ILLINOIS POLLUTION CONTROL BOARD
December 15, 2005

IN THE MATTER OF:	)	
	)	
REVISIONS TO RADIUM WATER QUALITY	)	R04-21
STANDARDS: PROPOSED NEW 35 ILL. ADM.	)	(Rulemaking – Water)
CODE 302.307 and AMENDMENTS TO	)	
35 ILL. ADM. CODE 302.207 and 302.525	)	

Proposed Rule. Second Notice.

OPINION AND ORDER OF THE BOARD (by N.J. Melas):

Today the Board proposes revisions to the general use water quality standard for radium based on new facts and public comments the Board has received since the 2005 second first-notice publication. At first notice in 2004, the Board adopted the proposal filed by the Illinois Environmental Protection Agency (Agency). At second first notice in 2005, the Board proposed a general use water quality standard of 3.75 picocuries per liter (pCi/L) radium 226 and 228 combined (combined radium) applicable to all general use waters of the State. In addition, the Board proposed a general use water quality standard of 30 pCi/L combined radium applicable to waters receiving discharge from publicly owned treatment works (POTWs). The 30 pCi/L standard applied from the point of discharge to one mile downstream of the discharge outfall and was incorporated as a new Section 302.207(d).

The Board adopts the proposed rule for second-notice review by the Joint Committee on Administrative Rules (JCAR) pursuant to the Illinois Administrative Procedure Act (5 ILCS 100/1-1 *et seq.*). The Board received 13 public comments subsequent to the 2005 first-notice publication, and the proposal adopted here is substantively changed from that adopted in the 2005 first notice opinion and order in light of those comments. Today the Board amends the general use water quality standard for combined radium 226 and 228 adopted for the 2005 first notice. The Board retains the standard of 3.75 pCi/L combined radium 226 and 228, but sets the standard as an annual average value, rather than an instantaneous maximum standard.

The Board finds that the changes to the Board's 2005 first-notice proposal adopted today are warranted. The comments received during the 2005 first-notice period clearly indicate a need for further amendments to this section. The record consistently demonstrates a need to maintain a general use water quality standard, protective both of human health and the environment. The Board invited and received comments on the new Section 302.207(d) proposed the 2005 first notice. The additional data and comments received enhanced the record with respect to actual levels of combined radium contained in water before and after treatment by Northern Illinois publicly owned treatment works. The Board finds that based on the record, today's proposal meets the Board's stated objectives while also tailoring the general use water quality standard for radium to the nature of radionuclides in Illinois ecosystems.

In this opinion, the Board provides the procedural history of this rulemaking, an overview of the public comments received, and a discussion of the second-notice proposal.

OVERVIEW OF THE PROPOSED CHANGES IN RADIUM WATER QUALITY STANDARDS FOR SECOND NOTICE

The Board modifies the general use water quality standard for combined radium 226 and 228 adopted for the 2005 first notice. The Board retains the standard of 3.75 pCi/L combined radium 226 and 228, but sets the standard as an annual average value, rather than an instantaneous maximum standard, as proposed for the 2005 first notice. This standard, as before, applies to all general use waters of the State, including stream segments that receive discharge from POTWs, as well as the Lake Michigan Basin. In addition, today's proposal eliminates the separate water quality standard of 30 pCi/L adopted at second first notice for stream segments that receive discharge from POTWs. Finally, the Board adopts a 5pCi/L combined radium 226 and 228 standard for Public and Food Processing Water Supplies as an instantaneous maximum standard for public and food processing water supply intakes.

The Board finds that today's proposal for second notice more precisely achieves the Agency's goal of relieving a regulatory burden for many existing POTWs that may not comply with the existing general use radium water quality standards while remaining protective of the most sensitive designated use of the State's waters. Dischargers such as POTWs will benefit because compliance with the proposed standard is based on a long-term average.

PROCEDURAL HISTORY

On January 13, 2004, the Agency filed a proposal to amend Part 302 of the Board's water quality standards.[1] The Agency proposed to change the general use and Lake Michigan water quality standards for radium from 1 pCi/L radium 226 to 5 pCi/L combined radium 226 and 228 and apply the proposed standards specifically to surface waters used for public and food processing water supplies. According to the Agency, these changes would make the radium water quality standards consistent with the federal finished water maximum contaminant level (MCL) and ensure the protection of surface water intakes for raw drinking water in the State. The Agency argued the proposed changes would also relieve a regulatory burden for many existing POTWs that receive, treat, and discharge wastewater from public water supplies that remove radium from high radium groundwater.

The Board accepted this proposal for hearing on January 22, 2004. The Board has held five days of hearings before the Board hearing officer, members, and staff. The first hearing was held on April 1, 2004, at the James R. Thompson Center in Chicago.[2] The second hearing was

[1] The Agency's Statement of Reasons included in the rulemaking proposal will be cited as "Statement at _."

[2] The transcript of the first hearing will be cited as "Tr.1 at _."

held on May 6, 2004, at the Board's offices in Springfield.[3] Both hearings allowed the proponent and any other interested party the opportunity to present testimony on the merits and economic impact of the rulemaking proposal.

On June 2, 2004, WRT Environmental (Illinois), L.L.C. (WRT Environmental) moved the Board for an additional merit hearing. On July 8, 2004, the Board adopted the Agency's proposal for publication of first notice in the *Illinois Register*, but noted by hearing officer order that the Board would grant WRT Environmental's motion for a third hearing. First notice was published in the *Illinois Register* on August 6, 2004. 28 Ill. Reg. 32, pg. 10887, *eff*. Aug. 6, 2004. First-notice publication in the *Illinois Register* began a public comment period for interested persons to file comments with the Board. The Board granted the motion and held a third hearing on August 25, 2004, in Springfield.[4] The Board gave notice of hearings a fourth time and they continued on October 21 and 22, 2004, in Chicago.[5]

On April 7, 2005, the Board adopted the proposal, with modifications, for publication of the 2005 first notice in the *Illinois Register*. The 2005 first notice was published in the *Illinois Register* on April 11, 2005. 29 Ill. Reg. 17, pg. 5782, *eff.* Apr. 11, 2005. Second first-notice publication began another 45-day public comment period. On May 13, 2005, the City of Joliet (Joliet) moved the Board to extend the public comment period through August 15, 2005. The Board granted the motion and extended the comment period as requested.

The Board received 12 additional public comments during the second first-notice comment period. After the close of public comment, WRT Environmental moved the Board for leave to file a supplemental public comment, accompanied by the supplemental public comment. The Board grants WRT Environmental's motion and accepts the supplemental public comment.

Summary of Public Comments

The Board received 13 additional comments subsequent to second first-notice publication, for a total of 52 public comments in this proceeding. The additional comments consist primarily of those that oppose the Board's second first-notice proposal and those that support the proposed standard of 3.75 pCi/L combined radium, but oppose the separate 30 pCi/L standard up to one-mile below POTW discharges.

Those that submitted comments opposing the Board's proposal include the directors of Citizens Against Ruining the Environment (CARE) (PC 40, 42, and 43), the City of Joliet (Joliet) (PC 46), and the Fox River Reclamation District (PC 51). The following commenters reject the proposed Section 302.207(d) and offer support for the 3.75 pCi/L standard, however, propose that compliance be measured as a long-term average: the United States Environmental

[3] The transcript of the second hearing will be cited as "Tr.2 at _."

[4] The transcript of the third hearing will be cited as "Tr.3 at _."

[5] The transcript of the fourth hearing will be cited as "Tr.4 at _."

Protection Agency (USEPA) (PC 41), the Sierra Club and the Environmental Law and Policy Center (Envrionmental Groups) (PC 44), WRT Environmental (PC 48), and the Illinois Environmental Protection Agency (PC 50).

2005 FIRST NOTICE COMMENTS

During the 2005 first notice comment period, the participants in this rulemaking discussed both the 3.75 pCi/L general use water quality standard as well as the 30 pCi/L standard for streams receiving discharge from POTWs that the Board adopted at the 2005 first notice. A review of the public comments reveals that a majority of the participants supported the general use standard and the most disagreement arose over the separate standard provided for POTWs. Below the Board discusses the comments and provides reasons for today's divergence from the 2005 proposed rule adopted for first notice. Because the Agency is the proponent of this rulemaking, the Board will discuss the Agency's 2005 first-notice comment separately below.

Opposition to the Proposed Section 302.207(d)

In its public comment, the USEPA expressed concern that the proposal did not adequately demonstrate that 30 pCi/L within a one-mile mixing zone would provide a level of protection consistent with the 3.75 pCi/L value, nor any other independent level of protection for the designated use. The USEPA also states it is not clear how the proposed 30 pCi/L standard would be implemented to protect possible downstream public water supply intakes.

In its public comment, CARE strongly objects to the addition of Section 302.207(d) of the Board's 2005 proposal. PC 45. CARE states that proposed Section 302.207(d) is premature and will be until 2009. Non-compliant public water suppliers have until 2007 to come into compliance with the Federal drinking water standards. According to CARE, by the end of 2008, many of the problems anticipated by the Board's proposed Section 302.207(d) may be resolved. Therefore, CARE advises that the Board abstain from establishing a rule like 302.207(d) until public water supplies achieve compliance since many of the techniques they employ may eliminate or substantially reduce the amount of radium in wastewater.

CARE also states that the proposed Section 302.207(d) establishes a "de facto" mixing zone without having followed the well-developed regulatory approach the Agency must follow in reviewing mixing zones. CARE contends that an approach that allows for regulatory flexibility under specific circumstances as judged on a case-by-case basis is "far preferable than the categorical, 'carte blanche' for POTWs contained in proposed rule 302.207(d)."

Joliet commented that the Board ignored the recommendation of the Division of Nuclear Safety (DNS), and instead "gave great weight to the testimony provided by Water Remediation Technology." The Board's proposal, however, does not directly follow either party's proposal. The standard proposed by the DNS was a standard applied to cleanups of spills containing radium. A general use water quality standard must take into consideration the exposure of the most sensitive use of the water body to the radium levels over a lifetime. In particular, the Board's standard reflects the effects of radium on the reproductive cycles of aquatic wildlife.

On this point, Joliet states that it is unlikely that sensitive species live in the receiving streams of plants that are expected to violate the proposed standard. PC 46 at 5. For example, Joliet states that Don Blancher, PhD of Toxicological and Environmental Associates, Inc. opined that low flow streams represent poor or unsuitable habitat for species like muskrat and the length of time for exposure in these areas would be minimal. *Id*. Dr. Blancher based his determination on the U.S. Fish and Wildlife Services Habitat Suitability Index Model for muskrat which indicates that muskrat habitat is in streams with flow rates of 0.4 c.f.s. to 30 c.f.s. in waters with depth greater than 18 inches.

Joliet argues that because no sensitive species live downstream of impacted treatment plants in Illinois, there is no reason to establish such a restrictive standard. For this reason, Joliet concludes that the standard of 60 pCi/L radium, proposed by the Illinois Emergency Management Agency, DNS, is appropriate. Joliet also supports the DNS suggestion to apply a safety factor of 2.0 for a water quality standard of 30 pCi/L combined radium.

Joliet contends the Board's proposal for the 2005 first notice does not consider other radium discharges in Illinois that do not originate from wastewater treatment plants. In the way of examples, Joliet provides sources such as deep wells used for irrigation of golf courses and agriculture, deep wells used during testing, and fire hydrants. PC 46 at 4. However, Joliet did not provide any specific examples or levels of radium contained by such releases.

WRT Environmental agrees with the USEPA's comment that the proposed Section 302.207(d) provides no level of protection consistent with the designated use. Further, WRT Environmental contends that the proposed standard of Section 302.207(d) is not "'based on sound scientific rationale,' as required by the [Clean Water Act] CWA." PC 48 at 10; citing 40 C.F.R. 131.11(a)(1). WRT Environmental concludes that the "one-mile exemption zone" is contrary to federal and state law and unsupported by the record. WRT Environmental urges the Board to delete the proposed Section 302.207(d).

The Radium Water Quality Standard Expressed as a Long-Term Average

The USEPA recommends that the Board express the proposed standard as an average value over some period of time to reflect long-term exposure, rather than an instantaneous value. As an example, the USEPA refers to its Great Lakes Water Quality Guidance (40 C.F.R. 132), which recommends that waste load allocations based on wildlife standard be calculated using the 90-day, 10-year low flow as the design flow. The USEPA continues that if the Board takes this approach, it should also implement a 5 pCi/L Public and Food Processing Water Supply standard as an instantaneous maximum standard to ensure that public water supplies meet the Federal drinking water maximum contaminant level for radium.

The Environmental Groups agree with the USEPA's argument that an average value radium standard is consistent with the goal not to exceed the biota dose limit of 0.1 rad/day for riparian animals. PC 44 at 4. Nonetheless, the environmental groups emphasize that if such an approach is taken, it is even more important to monitor in-stream sediment outside of that zone.

Joliet also does not object to the use of an annual average, and states in fact, that the use of the annual average would reduce the number of plants with potential violations from nine plants to between two and six.

Whether Consideration of Economic Factors Was Proper

According to the environmental groups, economic factors should not be considered in setting general use water quality standards, and even considering economic factors, there is no evidence it would be costly to comply with the combined 3.75 pCi/L standard anywhere.

The environmental groups state that economic factors should not be taken into account in setting the numeric standards that are protective of uses. The appropriate considerations are whether the designated uses are "based on a sound scientific rationale" and protect the "most sensitive use." PC 44 at 2; citing 40 C.F.R. 131.11(a); People v. PCB, 103 Ill. 2d 441, 469 N.E. 2d 1102, 1108 (Ill. 1984). On the other hand, state the environmental groups, economic factors are irrelevant to setting such criteria. PC 44 at 2; citing Mississippi Commission on Natural Resources v. Costle, 625 F.2d 1269, 1277 (5th Cir. 1980).

The environmental groups further state that the hearing record contains no testimony showing that the 3.75 pCi/L standard would be costly for any discharger. PC 44 at 3. The environmental groups state that new post-hearing data submitted by Joliet indicates that in-stream levels of combined radium were less than 1.5 pCi/L at all locations tested. The data also showed, state the environmental groups, that almost all of the communities would meet the 3.75 pCi/L standard with a standard mixing zone. The environmental groups conclude that even if it was considered, there is no substantial economic reason for the proposed Section 302.207(d). *Id*.

Sediment Monitoring

The Environmental Groups support the Board's reliance on the Department of Energy (DOE) technical standard[6] as guidance to establish a water quality standard for combined radium applicable to general use waters and the Lake Michigan Basin. PC 44 at 3. However, the environmental groups note that the proposed standard of 3.75 pCi/L does not consider the contribution of radium from stream sediment. *Id*. Therefore, the environmental groups recommend that the Board include in the rule a requirement that the Agency must include in POTW permits a requirement to monitor stream sediment at a point outside of the mixing zone. The environmental groups state that monitoring would ensure that radium particles were not building up in the sediment and exceeding the biota dose limit of 0.1 rad/day. *Id*.

CARE also advocates a comprehensive review by the Agency of the adequacy of Illinois' regulations concerning radium that originates in drinking water. PC 43 at 4. It is inadvisable,

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[6] *See* Hearing Exhibit 15, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota (DOE-STD-1 153-2002)," for Use in DOE Compliance and Risk Assessment Activities, U.S. Department of Energy, Domotor, Stephen, July 2002.

according to CARE, to consider the water quality issue in isolation without also considering related issues such as the land application of POTW biosolids that contain radium. *Id*.

New Data Submitted by the City of Joliet

Joliet identified fourteen treatment plants as having potential problems complying with the proposed standards. Joliet collected wastewater plant data from eleven of those plants, seven of which would violate an instantaneously applicable standard of 3.75 pCi/L combined radium. The data does not demonstrate the actual radium levels one mile downstream of the POTWs' discharge.

WRT Environmental interprets Joliet's data to reveal that most communities can meet the 3.75 pCi/L standard even before applying averaging factors for grab and composite sampling, or before mixing in the receiving stream. PC at 4; citing 35 Ill. Adm. Code 304.104; PC 46, Att. 1. The Environmental Groups state they could not comment on dischargers from communities A and B because of the lack of information regarding the nature of the receiving water bodies and uncertainty with the Monmouth data. PC 44 at 3. Like Joliet, the environmental groups state that the data suggests that the rest of the dischargers would be able to meet the 3.75 pCi/L standard with a standard mixing zone, if needed. According to the environmental groups, the new data further suggests that there is no substantial economic reason for the special pCi/L mixing zone included in the Board's proposal. *Id.*

Radioactive Water Treatment Residuals

WRT Environmental states that it supports the proposed 3.75 pCi/L combined standard, yet urges the Board to open an inquiry docket or present a warning comment on the amended rule to address the issue of residual solids or sludge. PC 48 at 12. WRT Environmental takes the position that the sludge issue is not only a part, but "the major issue in this proceeding." PC at 48.

By repealing the 1 pCi/L radium 226 limit, WRT Environmental contends the Board should not simultaneously "open the door for the disposal into waterways of sludge that was previously illegal and regulated." PC 48 at 17. To prevent this, WRT Environmental proposes that the Board insert a warning comment into its rules referring to a USEPA guidance manual regarding the management of radionuclide residuals from drinking water treatment technologies, or alternatively, initiate hearings on the adequacy of existing regulations for radionuclides.

Because the proposed rulemaking fails to address the re-introduction of radioactive residuals into the environment following treatment, WRT Environmental claims the rulemaking violates applicable Illinois environmental law, such as the Illinois Pollution Prevention Act, the Illinois Groundwater Protection Act, the Illinois Low Level Radioactive Waste Management Act, the Illinois Endangered Species Act, and the Environmental Protection Act. PC 48 at 19.

In summary, WRT Environmental reiterates its support for the As Low As Reasonably Achievable (ALARA) standard. WRT continues that the ALARA philosophy would not include

the proposed Section 302.207(d), or allowing an unnecessary risk of radium exposure to POTW workers.

The Agency's Public Comment (PC 50)

The Agency prefers its original January 2004 proposal and disagrees with the Board's reliance on certain technical documents incorporated into the record and cited in the Board's 2005 first-notice opinion and order. However, in its 2005 first-notice public comment, the Agency offers suggestions on "the best way to achieve [the Board's] goals within the framework established in its April 2005 Opinion and Order and the requirements of the Clean Water Act." PC 50 at 3.

As discussed below, the Agency favors the USEPA's recommendation of using long-term averaging for the radium general use water quality standard and suggests how it may implement such a standard. The Agency states that using "long term flow values in developing mixing zones would more closely achieve the Board's stated goals." PC 50 at 6.

Consistent With Board Regulations

The Agency suggests the Board should regulate radium based on an annual average concentration of radium present in the water body due to the nature of radium. The Agency states that, for example, in Subtitle E of the Board's regulations (35 Ill. Adm. Code 501-580), bioaccumulative substances such as PCBs or DDT are regulated based on concentrations present during 90Q10 or higher stream flow conditions. PC 50 at 7. The Agency explains that 90Q10 is the average minimum 90 day low flow that is predicted to occur once every 10 years. The Agency states that using this approach, discharged concentrations of the regulated substance will be diluted much of the time due to a water body having a higher than 90Q10 flow. *Id*. Therefore, the Agency states the concentration of substances remains acceptably low and wildlife species are protected. *Id*.

The Agency provides two additional examples where the Board uses a flow value other than 7Q10: (1) harmonic mean flow values used for the Human Nonthreshold Criterion of the Board's water quality standards; and (2) an annual average used in the Human Health Standard used for mercury and benzene. PC 50 at 8. Radium is different because it affects wildlife through simple exposure, rather than bioaccumulation. For this reason, argues the Agency, it is more appropriate to regulate radium based on long-term averaging, rather than an instantaneous standard. For all of these reasons, the Agency recommends that the Board adopt a General Use and Lake Michigan Basin radium water quality standard of 3.75 pCi/L combined radium based on an annual average concentration in the water body. PC 50 at 8-9.

Consistent With the Record

The Agency asserts this recommendation is consistent with the use of the biota dose assessment of the DOE model. This document models the reproductive effects of radium on riparian mammals that occur over a lifetime of exposure to radium concentrations in the

environment. PC at 9. The Agency states that the exposure period used in the DOE model is consistent with the Agency's annual average exposure period recommendation. PC 50 at 9.

Protective of Drinking Water Intakes

The Agency asserts that the Board has "removed the use of a Public and Food Processing Water Supply standard matching the U.S. EPA's MCL for radium in drinking water." PC 50 at 10. The Agency recommends that the 5 pCi/L drinking water standard should remain an instantaneously applied standard applicable to drinking water intakes at all times. *Id*. While it is not aware of any present or potential situations where an upstream discharge would cause a Public and Food Processing Water Supply surface water intake to exceed 5 pCi/L, the Agency agrees that the standard should be adopted as a safeguard. *Id*.

Relief For POTWs

The Agency concludes that of the impacted POTWs, many or most would have difficulty complying with the instantaneously applied combined standard of 3.75 pCi/L, even one mile below their discharge point as those standards are currently implemented. PC 50 at 11. However, the Agency concludes from the data submitted by Joliet that the 3.75 pCi/L standard based on long term averaging will likely provide relief to many of the impacted dischargers in a way that is protective of the most sensitive uses of all waters of the State of Illinois. PC 50 at 12. Further, as evidenced by the Agency's proposed regulatory language, the Agency recommends that the Board allow mixing in low flow streams that receive radium discharge to provide relief to a few POTWs that discharge to such streams. PC 50 at 12.

The Agency's (PC 50) Proposed Regulatory Language

Section 302.207 Radioactivity

a) Gross beta (STORET number 03501) concentration shall not exceed 100 picocuries per liter (pCi/L).

b) ~~Concentrations of radium 226 (STORET number 09501) and s~~Strontium 90 (STORET number 13501) concentration must not exceed ~~1 and~~ 2 picocuries per liter (pCi/L) ~~respectively~~.

c) The annual average radium 226 and radium 228 (STORET number 11503) combined concentration must not exceed 3.75 picocuries per liter (pCi/L).

1) For purpose of this subsection, the requirement of Section 302.102(b)(8) of this Part that mixing is not allowed in receiving waters which have a zero minimum seven day low flow which occurs once every ten years does not apply; and

2) Mixing zones for radium dischargers may be calculated using the annual average stream flow present at the point of discharge.

SUBPART C: PUBLIC AND FOOD PROCESSING WATER SUPPLY STANDARDS

Section 302.307 Radium 226 and 228

Radium 226 and 228 (STORET number 11503) combined concentration must not exceed 5 picocuries per liter (pCi/L) at any time.

SUBPART E: LAKE MICHIGAN BASIN WATER QUALITY STANDARDS

Section 302.525 Radioactivity

Except as provided in Section 302.102, all waters of the Lake Michigan Basin must meet the following concentrations ~~in any sample~~:

a) Gross beta (STORET number 0351) concentrations must not exceed 100 picocuries per liter (pCi/L).

b) ~~Concentrations of radium 226 (STORET number 09501) and s~~Strontium 90 (STORET number 13501) concentration shall not exceed ~~1 and~~ 2 picocuries per liter (pCi/L) ~~respectively~~.

c) The annual average radium 226 and 228 (STORET number 11503) combined concentration must not exceed 3.75 picocuries per liter (pCi/L).

DISCUSSION OF SECOND-NOTICE PROPOSAL

Below the Board analyzes the participants' recommendations and other issues raised in public comments. The Board will also discuss the second-notice changes and give reasons for the changes.

The parties generally agree that evidence exists demonstrating that a general use water quality standard for radium 226 and 228 combined must be retained to afford protection to most sensitive use of Illinois waters, the protection of riparian mammals. The parties, excluding the Agency, also generally agree that the DOE technical standard provides the necessary guidance to establish a water quality standard for combined radium applicable to general use waters and the Lake Michigan basin. CARE and the Fox River Reclamation District both oppose the 3.75 pCi/L combined radium standard that the Board adopted for second first-notice, CARE finding the standard too "weak," and Fox River Reclamation District supporting no general use standard at all.

The Board disagrees with Joliet's comment that the USEPA in "their June 10, 2005 letter to the Hearing Officer makes it clear that the proposed rule will not be approved by the USEPA." PC 46. In fact, the USEPA, in an *informal* review of the rule, stated it "does not anticipate disapproval of the General Use standard of 3.75 pCi/L." PC 41. After considering all of the

comments, the Board retains the 3.75 pCi/L combined radium limit as a general use water quality standard for second-notice.

The Board does not agree that treatment residuals should be addressed in this rulemaking. This rule only amends Part 302 of the Board's water quality rules and cannot open a new part at this late date in the proceeding.

Consideration of Economic Factors

Several of the public comments stated that economic factors should not be taken into account in setting the numeric standards that are protective of designated uses. *See e.g.* PC 44 at 2; PC 48 at 8. However, the Board is required by statute to consider economic impacts of each rulemaking it considers.

Under Section 13 of the Act, the Board is granted rulemaking authority to establish water quality standards. 415 ILCS 5/13(a)(1) (2004); *see* Granite City Steel Co., *et al* v. PCB, 155 Ill. 2d 149, 613 N.E.2d 719 (1993). In promulgating those regulations, the Board is governed by Section 27 of the Act. 415 ILCS 5/27 (2004). For example, Section 27(a) provides "the Board shall take into account the . . . technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution." *Id*. Section 27(b)(1) requires the Department of Commerce and Community Affairs (now the Department of Commerce and Economic Opportunity) to conduct a study of the economic impact of the proposed rules, and subpart (b)(2) of that section requires the Board to "conduct at least one hearing on the economic impact of those new rules." 415 ILCS 5/27(b)(1), (2) (2004). Finally, the Board must "in its written opinion, make a determination, based upon the evidence in the public hearing record, including but not limited to the economic impact study, as to whether the proposed rule has any adverse economic impact on the people of the State of Illinois." 415 ILCS 5/27(b)(2) (2004).

Economic impact relates to the impact on the community. *See* Citizens' Utilities Co. v. PCB, 152 Ill. App. 3d 122, 504 N.E.2d 224 (1987). Therefore, as required by statute, the Board properly considered the potential economic impacts the proposed rule would have on POTWs, as well as the economic impact when costs of compliance for POTWs are filtered down to citizens in the form of increased rates.

Further, support for a general use water quality limit of 30 pCi/L, that the Board proposed in Section 302.207(d), was not based solely on economic factors. In fact, as stated in the Board's April 7, 2005 opinion and order, "this limit is based on IEMA's recommendation of using the NRC limit and Joliet's suggestion of applying a factor of safety of 2." The Illinois Emergency Management Agency (IEMA) adopted the U.S. Nuclear Regulatory Commission's effluent concentration limit for radium; a standard that relates directly to radiation dose for humans. 32 Ill. Adm. Code 340, Appendix B, Table 2. The effluent concentration limit for radium in water is 60 pCi/L combined radium, which if ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 millirem. PC 24. At IEMA's suggestion, the Board applied a factor of safety of two to arrive at the 30 pCi/L combined radium water quality limit. Nonetheless, the Board explicitly invited comments from the participants on this provision, which the Board analyzes in the following paragraphs.

Radium General Use Water Quality Standard Expressed as a Long-Term Average

As discussed at the 2005 first notice, the 3.75 pCi/L limit is based on the DOE technical standard that meets the biota dose limit of 0.1 rad/d for riparian animals. Based on the evidence in the record, the Board finds this general use standard will be protective of human health and the environment, including aquatic life and riparian mammals, and ensure that high levels of radium cannot be discharged into Illinois waterways.

In today's proposal, the Board expresses that limit as an average measured over the length of a year. Therefore, while the concentration of radium 226 and 228 combined may be higher than 3.75 pCi/L at times due to environmental conditions, the water body will still meet the standard as long as the concentration averaged over the period of a year remains at or below 3.75 pCi/L. Determining compliance in this way will provide relief to POTWs while more precisely tailoring the standard to meet the Board's goal of protecting riparian mammals.

The DOE technical document supports considering temporal variability of contamination in the environment when evaluating doses to biota. Exh. 15, M2-27. The DOE document explains that radionuclide concentrations in surface water, compared to concentrations in sediments or surface soil, can change relatively rapidly. Exh. 15, M2-28. Further, site-specific conditions such as storm water flows or seasonal occurrences like high flow conditions may produce wide variations of exposure to receptors. *Id*.

The DOE document provides reasons why it is appropriate to use time averaging in applying the daily dose limits for biota. Exh. 15, M2-28. First, daily dose limits are intended to protect whole populations of a species, rather than individuals, where a primary concern is the effect of contaminants on reproductive capability over the normal reproductive lifetime. *Id*. Second, the studies used as bases for the daily dose limits were obtained primarily from studies involving chronic exposure, where the average dose rate in the population varied substantially, over exposure times ranging from several months to several years. *Id*.

Third, single acute doses, even doses 10-30 times higher than the daily dose limit, appeared tolerable, based on studies involving short-term exposures, so long as the recovery time between doses was sufficiently long (30-60 days), and the daily dose rate was limited in accordance with the standards. Exh. 15, M2-29. Fourth, the average doses were the primary bases for the DOE document's conclusions regarding early mortality and the impairment of reproductive capability. *Id*. According to the DOE document, the dose limits were not intended as limits on each day of exposure, but rather, as limits on the average dose rates encountered from conception through reproductive age. For these reasons, the DOE document suggests that "averaging times as long as one year may be appropriate for reproducing members of populations of the most radiosensitive organisms." Exh. 15, M2-29. Fifth, radioecological studies[7] demonstrate that radiation effects are observed at the population and community level only for annual doses greater than about 400 rad or 1 rad/day. *Id*.

[7] The DOE document provides that these were studies done at highly contaminated sites in the former Soviet Union (Polikarpov 1994). Exh. 15, M2-29.

Therefore, based on the record, the Board also finds the long-term averaging approach appropriate given the nature of radium as well as the bases used for establishing the method for determining the daily dose limit. Radium does affect wildlife through simple exposure, yet the primary concern regarding exposure is the chronic effects of radium that result from bioconcentration and bioaccumulation such as cancer and reproductive and developmental effects. Thus, the Board finds that a combined radium standard, expressed as a limit on the annual average of daily dose rates encountered from conception through reproductive age, will adequately protect the most sensitive designated use of Illinois water bodies. The 3.75 pCi/L combined radium standard does not include any contributions of radium from sediment because the record does not contain any data supporting or refuting the contribution of radium from stream sediments in Illinois waters.

Additionally, the new data submitted by Joliet regarding Northern Illinois POTWs indicates that expressing the general use water quality limit as a long-term average will provide relief for a majority of the affected POTWs. According to Joliet, the use of the annual average would reduce the number of plants with potential violations to between two and six. PC 46 at 3.

Today's proposal does not incorporate the Agency's suggestion of allowing for mixing even if the stream has a zero 7Q10 flow. The Agency does not support this portion of its proposal with evidence contained in the record, stating only that allowing mixing zones in dischargers' permits would provide relief for POTWs. The Board finds that the proposed water quality standard expressed as an annual average provides relief for the majority of POTWs, while also protecting the most sensitive use of general use waters. Any dischargers that cannot comply may seek an adjusted standard or other relief from the Board upon making the proper showing.

In today's proposal, the Board eliminates the 30 pCi/L water quality standard applicable up to one-mile downstream of POTW discharges. Simultaneously, the Board expresses the 3.75 pCi/L standard as an annual average concentration of combined radium rather than as an instantaneous standard.

Public and Food Processing Water Supply Standard

As suggested by the USEPA and the Agency, today the Board also adopts a Public and Food Processing Water Supply standard of 5 pCi/L combined radium 226 and 228 to ensure that public water supplies meet the Federal drinking water maximum contaminant level for radium. Since the proposed general use standard is based on a long-term average concentration, an instantaneous surface water intake standard will ensure protection from upstream discharges that could cause a Public and Food Processing Water Supply to exceed 5 pCi/L.

CONCLUSION

To protect all designated uses of Illinois waters, the Board retains the 3.75 pCi/L combined radium 226 and 228 standard applicable to general use waters and the Lake Michigan Basin proposed in 2005. Today's proposal, however, diverges from the Board's 2005 proposal

in that compliance with the standard is determined by the annual average of combined radium concentrations. The proposal applies a 5.0 pCi/L standard to Public and Food Processing Water Supply intakes as an instantaneous standard. The Board finds the proposal adopted today economically reasonable and technically feasible.

The Board adopts this proposal for second-notice review by JCAR. The 45-day second-notice period will begin on the date written notice is received by JCAR and the Board will accept comments only from JCAR during the second-notice period. *See* 35 Ill. Adm. Code 102.606.

ORDER

The Board proposes for second-notice review by JCAR the following amendments to 35 Ill. Adm. Code 302. Proposed deletions to the current rules are stricken, and proposed additions are underlined.

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE C: WATER POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD

PART 302
WATER QUALITY STANDARDS

SUBPART A: GENERAL WATER QUALITY PROVISIONS

Section
302.100 Definitions
302.101 Scope and Applicability
302.102 Allowed Mixing, Mixing Zones and ZIDs
302.103 Stream Flows
302.104 Main River Temperatures
302.105 Antidegradation

SUBPART B: GENERAL USE WATER QUALITY STANDARDS

Section
302.201 Scope and Applicability
302.202 Purpose
302.203 Offensive Conditions
302.204 pH
302.205 Phosphorus
302.206 Dissolved Oxygen
302.207 Radioactivity
302.208 Numeric Standards for Chemical Constituents
302.209 Fecal Coliform
302.210 Other Toxic Substances
302.211 Temperature

SUBPART C: PUBLIC AND FOOD PROCESSING WATER SUPPLY STANDARDS

SUBPART D: SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE STANDARDS

SUBPART E: LAKE MICHIGAN BASIN WATER QUALITY STANDARDS

SUBPART F: PROCEDURES FOR DETERMINING WATER QUALITY CRITERIA

AUTHORITY: Implementing Section 13 and authorized by Sections 11(b) and 27 of the Environmental Protection Act [415 ILCS 5/13, 11(b), and 27]

SOURCE: Filed with the Secretary of State January 1, 1978; amended at 2 Ill. Reg. 44, p. 151, effective November 2, 1978; amended at 3 Ill. Reg. 20, p. 95, effective May 17, 1979; amended at 3 Ill. Reg. 25, p. 190, effective June 21, 1979; codified at 6 Ill. Reg. 7818; amended at 6 Ill. Reg. 11161, effective September 7, 1982; amended at 6 Ill. Reg. 13750, effective October 26, 1982; amended at 8 Ill. Reg. 1629, effective January 18, 1984; peremptory amendments at 10 Ill. Reg. 461, effective December 23, 1985; amended at R87-27 at 12 Ill. Reg. 9911, effective May 27, 1988; amended at R85-29 at 12 Ill. Reg. 12082, effective July 11, 1988; amended in R88-1 at 13 Ill. Reg. 5998, effective April 18, 1989; amended in R88-21(A) at 14 Ill. Reg. 2899, effective February 13, 1990; amended in R88-21(B) at 14 Ill. Reg. 11974, effective July 9, 1990; amended in R94-1(A) at 20 Ill. Reg. 7682, effective May 24, 1996; amended in R94-1(B) at 21 Ill. Reg. 370, effective December 23, 1996; expedited correction at 21 Ill. Reg. 6273, effective December 23, 1996; amended in R97-25 at 22 Ill. Reg. 1356, effective December 24, 1997; amended in R99-8 at 23 Ill. Reg. 11249, effective August 26, 1999; amended in R01-13 at 26 Ill. Reg. 3505, effective February 22, 2002; amended in R02-19 at 26 Ill. Reg. 16931, effective November 8,

2002; amended in R02-11 at 27 Ill. Reg. 166, effective December 20, 2002; amended in R_____ at _____ Ill. Reg. _____, effective _____.

SUBPART B: GENERAL USE WATER QUALITY STANDARDS

Section 302.207 Radioactivity

a) Gross beta (STORET number 03501) concentration shall not exceed 100 picocuries per liter (pCi/L).

b) ~~Concentrations of radium 226 (STORET number 09501) and s~~Strontium 90 (STORET number 13501) concentration must not exceed ~~1 and~~ 2 picocuries per liter (pCi/L)~~respectively~~.

c) The annual average radium 226 and 228 (STORET number 11503) combined concentration must not exceed 3.75 picocuries per liter (pCi/L).

(Source: Amended at _____ Ill. Reg. _____, effective _____)

SUBPART C: PUBLIC AND FOOD PROCESSING WATER SUPPLY STANDARDS

Section 302.307 Radium 226 and 228

Radium 226 and 228 (STORET number 11503) combined concentration must not exceed 5 picocuries per liter (pCi/L) at any time.

(Source: Amended at _____ Ill. Reg. _____, effective _____)

SUBPART E: LAKE MICHIGAN BASIN WATER QUALITY STANDARDS

Section 302.525 Radioactivity

Except as provided in Section 302.102, all waters of the Lake Michigan Basin must meet the following concentrations ~~in any sample~~:

a) Gross beta (STORET number 03501) concentrations must not exceed 100 picocuries per liter (pCi/L).

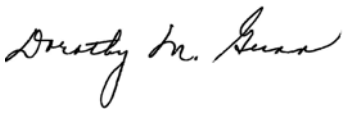
b) ~~Concentrations of radium 226 (STORET number 09501) and s~~Strontium 90 (STORET number 13501) concentration shall not exceed ~~1 and~~ 2 picocuries per liter (pCi/L)~~respectively~~.

c) The annual average radium 226 and 228 (STORET number 11503) combined concentration must not exceed 3.75 picocuries per liter (pCi/L).

(Source: Amended at _____ Ill. Reg. _____, effective _____)

IT IS SO ORDERED.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on December 15, 2005, by a vote of 4-0.



Dorothy M. Gunn, Clerk
Illinois Pollution Control Board