposes changing the standards for nine constituents as follows:

Constituent	Current Standard (mg/L)	Proposed Standard (mg/L)
Cobalt	1.0	0.0012
Copper	0.65	0.5
Fluoride	4.0	2.0
Nickel	0.1	0.077
Perchlorate	0.0049	0.0081
Selenium	0.05	0.02
Silver	0.05	0.058
Vanadium	0.049	0.00027
Zinc	5.0	1.2

In Section 620.410(b), IEPA proposes striking a table for organic chemical constituents and replacing it with a table that adds six PFAS: PFBS, PFHxS, PFNA, PFOA, PFOS, and HFPO-DA. The following standards are set for these six constituents:

PFBS: 0.0012 mg/L
PFHxS: 0.000077 mg/L

PFNA: 0.000012 mg/L
PFOA: 0.000004 mg/L
PFOS: 0.0000077 mg/L
HFPO-DA: 0.000012 mg/L

The proposed table also adds five additional constituents and standards as follows:

Chlorobenzene: 0.l mg/L
2,4-D: 0.07 mg/L
1,4-Dioxane: 0.00078 mg/L
Ethylbenzene: 0.7 mg/L

IEPA proposes changing the standards for 34 constituents as follows:

Constituent	Current Standard (mg/L)	Proposed Standard (mg/L)
Acenaphthene	0.42	.023
Acetone	6.3	3.5
Alpha-BHC	0.00011	0.000012
Anthracene	2.1	1.2
Benzo(a)anthracene	0.00013	0.00025
Benzo(b)fluoranthene	0.00018	0.00025
Benzo(k)fluoranthene	0.00017	0.0025
Benzoic acid	28.0	15
2-Butanone	4.2	2.3
Carbon disulfide	0.7	0.38
Chrysene	0.012	0.025
Dibenzo(a,h)anthracene	0.0003	0.0001
Dicamba	0.21	0.12
Dichlorodifluoromethane	1.4	0.77
1,1-Dichloroethane	1.4	0.77
Diethyl phthalate	5.6	3.1
Di-n-butyl phthalate	0.7	0.38
1,3-Dintrobenzene	0.0007	0.001
2,4-Dinitrotoluene	0.0001	0.00025
2,6-Dinitrotoluene	0.00031	0.0001
Fluoranthene	0.28	0.15
Fluorene	0.28	0.15
HMX	1.4	0.77
Indeno(l,2,3-c,d)pyrene	0.00043	0.00025
Isopropylbenzene	0.7	0.38
MCPP	0.007	0.1
MTBE	0.07	0.038
2-Methylnaphthalene	0.028	0.15
2-Methylphenol	0.35	0.19
Naphthalene	0.14	0.077
Nitrobenzene	0.014	0.0077

Pyrene	0.21	0.12
RDX	0.084	0.062
TNT	0.014	0.0077
Trichlorofluoromethane	2.1	1.2
1,3,5-Trinitrobenzene	0.84	0.46

Additionally, footnotes with citations have been added to the table in 620.410(b). The entirety of Section 620.410(c) has been struck and the constituents in the table in (c) have been added to the table in 620.410(b). IEPA proposes incorporating 620.410(d) into 410(b) as a new subsection, 620.410(b)(1). The new table is reformatted and footnotes with citations have been added. A new Section 620.410(b)(2) has been proposed, which adds atrazine and metabolites along with a footnote and citation. IEPA argues that moving atrazine to the complex chemical mixtures is necessary as the chemical becomes a complex organic chemical mixture and is more appropriate for 620.410(c). SR at 10.

In its Statement of Reasons, IEPA says that the new chemicals have been added to the tables in Section 620.410(a) and (b) because "they have been identified in the groundwater in Illinois and may cause a hazard to human health." SR at 9. In both tables, IEPA is proposing removing the asterisks that identified constituents as carcinogens and instead include in the footnotes the identification of carcinogens, "that operate via mutagenic mode of action." *Id*. Updated methodologies for calculating the standards are noted in the footnotes, and the methodologies are found in Appendix A. "Class I potable resource groundwater standards calculated using the methods at Appendix A are based on the protection of human health when ingesting groundwater. Whether a health-based objective is called a screening level, remediation objective, or a standard, the premise is the same: it is a value intended for the protection of human health." PC 54 at 12-13.

Section 620.420 Groundwater Quality Standards for Class II: General Resource Groundwater

In its Statement of Reasons, IEPA says it is proposing to add Class II groundwater quality standards for ten new chemicals as well as two chemicals without prior class II groundwater quality standards. IEPA proposes reformatting the table in Section 620.420(a)(1) to add both lithium and molybdenum, as well as footnotes with citations. The footnotes detail the sources of the standards as well as indicate carcinogenicity of the constituents. Further, IEPA proposes changing the standard for perchlorate from 0.0049 to 0.0081 mg/L. In addition to adding lithium and molybdenum, IEPA proposes changing the standards for two constituents in 620.420(a)(1) are as follows:

Constituent	Current Standard (mg/L)	Proposed Standard (mg/L)
Fluoride	4	2
Perchlorate	0.0049	0.0081

IEPA proposes reformatting the table in Section 620.420(a)(2) and adds three constituents: aluminum, radium, and silver. Additionally, footnotes with citations have been

added to this table. In addition to adding aluminum, radium, and silver, IEPA proposes changing the standard for two constituents as follows:

Constituent	Current Standard (mg/L)	Proposed Standard (mg/L)
Copper	0.65	0.5
Selenium	0.05	0.02

The proposal reformats the table in Section 620.420(b)(1) to add six PFAS, 1-methylnapthelene, and add footnotes and citations. Further, IEPA proposes changing the standards for 35 constituents as follows:

Constituent	Current Standard (mg/L)	Proposed Standard (mg/L)
Acenaphthene	2.1	1.2
Acetone	6.3	3.5
Anthracene	10.5	6
Benzo(a)anthracene	0.00065	0.0012
Benzo(b)fluoranthene	0.0009	0.0012
Benzo(k)fluoranthene	0.006	0.012
Benzoic acid	28.0	15
2-Butanone (methyl ethyl ketone)	4.2	2.3
Carbon disulfide	3.5	1.9
Chrysene	0.06	0.12
Dibenzo(a,h)anthracene	0.0015	0.0005
Dicambra	0.21	0.12
Dichlorodifluoromethane	7.0	3.9
1,1-Dichloroethane	7.0	3.9
Dichloromethane (methylene chloride)	0.05	0.025
Diethyl phthalate	5.6	3.1
Di-*n*-butyl phthalate	3.5	1.9
2,4-Dinitrotoluene	0.0001	0.00125
2,6-Dinitrotoluene	0.00031	0.0005
1,4-Dioxane (*p*-dioxane)	0.0077	0.00078
Fluroanthene	1.4	0.75
Fluorene	1.4	0.75
HMX	1.4	3.9
Indeno(1,2,3-c,d)pyrene	0.0022	0.0012
Isopropylbenzene (cumene)	3.5	1.9
MCPP (mecoprop)	0.007	0.1
MTBE (methyl tertiary-butyl ether)	0.07	.5
2-Methylnaphthalene	0.14	0.075
2-Methylphenol (*o*-cresol)	0.35	0.19
Napthalene	0.22	0.39
Nitrobenzene	0.014	0.0077
Pyrene	1.05	0.6
TNT (2,4,6-trinitrotoluene)	0.014	0.039

Trichlorofluromethane	10.5	6
1,3,5-Trinitrobenzene	0.84	2.3

The table in Section 620.420(c) is struck and the constituents have been added to the table in Section 620.420(b)(1). Additionally, Section 620.420(d) has been incorporated into Section 620.420(c) as 620.420(c)(1). IEPA proposes adding a new subsection, 620.420(c)(2) to add atrazine and metabolites as well as a footnote and citations.

Section 620.430: Groundwater Quality Standards for Class III: Special Resource Groundwater

IEPA proposed to establish "location specific Class III groundwater quality standards for six dedicated nature preserves (DNPs), as designated pursuant Section 620.230(b)." SR. at 11. IEPA proposed to establish chloride and pH location specific Class III groundwater quality standards at four "cave" DNPs and to establish chloride location specific Class III groundwater quality standards for two "wetland" DNPs. *Id*. IEPA also proposed adding a qualifier that concentrations of chemical constituents may exceed groundwater quality standards due to natural causes. Prop. at 53.

Second, the Board asked IEPA whether, in Section 620.430(b), "'nature' preserve' should be replaced with 'dedicated nature preserve' to be consistent with Section 620.230(b)(4)" and whether "the Environmental Registers listed in Section 620.430(b)(1) should be incorporated by reference." Board Questions at 13 (No. 33). IEPA responded that the "term 'dedicated nature preserve' should be used in Section 620.430(b) to be consistent with Section 620.230(b)(4)." IEPA Resp. to Board Questions at 26 (No. 33). IEPA stated that it is not opposed to "adding the Environmental Registers listed in Section 620.430(b)(1) to the incorporations by reference, but notes that if this change is made the Environmental Registers listed in Section 620.430(b)(2) should also be added to the incorporations by reference." *Id*. The Board includes these revisions in its first-notice proposal.

Section 620.440: Groundwater Quality Standards for Class IV: Other Groundwater

IEPA proposed to "update the names of explosive constituents." SR. at 11.

The Board asked IEPA whether "the zone of attenuation under Part 816 should be included in Section 620.440(b)" and whether "the exception specified in this provision should be expanded to include unpermitted facilities." Board Questions at 13 (No. 34). IEPA responded that "Part 816 does not reference a zone of attenuation" and it "does not see a need to extend this provision to unpermitted facilities." IEPA Resp. to Board Questions at 26 (No. 34). As a follow-up at the first hearing, the Board stated that there was a typo in the Board's question and it should have asked whether Part 817 should have Been included and if Part 817 has a zone of attenuation. Tr.1 at 158. IEPA responded that "Part 817 should be added as a reference at Section 620.440(b)." IEPA Resp. to Follow-Up Questions at 47. The Board includes this revision in its first-notice proposal.

Section 620.450: Alternative Groundwater Quality Standards

Please see the earlier detailed discussion in Groundwater Management Zones for the Board's proposed changes to Section 620.450.

SUBPART E: GROUNDWATER MONITORING AND ANALYTICAL PROCEDURES

IEPA proposes amending Section 620.510(b)(1) by deleting the listed methodologies as they are incorporated by reference in Section 620.125. The amendments also add Section 620.510(b)(3) which describes the statistical methods used to determine naturally occurring groundwater quality background concentrations of contaminants. In its Statement of Reasons, IEPA says that this addition, "requires the use of the 2009 Unified Guidance to determine background groundwater quality unless other methods are specified by regulation." SR at 11-12.

SUBPART F: HEALTH ADVISORIES

Section 620.601: Purpose of a Health Advisory

IEPA proposed to update the references from 35 Ill. Adm. Code 611.114 and 611.115 to 35 Ill. Adm. Code 604.200 in order to "more thoroughly and accurately reflect the factors that must be considered when establishing a new source of public water supply." SR. at 12.

At the first hearing, the ACC asked IEPA whether it has established any health advisories. Tr.1 at 159. IEPA responded in the affirmative. *Id*. The ACC followed-up and asked IEPA how often it establishes health advisories. *Id*. at 159-169. IEPA replied that "it is a fairly rare occurrence." *Id*. at 160.

Appendix B – Procedures for Determining Hazard Indices for Class I: Potable Resource Groundwater for Mixtures of Similar-Acting Substances

IEPA proposes to delete a list of similar-acting substances in subsection (c) and refer to a new, larger list in Section 620.Appendix E.

The Board notes a grammatical error in the proposed modifications to Section (c) and proposes the following changes in double strike through and double underline:

> c) The ~~following~~ substances listed in Section 620.Appendix E ~~Section 620.410~~ are similar-acting ~~mixtures of similar acting~~ substances.~~:~~
>
> ~~1) Mixtures of ortho-Dichlorobenzene and para-Dichlorobenzene. The Hazard Index (HI) for such mixtures is determined as follows:~~
>
> ~~HI = [ortho-Dichlorobenzene]/0.6 + [para-Dichlorobenzene]/0.075~~

~~2) Mixtures of 1,1-Dichloroethylene and 1,1,1-trichloroethane. The Hazard Index (HI) for such mixtures is determined as follows:~~

~~HI = [1,1-Dichloroethylene]/0.007 + [1,1,1-trichloroethane]/0.2~~

Additionally, IEPA proposes to revise subsection (f) of Appendix B to replace PQL by LLOQ or LCMRL and adds a reference to an incorporation by reference under Section 620.125 as an alternative for guidance level for the lowest appropriate LLOQ or LCMRL.

Appendix C – Guidelines for Determining When Does Addition of Similar-Acting Substances in Class I: Potable Resource Groundwaters is Appropriate

The proposal changes "PQL" to "LLOQ" and identifies documents incorporated by reference under Section 620.125 rather than the Health Advisory Concentration as the guidance level for the lowest appropriate LLOQ or LCMRL.

Appendix E – Similar-acting Substances

The proposal adds new Appendix E which contains two new tables. Table A lists similar-acting noncarcinogenic constituents. This table is divided into sections that relate to various human organs or systems and lists constituents that affect those systems. Table B lists similar-acting carcinogenic constituents and it is also divided into sections related to human organs and systems. In the Statement of Reasons, IEPA says that the proposal adds these tables for convenient reference. SR at 17. IEPA says that adding all the constituents that have similar-acting health effects in one appendix will assist the user, "in determining if chemicals detected together in groundwater have similar-acting effects, making them subject to the mixture rule." *Id*. at 16.

ECONOMIC REASONABLENESS AND TECHNICAL FEASIBLITY

Affected Facilities

In its Statement of Reasons, IEPA listed as facilities affected by the proposed amended standards as those sources and facilities that are subject to the permitting requirements and cleanup programs. SR at 21-22.

Technical Feasibility

When promulgating substantive environmental regulations under the Act, the Board must consider the "technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution." See 415 ILCS 5/27(a) (2022). The Board must also determine "whether the proposed rule has any adverse economic impact on the people of the State of Illinois." 415 ILCS 5/27(b) (2022).

In a comment to the Board, IERG argued that "[t]he standards proposed for the PFAS constituents are needlessly stringent and will result in many detections above those levels

throughout the state, creating potential liability for numerous entities and raising questions and unnecessary concerns from the public about threats to their health." PC 51 at 1. IERG argues that "[b]ased on a comparison of the Agency's proposed PFAS standards to standards adopted in other states, it is apparent that Illinois would have some of, if not the most stringent standards for PFAS chemicals in the country." *Id*. The NWRA also argues that the proposed standards for PFAS are too strict and that "it is easy to conclude that Illinois' proposal is much more stringent than the other states – making these standards virtually impossible to meet. Further, it would be unreasonable and arbitrary for Illinois to adopt groundwater standards that are stricter than federal USEPA guidance for drinking water standards – but that is what is being proposed." PC 53 at 12.

In a comment to the Board, IEPA looked to actions taken by other states in regulating PFAS and determined that, as of January 2023, 30 states had established 52 actions related to PFAS in groundwater and/or drinking water. PC 54 at 23. "While Illinois numerical standards are low, they are not the most stringent to date. Eleven promulgated rules include concentrations lower than Illinois EPAs proposed six PFAS standards." *Id*.

Several participants in this rulemaking argue that the standards for PFAS proposed by IEPA fall below current detection methods, rendering complying with the standards unfeasible. IERG argues, "[t]he Agency's proposed groundwater standard for PFOA is below USEPA's reporting level, which suggests that such a low level cannot be reliably measured." PC 51 at 2. The PFAS Regulatory Coalition also argued, "IEPA has refused to gather or consider data on background levels of PFAS in the environment, which (as shown in the Beecher testimony) are often found to be higher than the levels of IEPA's proposed groundwater standards. Therefore, raising substantial concerns as to whether IEPA's proposed PFAS standards are even attainable." PC 55 at 3. However, IEPA demonstrated that it is technically feasible for laboratories to measure PFAS using USEPA methods.

Economic Reasonableness

The PFAS Regulatory Coalition argues that the costs associated with complying with the proposed PFAS standards are unclear. PC 55 at 1. "The other parties to the rulemaking have provided information showing that that the PFAS-related compliance costs resulting from the proposal will likely be substantial, and IEPA has not provided any persuasive reason why that information is not relevant and appropriate for the Board to consider before this rulemaking proceeds." *Id*.

The Office of the Illinois Attorney General argues that the proposed rule changes are economically reasonable given precedent. "For over 30 years and across multiple regulations, the Board has consistently decided that the economic impact of proposed groundwater quality standards does not include the financial cost of remediation necessary to comply with these standards. The cost of remediation is properly considered in separate proceedings, not when the Board is initially adopting groundwater quality standards. The Board should continue to apply this approach to the proposed rulemaking currently under consideration." PC 52 at 5.

Both the Attorney General and IEPA point to previous Board rulemakings for Part 620 to illustrate the "important distinction between the Part 620 groundwater quality standards and cleanup standards or requirements." PC 54 at 38. Part 620 sets groundwater quality standards that are then used in separate cleanup programs that implement the groundwater standards. It is within those cleanup programs where the economic impacts can be expected. "Maintaining this difference, the proposed amendments simply establish the groundwater quality standards. They do not establish clean-up standards or requirements. In addition, the proposed groundwater quality standards do not require new corrective action or monitoring programs. It is through these existing programs cleanup standards and programs in which the proposed groundwater quality standards will be implemented." *Id*.

In previous groundwater quality standards rulemakings, the Board has held that changes to the standards do not impose an unreasonable economic or technical burden. R08-18 at 27.

Board Findings

The Board finds today's amendments will not impose an economic or technical burden significantly different from that resulting from prior Part 620 rulemakings. *See* 415 ILCS 5/27(a) (2022), R08-18 at 27 (Oct. 4, 2012). The Board finds that updating the rules to protect Illinois' vital groundwater resources from PFAS and other constituents is necessary. The Board recognizes that these new standards may impose economic burdens when they are implemented under specific remediation programs; however, the Board also recognizes that the health concerns of these constituents are significant. For facilities that may be impacted by the groundwater standards, compliance and any potential remediation will be addressed under specific programs like Part 811 and 814 landfills, the Site Remediation Program and the Leaking Underground Storage Tank program. IEPA has stated that it will identify and develop amendments needed in other rules addressing specific programs after the adoption of the proposed amendments to Part 620. Additionally, where appropriate, regulatory relief mechanisms such as the adjusted standard process are available. In the end, the Board must balance economic reasonableness and technical feasibility with the protection of the environment and the health of the citizens of Illinois.

Regarding technical feasibility, the Board has found that IEPA has justified the proposed GWQS for PFAS and other constituents by providing adequate scientific bases for the toxicity values and methodologies used to derive them. Further, the Board also found that adequate sampling and analytical methods are available to measure PFAS and other standards at or below the proposed GWQS.

Thus, based on this record, the Board finds that the amendments proposed today are technically feasible and economically reasonable and will not have an adverse economic impact on the people of Illinois. *See* 415 ILCS 5/27(b) (2022).

QUESTIONS DIRECTED AT IEPA

The Board directs the hearing officer to set the deadline for IEPA response to the questions below at 30 days after the proposed rules are published in the *Illinois Register*.

Anyone may file a comment or respond to the questions directed at IEPA within the same deadline, and anyone may respond to IEPA's answers in their first notice comments. A hearing officer order will be issued following publication.

1. Does the Agency have a response to participants' concerns of potential contamination of groundwater samples resulting from well sampling instruments and equipment that may be composed of Teflon® or PFAS-containing plastics? Is there a need for additional requirements for sampling instruments and equipment? If so, please propose rule language.

2. In light of USEPA's proposed drinking water MCL for PFOS of 4 ppt, the Board invites comment from IEPA on whether the proposed PFOS GWQS should be revised to 4 ppt.

3. Please comment on the Board's proposal of setting the PFOA standard at 4 ppt, rather than 2 ppt.

4. Please comment on the use of USEPA's HBWC of 10 ppt as the basis for the Board's proposed PFNA GWQS of 12 ppt.

5. Please address the concerns raised by participants regarding the thyroid effects of PFHxS and whether the proposed standard should be based on USEPA's HBWC.

6. Please address participants' concerns as to why the proposed HFPO-DA standard of 12 ppt is higher than USEPA's HBWC of 10 ppt.

7. Please provide additional justification to support the adoption of the proposed Class II standard of 0.05 mg/L for molybdenum as related to the beneficial use for irrigation of crops and produce.

8. Please comment on whether the 2,500 feet setback zone maximum should be included as Class I groundwater under Section 620.210(a)(5).

9. It is the Board's understanding that IEPA will address impacts of the proposed PFAS GWQS to landfills and other programs in separate, future rulemakings. Can the Agency provide any details regarding its timeline on this issue?

10. The Board proposes striking the comparison of the total concentration of Atrazine plus Atrazine metabolites to the Atrazine standard of 0.003 mg/L in Section 620.410(c)(2) as the Table in subsection (c)(2) lists the applicable standards. Please comment on this change.

FILING COMMENTS ON THE BOARD'S FIRST NOTICE PROPOSAL

First-notice publication of the Board's proposal in the *Illinois Register* will start a period of at least 45 days during which any person may file a public comment with the Board,

regardless of whether the person has already filed a public comment. 5 ILCS 100/5-40(b) (2022). The Board welcomes comment on any part on its proposed amendments.

Comments must be filed electronically through the Clerk's Office On-Line (COOL) on the Board's website (https://pcb.illinois.gov). The comment should indicate the docket number for this rulemaking, R22-18. Questions about filing comments can be directed to the Clerk's Office at 312-814-3461. Public comments and all other filings with the Clerk must be served on the hearing officer and on those persons on the Service List for this rulemaking. The current version of the Service List for R22-18 is available on COOL.

CONCLUSION

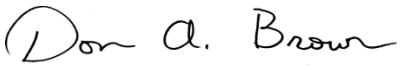
The Board proposes to revise its groundwater quality rules by adopting amendments to Part 620 to ensure that Illinois' groundwater quality standards match current scientific data and methodologies for groundwater quality. The proposed amendments appear in an addendum to this order. Publishing the proposed rules in the Illinois Register will start a period of at least 45 days during which any person may file public comments with the Board's Clerk.

ORDER

The Board directs the Clerk to file the first-notice proposal with the Secretary of State for publication in the *Illinois Register*.

IT IS SO ORDERED.

I, Don A. Brown, Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on March 7, 2024, by a vote of 4-0.



Don A. Brown, Clerk
Illinois Pollution Control Board