STATE OF WISCONSIN
DEPARTMENT OF ADMINISTRATION
DOA-2049 (R09/2016)

DIVISION OF EXECUTIVE BUDGET AND FINANCE
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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

1. Type of Estimate and Analysis	2. Date
☒ Original ☐ Updated ☐ Corrected	11/4/2021

3. Administrative Rule Chapter, Title and Number (and Clearinghouse Number if applicable)
NR 140 – Groundwater Quality

4. Subject
Amendments to ch. NR 140 to set numerical standards to minimize the concentration of polluting substances in groundwater. Board Order DG-15-19

5. Fund Sources Affected	6. Chapter 20, Stats. Appropriations Affected
☒ GPR ☐ FED ☐ PRO ☐ PRS ☒ SEG ☐ SEG-S	20.370 (4)(ma) & 20.370 (4)(mq)

7. Fiscal Effect of Implementing the Rule

☐ No Fiscal Effect	☐ Increase Existing Revenues	☐ Increase Costs ☐ Decrease Costs
☐ Indeterminate	☐ Decrease Existing Revenues	☒ Could Absorb Within Agency's Budget

8. The Rule Will Impact the Following (Check All That Apply)

☐ State's Economy	☒ Specific Businesses/Sectors
☒ Local Government Units	☒ Public Utility Rate Payers
	☒ Small Businesses **(if checked, complete Attachment A)**

9. Estimate of Implementation and Compliance to Businesses, Local Governmental Units and Individuals, per s. 227.137(3)(b)(1).

Chapter NR 140, Wis. Adm. Code, contains numerical groundwater quality standards for harmful substances that may enter the groundwater resources of the state. The department is required to propose rules based on recommendations from the Wisconsin Department of Health Services (DHS) for groundwater quality standards, to be contained in s. NR 140.10, Table 1, Wis. Adm. Code. The Table, which contains groundwater enforcement standards (ES) and preventive action limits (PAL), is a tool available to the department and other state regulatory agencies that provides uniform standards for regulatory programs contained in other parts of the state's statutes and administrative codes. Chapter NR 140 is not a self-implementing administrative rule and is independent from the regulatory programs that use the groundwater standards in regulatory actions, requirements, responses, and enforcement mechanisms.

After the department promulgates those groundwater standards, state regulatory agencies are required under ss. 160.19 to 160.25, Wis. Stat., to review the new groundwater standards and if necessary, commence promulgation or amendment of their administrative rules for their regulatory programs in order to comply and respond to the new groundwater standards. Numerous DNR administrative programs refer to the groundwater standards in ch. NR 140, Wis. Adm. Code, along with regulatory programs at the Wisconsin Department of Transportation, Wisconsin Department of Agriculture, Trade, and Consumer Protection, and Wisconsin Department of Safety and Professional Services. This administrative rule only amends and adds groundwater standards; it does not amend or create any regulatory authority that implements programs that may use or enforce groundwater standards.

Because ch. NR 140, Wis. Adm. Code groundwater standards are not self-implementing and have no regulatory or enforcement mechanism, there is no cost directly attributable to the standards. Amendment of the groundwater standards alone do not create an implementation or compliance cost. The cost of implementation and compliance for groundwater standards is dictated entirely by the regulatory agencies and their numerous regulatory programs with their own statutory and administrative code authority. To the extent that the groundwater standards are used in other regulatory programs, the estimation of those costs is limited by the statutory requirement that the regulatory agencies review, amend, or create rules to implement the standards *after* the groundwater standards are promulgated.

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The department anticipates that rulemaking activity in other regulatory programs may significantly decrease the cost of this groundwater standards rule. The department is in the process of promulgating a permanent rule adding numeric thresholds for PFOS and PFOA to the surface water quality standards. The surface water quality standards proposed rule includes WPDES permit implementation procedures for source reduction and treatment of PFOS and PFOA in wastewater discharges. Many of the industries and facilities governed by surface water quality standards would also be subject to the changes in this groundwater proposed rule. If the surface water quality rule is promulgated, the department anticipates the implementation and compliance cost of the proposed groundwater rule will substantially decrease. The WPDES permit program may also propose rules amending how the WPDES permit program regulates the land application of biosolids that contain PFOA and PFOS.

Any reasonable estimate of the implementation and compliance costs of this rule will be altered by the statutorily require review and ongoing promulgation of regulatory program rules outside the scope and authority of this rule. To comply with the directive in s. 227.137, Wis. Stat., the department analyzed and is providing a detailed quantification of the economic impact of the proposed rule, including the implementation and compliance costs that are reasonably expected to be incurred by or passed along to the businesses, local governmental units, and individuals that may be affected by the proposed rule, based on the current administrative and statutory authority in the regulatory programs that rely on groundwater standards.

To the extent possible, this economic impact analysis includes estimated costs of implementation and compliance incurred by other regulatory programs and rules that refer to ch. NR 140 standards. The estimated average annual costs incurred by other regulatory programs and rules is $3,284,171 in any year over a 5-year permitting cycle and $9,537,243 maximum over any two-year period. See Attachment C for a detailed derivation of these figures. However, review and possible amendment of those regulatory program rules are outside the scope of this rule. Any amendment to regulatory program rules may alter the cost of implementation and compliance of ch. NR 140 groundwater standards estimated here.

10. Would Implementation and Compliance Costs Businesses, Local Governmental Units and Individuals Be $10 Million or more Over Any 2-year Period, per s. 227.137(3)(b)(2)?

☐ Yes ☒ No

11. Policy Problem Addressed by the Rule

The objective of the proposed rule is to set numerical standards for consistent use in state regulatory programs to minimize the concentration of polluting substances in groundwater [ss. 160.001 and 160.07(5), Stats.]. The standards are used by other administrative programs that regulate facilities and activities such as: solid and hazardous waste management, land application of wastewater and wastewater solids/sludges regulated under the Wisconsin Pollutant Discharge Permit (“WPDES”) program, mining operations, spills and remediations sites, and pesticide applications. The standards also apply to water bottled in Wisconsin and the well compensation grant program.

The proposed rule establishes new state groundwater quality standards for substances presently without a numeric standard, having been detected in or having a reasonable probability of entering, the groundwater resources of the state. To develop proposed groundwater standards, DHS follows the process described in sections ss. 160.09 to 160.17, Wis. Stat. This includes a review of federal numbers, state drinking water standards, and acceptable daily intake values from the United States Environmental Protection Agency (EPA), research studies and a search of peer-reviewed scientific research. DHS then develops a scientific support document describing the findings of their review and basis for the recommended proposed groundwater standards.

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Fiscal Estimate & Economic Impact Analysis

The proposed rule also revises existing state groundwater quality standards in cases where established federal numbers or health based reference doses for substances have changed, or where significant technical information, not considered when federal numbers or reference doses were established, justifies revision. Again, proposed revisions to existing groundwater quality standards are based on recommendations developed by the DHS after scientific review of peer-reviewed research.

The proposed rule for new and revised groundwater quality standards are grouped into five categories: Per- and Polyfluoroalkyl Substances (PFAS), Volatile Organic Compounds (VOCs), Metals/Metalloids, Agricultural Chemicals, and Bacteria. The proposed amendments are for: Per- and polyfluoroalkyl substances (PFAS), including perfluorooctanoic acid (PFOA), and perfluorooctane sulfonate (PFOS); volatile organic compounds (VOCs), including trichloroethylene (TCE), tetrachloroethylene (PCE), 1,2,3-trichloropropane (1,2,3-TCP), and 1,4-dioxane; metals/metalloids, including aluminum, boron, molybdenum, cobalt, hexavalent chromium, and strontium; agricultural chemicals, including thiamethoxam, imidacloprid, clothianidin, isoxaflutole and isoxaflutole DKN degradate, isoxaflutole BA degradate, thiencarbazone-methyl, Dacthal TPA and MTP degradates, glyphosate, glyphosate aminomethylphosphonic acid (AMPA) degradate, and sulfentrazone; and bacteria, including *Escherichia coli* (*E. coli*).

The enforcement standards and preventive action limits for substances in groundwater under this chapter provide uniform and predictable guidelines and procedures for the exercise of regulatory authority, which is established elsewhere in the statutes and does not create independent regulatory authority. No particular type of regulation is required. Regulatory agencies are free to establish any type of regulation that assures that regulated facilities and activities will not cause the concentration of a substance in groundwater affected by the facilities or activities to exceed the enforcement standards and preventive action limits under this chapter at a point of standards application. For each substance for which the department adopts an enforcement standard or a preventive action limit, each regulatory agency shall promulgate rules which set forth the range of responses the regulatory agency may take or which it may require the person controlling a facility, activity or practice which is a source of the substance exceeding a standard in groundwater at a point of standards application to take.

Responses may vary depending on the type and age of the facility, the hydrogeological conditions of the site, and the cost-effectiveness of alternative responses that will achieve the same objectives under the conditions of the site. Responses shall take into account the background water quality at the site.

12. Summary of the Businesses, Business Sectors, Associations Representing Business, Local Governmental Units, and Individuals that may be Affected by the Proposed Rule that were Contacted for Comments.

The department held five stakeholder meetings in 2020 on the rulemaking effort to establish new and revised groundwater quality standards in ch. NR 140, Wis. Adm. Code. These meetings provided an opportunity for stakeholders to submit comments and information relevant to the proposed rule and its potential economic impacts. A number of individuals and organizations were contacted and offered an opportunity to participate in the ch. NR 140 stakeholder meetings, and to provide comments and information relevant to the economic impacts associated with rule implementation. A listing of the individuals and organizations contacted is provided in Attachment B.

13. Identify the Local Governmental Units that Participated in the Development of this EIA.

A number of local government units were contacted and offered an opportunity to submit comments and information relevant to the proposed rule and its potential economic impacts during the stakeholder meetings held in 2020. The local

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government units that were offered an opportunity to provide comments and information relevant to the economic impacts associated with implementation of the proposed revisions to ch. NR 140 are included in the Attachment B list. We received comments related to the EIA from representatives/associations of local government units and a utility owned by a local government.

14. Summary of Rule's Economic and Fiscal Impact on Specific Businesses, Business Sectors, Public Utility Rate Payers, Local Governmental Units and the State's Economy as a Whole (Include Implementation and Compliance Costs Expected to be Incurred)

In addition to the rulemaking requirements in ch. 227, Wis. Stat., the legislature has prescribed specific procedures for promulgating groundwater standards and separate procedures for promulgating rules for regulatory agencies and programs that implement those groundwater standards. Chapter 160, Wis. Stat., describes those processes.

Chapter NR 140, Wis. Adm. Code, contains numerical groundwater quality standards for harmful substances that may enter the groundwater resources of the state. The department is required to propose rules based on recommendations from DHS for groundwater quality standards, to be contained in s. NR 140.10, Table 1, Wis. Adm. Code. The Table is a tool available to the department and other regulatory agencies that provides uniform standards for regulatory programs contained in other parts of the state's statutes and administrative codes. Chapter NR 140 is not a self-implementing administrative rule and is independent from the regulatory programs that contain actions, requirements, responses, and enforcement mechanisms for the various activities or facilities they regulate.

After the department promulgates those groundwater standards, regulatory agencies are required under ss. 160.19 to 160.25, Wis. Stat., to review the new standards and commence promulgation or amendment of their administrative rules for their regulatory programs in order to comply and respond to groundwater standards. Numerous DNR administrative programs refer to the groundwater standards in ch. NR 140, Wis. Adm. Code, along with administrative regulatory programs at the Wisconsin Department of Transportation, Wisconsin Department of Agriculture, Trade, and Consumer Protection, and Wisconsin Department of Safety and Professional Services.

The cost of implementation and compliance for groundwater standards is dictated entirely by the regulatory agencies and their numerous regulatory programs based on authority outside of ch. NR 140, Wis. Adm. Code. Implementation and compliance costs for regulatory agencies may change after they complete their statutorily require review of new or amended groundwater standards and, if necessary, amend or create administrative rules to ensure compliance with the new groundwater standards.

To the extent possible, the department is providing an estimate of the cost of implementation and compliance for other regulatory program rules that refer to ch. NR 140, Wis. Adm. Code groundwater standards. This is limited by the fact that these programs will undergo the statutorily required review and possibly amend their administrative rules, which may alter the costs described here. As described above, there is ongoing rulemaking for surface water quality standards relating to PFOA and PFOS that, if promulgated, will significantly decrease the cost of this proposed rule. Similarly, additional rulemaking is anticipated regarding the WPDES permitting process that may impact the cost for permitting biosolid management.

To the extent it is possible to estimate, the department estimates average annual costs incurred by other regulatory programs and rules is $3,284,171 in any year over a 5-year permitting cycle and $9,537,243 maximum over any two-year period.

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Table 1 below shows a summary of the categories of costs incurred for compliance and implementation. The department does not anticipate costs to regulated entities from the addition of standards for metals/metaloids, agricultural chemicals, and bacteria (see sections 3, 4, and 5 of Attachment C). A detailed assessment of the estimated compliance cost associated with this rule can be found in the EIA narrative document (Attachment C).

Table 1: Estimated Average Compliance Cost Per Year

Categories	Average Annual Cost
PFAS	
Industrial and Municipals Wastewater and Industrial solids	$ 1,009,278
Municipal Biosolids	$ 1,577,533
VOC's	
TCE	$ 560,080
1,4 dioxane	$ 137,280
Total Annual cost (In Any Year Average Cost)	**$ 3,284,171**

The groundwater quality standards in ch. NR 140 are intended to be used by state regulatory programs to minimize the concentration of polluting substances in groundwater. In exercising their regulatory authority, state agencies establish specific rules and regulations to ensure that regulated facilities, activities, and practices do not attain or exceed established groundwater standards at applicable points of standards application. In situations where standards are attained or exceeded, each regulatory agency and program provides actions to address contaminant sources and, in some cases, actively remediate residual contamination in groundwater.

Regulating agencies evaluate alternate responses, including consideration of the technical and economic feasibility of those alternate responses, in determining the appropriate action to be required at a site to control further releases of a contaminating substance, or to restore contaminated groundwater.

The enforcement of state groundwater quality standards is done by state regulatory agencies through their groundwater protection programs. In exercising their statutory powers and duties, state regulatory agencies establish groundwater protection regulations that assure that regulated facilities and activities will not cause state groundwater quality standards to be exceeded. A state regulatory agency may establish specific design and management criteria to ensure that regulated facilities and activities will not cause the concentration of a substance in groundwater, affected by the facilities or activities, to exceed state groundwater quality enforcement standards or preventive action limits at applicable "point of standards application" locations.

Specific Businesses and Business Sector (Private Businesses):

Specific businesses anticipated to be impacted include: Paper and Packaging Manufacturers that currently land apply sludge, Waste Hauler, Treatment Facility that discharges industrial liquid waste through an absorption/seepage pond land treatment system, businesses that contribute wastewater to Wastewater Treatment Facilities (WWTFs) and businesses that use and handle TCE and 1,4 dioxane.

The average annual compliance cost to private businesses and business sector is expected to be $2,856,038 per year.

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Fiscal Estimate & Economic Impact Analysis

A detailed assessment of compliance cost to specific businesses, business sectors and small businesses is presented in "Attachment C" to this document. Attachment C details assumptions, number of entities impacted and related compliance cost estimations.

Fiscal Impact and Impact on State Economy

The department does not anticipate that this rule will impact the state's economy adversely. The estimated fiscal impact of this rule ($1,500) on the state is associated with DATCP agricultural chemical sampling. A detailed assessment of this fiscal impact is provided in the agricultural chemical section of Attachment C. DATCP has indicated that it will be able to absorb this additional cost in the agency's current budget. Additional cost to the DNR in terms of staff time would be absorbed in the agency's current budget.

Impacts on Local Governmental Units

The department assumes that municipal-owned utilities will incur some cost that is primarily related to publicly owned treatment works (POTWs) and classifies this as a cost to local government. The department anticipates that the average cost to a local government over a 5-year permitting cycle to be $428,133 per year. This cost includes wastewater sampling, groundwater monitoring, and POTWs biosolids management.

Impacts on Public Utility Rate Payers

The department does not anticipate this rule to significantly impact public utility rate payers. Assuming impacted municipal-owned utilities will pass on the cost of compliance to rate payers, the total average cost to rate payers over a 5-year permitting cycle is anticipated to not exceed $428,133 per year.

15. Benefits of Implementing the Rule and Alternative(s) to Implementing the Rule

The benefits of establishing new and revised groundwater quality standards in ch. NR 140, Wis. Adm. Code, include:

1. Providing clarity to regulated entities and property redevelopers on how to address these compounds if they are detected at remediation and redevelopment sites, with the ability to accurately determine costs to completing their redevelopment and achieving case closure.
2. Providing clarity on the appropriate concentrations that would be considered by the state for a drinking water advisory and provision of temporary emergency water.
3. Providing human health protection, as the standards protect groundwater from substances that pose a hazard to human health. For instance, the substance may increase the risk of illness, disease, or death or may increase the risk or severity of a long-term disease.
4. Allowing state regulatory agencies to establish rules that define specific design and management criteria to reduce concentrations of a substance in groundwater, if concentrations are found to exceed established ch. NR 140 groundwater standards.
5. Providing state regulatory agencies the ability to manage, close and redevelop spill/release sites where substances in groundwater exceed established ch. NR 140 groundwater standards, where natural attenuation is effectively addressing the contamination.
6. Providing standards for bottled water providers.
7. Setting health-based levels for substances in water supplies that would allow homeowners to evaluate the safety of their home well water supply.
8. Allowing homeowners to apply for well compensation well replacement funds in cases where sampling shows home well water exceeds established ch. NR 140 enforcement standards for groundwater quality standards.

Alternative(s) to Implementing the Rule

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Fiscal Estimate & Economic Impact Analysis

Chapter 160, Wis. Stat., directs the department to propose rules establishing DHS recommendations as ES groundwater quality standards in ch. NR 140, Wis. Adm. Code. Chapter 160, Wis. Stat. does not include an alternative to the department proposing DHS recommendations as ch. NR 140 groundwater quality standards.

Benefits: Per- and Polyfluoroalkyl Substances (PFAS) Proposed amendments to ch. NR 140, Wis. Adm. Code, would add new groundwater quality standards for two per- and polyfluoroalkyl substances (PFAS): perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).

Human health impacts potentially avoided include:

- Perfluorooctanoic acid (PFOA); Studies in workers and people living in areas with high levels of PFOA show that PFOA may increase cholesterol, damage the liver, cause pregnancy-induced hypertension, increase the risk for thyroid disease, decrease antibody response to vaccines, decrease fertility, and cause small decreases in birth weight. Studies in research animals have found that PFOA can cause damage to the liver and the immune system, birth defects, delayed development, and newborn deaths in lab animals. The International Agency for Research on Cancer (IARC) classifies PFOA as possibly carcinogenic to humans and the EPA states there is suggestive evidence of carcinogenic potential for PFOA. PFOA has been shown to be genotoxic in some tests but has not been shown to be mutagenic. Both PFOA and PFOS have been shown to cause the same or similar effects on the immune system, development, and reproduction in people and research animals indicating that PFOA can cause interactive effects.
- Perfluorooctane sulfonate (PFOS); Studies in workers and people living in areas with high levels of PFOS in drinking water show that PFOS may increase cholesterol, damage the liver, cause pregnancy-induced hypertension, increase the risk for thyroid disease, decrease antibody response to vaccines, decrease fertility, and cause small decreases in birth weight. Studies in research animals have found that PFOS can cause damage to the liver and the immune system. PFOS has also been shown to cause birth defects, delayed development, and newborn deaths in animals, indicating that PFOS can cause teratogenic effects. The EPA has classified PFOS as having suggestive evidence of carcinogenic potential. PFOS has not been shown to have mutagenic effects. Both PFOA and PFOS have been shown to cause the same or similar effects on the immune system, development, and reproduction in people and research animals indicating that PFOS can cause interactive effects.

Economics Benefits of PFOS/PFOA (Avoided Cost)
According to the EPA,[1] the documented adverse health effects of PFOA and PFOS include:

- Developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations);
- Cancer (e.g., testicular, kidney);
- Liver effects (e.g., tissue damage);
- Immune effects (e.g., antibody production and immunity); and
- Thyroid effects and other effects (e.g., cholesterol changes).

A benefit of establishing numerical standards in ch. NR 140 , Wis. Adm. Code., to minimize the concentration of polluting substances in groundwater, to be used by all groundwater regulatory programs, is the creation of defined thresholds for implementation that provides regulatory certainty for regulated entities and permittees.

One groups that may be particularly at risk are those residents who obtain their drinking water from municipal water systems that use groundwater as their source. Additionally, Wisconsin residents who own property near areas of known PFAS contamination may experience diminished property values, depressing their personal net worth as well as the wealth of local communities, as evidenced by Minnesota's experience with PFOS contamination from a 3M facility.[5]

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Fiscal Estimate & Economic Impact Analysis

Given that data specific to Wisconsin is not yet available, it is difficult to quantify PFOS/PFOA related health impacts in Wisconsin. For the purpose of this EIA, health impacts and recreational value impact studies presented here and the value transfer methods used to estimate potential Wisconsin-specific health impacts are based on a number of assumptions. The purpose of this analysis is to give estimate the potential economic value of PFOS/PFOA- related impacts given these assumptions. The economic value of potential impacts derived from this analysis are not deducted from or factored into the final total compliance costs of this rule.

Health Cost: To account for costs incurred to the State of Wisconsin as a result of not promulgating a PFOS/PFOA rule, the department analyzed two reports with health data linked to exposure to PFAS that were submitted by commenters during the EIA solicitation process.

The first study estimated that the total cost of PFOA-attributable low birthweight births in the United States for 2003 through 2014 was $13.7 billion.[2] These costs included the direct hospital costs at the time of birth as well as lost economic productivity due to low birthweight births being associated with a variety of longer-term outcomes including lower lifetime earning potential.

The department does not have data on PFOS/PFOA- attributable health incidents in Wisconsin. Using a value transfer method, the department assumed a linear relationship between impacts of PFOA – attributable low birthweight births quantified by Malits et al. (2018) and the total United States population. The department estimates that, based on 1.8% of the US population living in Wisconsin, the total costs due to low birth weight from PFOA exposure for the period (2003 – 2014) studied by Malits et al. (2018) to be $246.6 million (approx. $ 276.2 million in 2021 dollars). This cost value is likely not robust, given that this is an extrapolation based on non-specific population data, and recognizing that promulgation of both water quality standards and WPDES permit program regulations will not alone end PFAS exposure. However, it shows that it is reasonable to expect significant economic benefit (avoided cost) as a result of promulgation of these proposed thresholds of public health significance.

The second study examined background exposure to PFOA as it relates to widespread occurrence of hypertension. This study estimated that approximately 10.3 million Europeans would develop hypertension because of this exposure, which would cost Europe an estimated €10.7 – 35 billion[3] annually ($12.6 - $41.3 billion USD). Again, to use the value transfer method, the department assumed a linear relationship between European population and the estimated cost attributable to PFOA exposure. The department also assumed that the occurrence of PFOA-exposure related hypertension in the European population is the same in the United States as well as Wisconsin. Applying this occurrence to Wisconsin, and taking the lower end of that range, it is estimated that it would cost the state $99.9 million annually (approx. $103.9 million in 2021 dollars) if PFOA is not regulated.

It is important to note that the two studies cited above were specific to PFOA and low birthweights and hypertension. Total health-related costs associated with total PFAS reported by Goldenman, Gretta, et al. (2019) were between €52 billion to €84 billion annually in Europe, which could be several billions of dollars for United States and hundreds of millions for Wisconsin if the quantified values are transferred.[4]

Housing Value: In a study of the impact of PFAS groundwater contamination on property value in Oakdale Minnesota and other affected communities, Sunding (2017) found that the value of properties sold after PFAS contamination of groundwater decreased by 7.3% in Oakdale and 4.4% in other affected communities. This translates to an annualized value of $288 per year (approx. $326 in 2021 dollars) in Oakdale and 231 per year (approx. $261 in 2021 dollars) in the other affected communities. In other words, households in the affected communities were willing to pay to avoid PFAS contamination of groundwater.

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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

The department estimates that to date, approximately 51 remediation sites in Wisconsin (within 25 communities) have been discovered with PFAS contamination in groundwater. Hedonic models of property value are specific to a housing market. Nevertheless, this study gives us a sense of the potential impacts of PFAS contamination of groundwater on the property value for local communities in Wisconsin that rely on groundwater as a source of drinking water.

[1] United States Environmental Protection Agency. Drinking Water Health Advisories for PFOA and PFOS. https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos#:~:text=These%20studies%20indicate%20that%20exposure,)%2C%20liver%20effects%20(e.g.%2C

[2] Malits J, Blustein J, Trasande L, Attina TM. 2018. Perfluorooctanoic acid and low birth weight: estimate of US attributable burden and economic costs from 2003 through 2014. International Journal of Hygiene and Environmental Health 221: 269-275.

[3] Goldenman, Gretta, et al. 2019. The cost of inaction: A socioeconomic analysis of environmental and health impacts linked to exposure to PFAS. Nordic Council of Ministers.[4] Environmental Science and Technology. The True Cost of PFAS and the Benefits of Acting Now. https://pubs.acs.org/doi/10.1021/acs.est.1c03565

Benefits: Volatile Organic Compounds (VOCs) Proposed amendments to ch. NR 140, Wis. Adm. Code, would add revised groundwater quality standards for four VOCs: trichloroethylene (TCE), tetrachloroethylene (PCE), 1,2,3-trichloropropane (1,2,3-TCP) and 1,4-dioxane. Proposed revised groundwater quality standards for TCE, 1,2,3-TCP and 1,4-dioxane would be lower than existing standards. Proposed revised groundwater quality standards for PCE would be higher than existing standards.

Human health impacts potentially avoided include:

- Trichloroethylene (TCE); Known health effects from TCE come from animal studies and from studies of people who have come into contact with TCE in their environments. High levels of TCE in drinking water may cause nausea, convulsions, liver and kidney damage, impaired heart function, coma, or even death. There is strong evidence that TCE can cause kidney cancer in people and some evidence that it can cause liver cancer and malignant lymphoma. Lifetime exposure to TCE resulted in increased liver cancer in mice and increased kidney cancer and testicular cancer in rats. Additional animal studies indicate there may be an association between maternal exposure to TCE and specific heart defects in offspring. There is some evidence that human exposure to TCE while pregnant may be associated with similar effects. The EPA and the International Agency for Research on Cancer (IARC) have classified trichloroethylene as a human carcinogen by all routes of exposure. TCE has been shown to cause carcinogenic, mutagenic, and teratogenic effects.
- Tetrachloroethylene (PCE); Current knowledge about the health effects of PCE comes from studies in laboratory animals, workers, poisoning exposure reports, and epidemiological studies involving exposed communities, such as contaminated military bases. Short-term effects of PCE exposure in both humans and animals include liver and kidney damage and central nervous system effects. Longer-term PCE exposure causes changes in mood, memory, attention, reaction time, or vision. Long-term PCE exposure animal studies have also shown liver and kidney effects, as well as changes in brain chemistry. PCE may also have adverse effects on pregnancy and fetal development; problems such as miscarriage, birth defects, and slowed fetal growth have been observed in animal studies. The EPA has classified PCE as a likely human carcinogen. PCE has been shown not to be teratogenic, but it has been shown to have mutagenic effects and interactive effects with mixtures of trichloroethylene (TCE) and methylchloroform.
- 1,2,3-Trichloropropane; The known health information on 1,2,3-trichloropropane comes from studies with laboratory animals. Rats and mice exposed to large amounts of 1,2,3-trichloropropane for a long time developed tumors in the liver, digestive system, Harderian gland, and uterus. The EPA determined that 1,2,3-trichloropropane is likely to be carcinogenic to humans. Recent studies have shown that 1,2,3-trichloropropane can cause gene mutations and, therefore, is likely mutagenic.

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- 1,1-Dichloroethane; The known information about the health effects of 1,1-dichloroethane comes from studies of humans and laboratory animals. In humans, breathing high levels of 1,1-dichloroethane for a short amount of time can cause central nervous system depression and an irregular heartbeat. In animals, 1,1-dichloroethane has been shown to cause kidney and liver damage, affect weight gain in pregnant animals, delay bone development of offspring, and death at very high levels. A study by the National Toxicology Program found that high levels of 1,1-dichloroethane cause tumors in mice after oral exposure. The United States Environmental Protection Agency (EPA) has classified 1,1- dichloroethane as a possible human carcinogen by oral exposure.
- 1,4-Dioxane; At high levels or long-term exposure, 1,4-dioxane can cause severe kidney and liver effects. Animals that drank water with high levels of 1,4-dioxane for a long time developed cancer in the liver and nasal passages. Because of these effects, EPA has classified 1,4-dioxane as a likely human carcinogen. Recent studies have shown that 1,4-dioxane may be mutagenic. Limited data in animals suggest that 1,4-dioxane may be teratogenic.

Benefits: Metals/Metalloids Proposed amendments to ch. NR 140, Wis. Adm. Code, would add new groundwater quality standards for hexavalent chromium. Chapter NR 140 currently includes groundwater quality standards for total chromium, which includes both trivalent chromium and hexavalent chromium. Consulting firms and sub-contractors, including laboratories, will likely benefit financially from new hexavalent chromium groundwater standards.

Human health impacts potentially avoided include:

- Hexavalent Chromium; Hexavalent chromium has no known biological role and can cause toxicity. Studies involving people who work with hexavalent chromium have led to a greater understanding about how it affects the body if it is inhaled. However, information on how chromium affects the body if it is swallowed (oral exposure) is more limited, and mostly comes from animal studies. Animals that were exposed to large amounts of chromium had problems with their stomach and small intestines. Chromium also caused damage to sperm in male animals. Recent studies have shown that exposure to large amounts of hexavalent chromium for a long time can cause cancer in research animals. Previous studies have also shown that hexavalent chromium can cause teratogenic effects and may cause mutagenic effects. New studies have shown that hexavalent chromium may cause interactive effects with other substances such as benzo(a)pyrene and arsenic.
- Strontium; Because strontium is chemically similar to calcium, it can be deposited in the skeleton after exposure to high levels. Studies in people and animals have shown that strontium can interfere with bone mineralization in the developing skeleton. Strontium can also compete with calcium in bones and suppress vitamin D metabolism and intestinal calcium absorption. Some studies have shown that strontium can cause teratogenic effects.
- Boron; Recent studies in people suggest that small amounts of boron in the diet have beneficial effects. In fact, the World Health Organization (WHO) has added boron to the possible essential elements category for nutritional purposes. On the other hand, eating or drinking large amounts of boron can impact human health. Some people who ate large amounts of boron have experienced effects on the stomach, intestines, liver, kidney, and brain and some have died. Male animals that ate large amounts of boron had damage to their reproductive organs. Boron has also been shown to decrease the weight of newborn animals if given to the mothers when pregnant.
- Molybdenum; Low levels of molybdenum are essential for good health. The Institute of Medicine's Food and Nutrition Board has recommended dietary molybdenum levels of 45 micrograms per day for adults. However, high levels of molybdenum can be harmful. Studies in animals suggested that ingesting very large amounts of molybdenum might damage the male and female reproductive system and might cause kidney and liver damage. Studies indicate that the copper content in the body can affect the toxicity of molybdenum. Molybdenum has shown to have interactive effects with copper in the body and cause teratogenic effects.
- Aluminum; While most people do not experience health effects from exposure to aluminum, some groups are at higher risk for aluminum toxicity. Most cases of human aluminum toxicity have involved patients with impaired

kidney function or patients who were exposed to high levels of aluminum from contaminated water used in medical fluids. Premature babies are at risk for aluminum toxicity because of their immature kidney function. Full-term infants with normal kidney function may also be at risk because they have lower kidney excretion rates than adults which affect their ability to excrete aluminum. Studies with laboratory animals have shown that exposure to high levels of aluminum over a long period of time can affect testosterone levels, body weight, memory, and sperm.

- Cobalt; Exposure to high levels of cobalt can result in lung and heart effects and dermatitis. Liver and kidney effects have also been observed in animals exposed to high levels of cobalt. Birth defects have been observed in animals exposed to high levels of nonradioactive cobalt. A recent study has shown that cobalt can cause teratogenic effects in mice and rats.

Benefits: Agricultural Chemicals There are positive long-range implications to establishing new groundwater quality standards for agricultural pesticides and pesticide degradation products. When a pesticide that has an established groundwater enforcement standard (ES) or preventive action limit (PAL) is detected in a drinking water well, the standards allow state and local health officials to more quickly communicate health-related concerns and any protective measures that should be taken by the homeowner and users of the water. Having groundwater standards allows faster decision-making about resampling efforts and helps provide clear criteria for well and/or water supply replacement. It also provides legal criteria for the department to determine if well compensation funding or other financial support could be provided to an affected homeowner.

One of the best reasons for having health-based groundwater quality standards is that they allow environmental engineers and other professionals to rapidly determine soil and groundwater cleanup goals in situations where a spill of an agricultural chemical occurs. DATCP responds to about 40 agricultural chemical spills annually in the state (https://datcp.wi.gov/Documents2/ACMAnnualReport2019.pdf). But, there are tangible benefits of having established ESs and PALs for individuals like growers who use pesticides in agriculture. DATCP provides communication and outreach about pesticides that are detected in groundwater to other state agencies, local governments, University and Extension professionals, and to growers through presentations at industry association meetings and in pesticide training materials and seminars. Where DATCP data shows a particular pesticide is entering groundwater in an area, growers often quickly learn of the concern. Such outreach informs and educates the pesticide user and can have a significant effect on a grower's pesticide selection in an area, particularly if the groundwater test results approach the established standards. If DATCP observes impacts in areas prone to groundwater contamination, growers may choose to use other pesticides that are safer for human health and the environment. For example, if DATCP finds a highly soluble insecticide in the groundwater, any reduced use of that insecticide could potentially benefit non-target insects in the area, like bees or other pollinators, that could be unintentionally exposed to the insecticide through contaminated irrigation water. This potential exists for highly soluble neonicotinoid insecticides like imidacloprid, clothianidin and thiamethoxam. These compounds have been used on crops widely across irrigated sandy vegetable growing areas of Wisconsin where they have been detected in numerous private wells, monitoring wells and irrigation wells (NeonicotinoidReport.pdf (wi.gov)). DATCP reports suggest that growers who choose to use other insecticides in these sensitive areas could reduce impacts to groundwater and surface waters, and thereby reduce the potential for unintended impacts to invertebrates and non-target organisms on the land, and in streams and other surface waters.

The compound imidacloprid is the only agricultural chemical in the proposed rule that DATCP has detected in groundwater at concentrations exceeding its proposed PAL. Imidacloprid is a low-cost systemic insecticide that is water soluble and is taken up by and travels throughout the plant to control biting and sucking pests. It is labeled for use on a wide variety of Wisconsin crops including but not limited to corn, soybeans, beans, peas, and a host of fruits and vegetables. It is often applied at planting time as a coating on seed, but it may also be used in-furrow or as a soil drench (i.e., for potatoes), or can be mixed into spray formulations for foliar applications on established plants like vines, trees,

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shrubs and other plants. Evaluating costs for alternatives to imidacloprid is complicated and can be speculative. For foliar applications potential alternatives include a variety of insecticide options including pyrethroid, carbamate, organophosphate, and diamide insecticide products, as well as insecticides like sulfoxaflor and flupyradifurone and some others. Some alternatives for imidacloprid as a seed treatment include the insecticides clothianidin and thiamethoxam, both of which are also highly water soluble neonicotinoid-class insecticides, like imidacloprid. Both are comparably priced to imidacloprid, and which have new standards proposed in this rule due to similar groundwater contamination findings (NeonicotinoidReport.pdf (wi.gov)). As far as options for imidacloprid as a seed treatment goes, the decision to select an alternative insecticide for delivery on seed is complicated by the extent to which a grower can choose a particular coating on the seed they purchase to plant. Often, seed treatments come as a proprietary blend of crop protectants applied to a seed-line that has a unique set of genetic traits to address anticipated growing conditions and pest pressures.

Human health impacts potentially avoided include:

- Thiamethoxam; Most information about the health effects of thiamethoxam comes from studies with laboratory animals. Animals that ate large amounts of thiamethoxam for long periods of time had problems with their liver, adrenal glands, and blood. Male animals had problems with their reproductive system. Thiamethoxam has been shown to cause teratogenic effects (skeletal abnormalities) in several animal studies.
- Imidacloprid; Most information about the health effects of imidacloprid comes from studies with laboratory animals. Animals that swallowed large amounts of imidacloprid for long periods of time had thyroid, neurological, reproductive, and glucose regulation problems. Some studies have shown that imidacloprid can cause teratogenic effects in animals. Recent studies have shown that high levels of imidacloprid can cause mutagenic effects in mice and can have interactive effects with arsenic in rats.
- Clothianidin; Most information about the health effects of clothianidin comes from studies with laboratory animals. Animals that ate large amounts of clothianidin for long periods of time experienced liver, blood, and kidney problems.
- Isoxaflutole; Rats that ate large amounts of isoxaflutole for two years experienced liver, thyroid, eye, nerve, and muscle problems. Some rats also had tumors in their liver after eating isoxaflutole for several months to years. In these studies, scientists were not able to determine whether the effects were caused by isoxaflutole or isoxaflutole diketonitrile due to the fast conversion from isoxaflutole to isoxaflutole diketonitrile in the body. The EPA has classified isoxaflutole as a likely human carcinogen.
- Isoxaflutole Benzoic Acid; Compared to experiments with isoxaflutole, isoxaflutole benzoic acid has been shown to be much less toxic. High levels of isoxaflutole benzoic acid caused decreased weight gain and food consumption, increased salivation, and changes in clinical chemistry markers in rats.
- Thiencarbazone-methyl; Most information about the health effects of thiencarbazone-methyl comes from studies with laboratory animals. Animals that ate large amounts of thiencarbazone-methyl for long periods of time experienced problems with their kidney, bladder, and urinary tract.
- Dacthal Monomethyl tetrachloroterephthalic acid (MTP) degradate; In the body, Dacthal can turn into MTP and then TPA. While the studies on MTP are limited, Dacthal has been studied more extensively. Animals that ate large amounts of Dacthal for long periods of time experienced liver, lung, kidney, and thyroid problems. Some studies have shown that Dacthal can cause carcinogenic effects in animals and the EPA considers Dacthal a possible human carcinogen.
- Dacthal Tetrachloroterephthalic acid (TPA) degradate; In the body, Dacthal can turn into MTP and then TPA. While the studies on TPA are limited, Dacthal has been studied more extensively. Animals that ate large amounts of Dacthal for long periods of time experienced liver, lung, kidney, and thyroid problems. Some studies have shown that Dacthal can cause carcinogenic effects in animals and the EPA considers Dacthal a possible human carcinogen.

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P.O. BOX 7864
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FAX: (608) 267-0372

- Glyphosate; Studies in animals have shown that glyphosate can cause gastrointestinal effects and developmental effects. Ingestion of a large amount of glyphosate also caused inflammation in the gastrointestinal system in animal studies. High levels of glyphosate have also been shown to cause unossified breastbone (teratogenic effects) in offspring of pregnant animals given large amounts of glyphosate orally. The carcinogenic potential of glyphosate has been intensively discussed by multiple federal and international agencies. While the International Agency for Research on Cancer (IARC) classified glyphosate as "probably carcinogenic to humans" in 2015, the EPA has recently affirmed their position that glyphosate is not likely to be carcinogenic to humans. Some studies have shown that glyphosate can have mutagenic effects.
- Glyphosate Aminomethylphosphonic acid (AMPA) degradate; Most information about the health effects of AMPA comes from studies with laboratory animals. Studies have shown that AMPA can affect the gastrointestinal tract and the urinary tract, including bladder, and cause liver injury in animals given very large amounts of AMPA. Decreased fetal body weight was also observed in animals given larger amounts of AMPA during gestation.
- Sulfentrazone; Most information about the health effects of sulfentrazone comes from studies with laboratory animals. Animals that ate large amounts of sulfentrazone for long periods of time experienced developmental and reproductive toxicity. When pregnant animals were fed sulfentrazone for a long period of time, decrease in body weight and disruption in male reproductive system happened to the fetuses (unborn babies) at levels that did not cause effects in the mother. In some studies, similar reproductive toxic effects were mainly observed in the second-generation pups of the sulfentrazone-fed animals. In developmental studies in rats, increased number of stillborn fetuses and delayed bone formation was observed in pups (teratogenic effects).

Benefits: Bacteria Proposed amendments to ch. NR 140, Wis. Adm. Code, add new groundwater quality standards for *Escherichia coli* (*E. coli*) bacteria. *E. coli* bacteria is a type of coliform bacteria used as an indicator of fecal contamination in groundwater.

Human health impacts potentially avoided include:

- Bacteria (*E. coli*); *E. coli* bacteria is a type of coliform bacteria used to evaluate the potential for microbial pathogens, associated with fecal contamination, to be present in groundwater. Microbial pathogens in water can cause a variety of illnesses. Most common illnesses are acute (short-term) gastrointestinal illnesses causing diarrhea, abdominal discomfort, nausea, and vomiting. Less common illnesses are chronic (long-term) and include kidney failure, hepatitis, and bloody diarrhea. Infants and young children, the elderly, and people with compromised immune systems are at the highest risk for illness from pathogens in water.

16. Long Range Implications of Implementing the Rule

The department does not expect that there will be significant long-range negative state fiscal impacts associated with establishing new and revised groundwater quality standards in ch. NR 140, Wis. Adm. Code. While there may be additional costs in some regulatory programs that refer to ch. NR 140 groundwater standards, there will also be savings for existing standards that are being amended to a less stringent standard. In addition, the department's Remediation and Redevelopment program will be able to approve natural attenuation site closures even if ch. NR 140 enforcement standards are being attained or exceeded. This regulatory option allows the department to make site-specific decisions to allow case closure, thus saving regulated entities and developers money.

Regulated facilities, practices, and activities that are sources of the new and revised proposed groundwater standards are likely sources of substances for which other groundwater standards already exist. Consequently, the department anticipates limited cases where proposed standards will be exceeded where existing standards are not currently being exceeded. However, it may be necessary for state regulatory agencies to conduct future rulemaking to establish specific

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design and management criteria to ensure that regulated facilities and activities will not cause the concentration of a substance in groundwater to exceed new or revised state groundwater standards. Economic and fiscal impacts associated with any future design and management criteria rules, promulgated by state regulatory agencies to ensure that regulated facilities, practices, and activities comply with new or revised groundwater standards, would be evaluated at the time of that future rulemaking.

Agricultural Chemicals

In accordance with ch. 160, Wis. Stat., DATCP conducts annual sampling for 150 to 500 private wells statewide for pesticides. In the event that groundwater standards are exceeded at private wells, DATCP conducts a groundwater investigation to evaluate pesticide use and impacts to other nearby private wells and to determine the source of the impacts. Where a spill is reported and/or a DATCP investigation finds that a spill or other point source is the reason for a pesticide impact at a private well, DATCP may require the responsible party to perform a cleanup response under ch. 292, Wis. Stat., and chs. ATCP 35 and NR 700, Wis. Adm. Code. Where a DATCP investigation finds that a pesticide impact to a private well is the result of normal agricultural use or other non-point use of a pesticide, the DATCP response actions are limited under chs. ATCP 30 and 31, Wis. Adm. Code.

Where a groundwater investigation identifies that normal agricultural use has caused an enforcement standard exceedance for a pesticide in a private drinking water well, DATCP is compelled by rule to take action. Outreach to educate growers about a groundwater concern would be the foremost approach and could result in voluntary changes in use practices and improvements in an area. Under ch. ATCP 31, Wis. Adm. Code - Groundwater Protection Program, DATCP can set pesticide use restrictions on a regional or statewide basis through the use of special orders (requires consent) or by changing administrative rules (likely ch. ATCP 30, Wis. Adm. Code). In practice, the agency has utilized special orders on a short-term basis until an administrative rule can be developed and promulgated as a long-term control measure.

Once the department promulgates the current ch. NR 140 proposed groundwater standards, DATCP may begin rulemaking to propose administrative controls on the use of any pesticide that is found to exceed its enforcement standard at a point of standards application. On the list of agricultural chemicals for which new groundwater quality standards are proposed, the insecticide imidacloprid is the only chemical that has been detected in groundwater and is likely to require some form of short-term or long-term control measure.

17. Compare With Approaches Being Used by Federal Government

EPA establishes health-based drinking water maximum contaminant levels (MCLs), cancer risk levels and health advisories (HAs), that are used to assess the quality of groundwater drinking water supplies. Federal drinking water MCLs are established based on scientific risk assessments and, in some cases, economic and technological considerations. Cancer risk levels are established as the concentration of a chemical in drinking water that corresponds to a specific excess estimated lifetime cancer risk. Federal lifetime health advisories (LHAs) are developed based on an established health risk acceptable daily intake (ADI) level or reference dose (RfD). An ADI or RfD is the daily oral exposure to a chemical that is likely to be without an appreciable risk over a lifetime.

Federal drinking water MCLs have been established for: glyphosate (700 ug/L), *Escherichia coli* (*E. coli*) bacteria (0 bacteria present), trichloroethylene (TCE) (5 ug/L) and tetrachloroethylene (PCE) (5 ug/L). EPA cancer slope factors have been established that can be used to determine 1 in 1,000,000 drinking water cancer risk levels. EPA cancer slope factors have been established for: hexavalent chromium [EPA OPP = 0.791 $(mg/kg\text{-}day)^{-1}$, EPA IRIS draft = 0.5 $(mg/kg\text{-}day)^{-1}$], isoxaflutole [0.0114 $(mg/kg\text{-}day)^{-1}$], 1,2,3-trichloropropane (1,2,3-TCP) [30 $(mg/kg\text{-}d)^{-1}$] and 1,4-dioxane [0.01 $(mg/kg\text{-}d)^{-1}$]. US EPA LHAs have been established for: strontium (4,000 ug/L), the sum of Dacthal and its degradates

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(MTP and TPA) (70 ug/L), perfluorooctanoic Acid (PFOA) (70 nanograms per liter or ng/L), perfluorooctane sulfonate (PFOS) (70 ng/L), boron (6,000 ug/L), molybdenum (40 ug/L), and 1,4-dioxane (200 ug/L). RfDs have been established by EPA for: hexavalent chromium (0.003 mg/kg/day), thiamethoxam (0.012 mg/kg/day), imidacloprid (0.057 mg/kg/day), clothianidin (0.098 mg/kg/day), isoxaflutole (0.02 mg/kg/day), thiencarbazone-methyl (1.17 mg/kg/day), sulfentrazone (0.14 mg/kg/day), 1,2,3-trichloropropane (1,2,3-TCP) (0.004 mg/kg/day), and 1,4-dioxane (0.03 mg/kg/day).

18. Compare With Approaches Being Used by Neighboring States (Illinois, Iowa, Michigan and Minnesota)

Minnesota, Michigan, Illinois, and Iowa use groundwater protection values/levels/standards in their regulation of practices and activities that might impact the quality of groundwater. Minnesota, Michigan, and Illinois have promulgated individual state groundwater protection standards. Iowa uses established federal standards (federal drinking water MCLs, LHAs and established cancer risk levels) as its state groundwater protection standards.

Groundwater protection quality values/levels/standards are usually developed based on health risk assessments. States are often required to follow state-specific health risk assessment methodology when establishing groundwater protection quality standards. States may use state-specific health risk assessments, factors and methodology in calculating and developing their groundwater protection standards. This use of different health risk assessment factors and methodologies has led to the establishment of different state groundwater protection values/levels/standards for the same substance. For example, the health-based groundwater protection level for strontium used by the states surrounding Wisconsin varies by state. The level established in Minnesota is 3,000 micrograms per liter (ug/L), the level established in Michigan is 4,600 ug/L, Illinois has not established a strontium groundwater protection level, and Iowa uses the federal lifetime health advisory level of 4,000 ug/L as its strontium groundwater protection level.

Minnesota The state of Minnesota has established state groundwater protection "Health Risk Limits" (HRLs) under Minnesota Statutes Section 103H.201. The state of Minnesota has established HRLs for: hexavalent chromium (100 ug/L), thiamethoxam (200 ug/L), clothianidin (200 ug/L), PFOA (35 nanograms per liter or ng/L), TCE (0.4 ug/L), PCE (5 ug/L), 1,2,3-TCP (7 ug/L), and 1,4-dioxane (100 ug/L). The Minnesota Department of Health has also calculated "Health Based Values" (HBVs) for some groundwater contaminants. Minnesota HBVs are not standards that have been promulgated by rule but are calculated concentrations that may be used as advisory levels by Minnesota state groundwater and environmental protection programs. Minnesota has established HBVs for: imidacloprid (3 ug/L), glyphosate (500 ug/L), glyphosate AMPA degradate (1,000 ug/L) and PFOS (20 ng/L). The Minnesota Department of Health also issues Risk Assessment Advice (RAA) levels for some groundwater contaminants. Minnesota Department of Health RAAs are advisory concentrations developed to assist Minnesota agencies in evaluating potential health risks to humans from exposures to a chemical. Generally, RAAs contain greater uncertainty than HRLs and HBVs because the information available to develop them is more limited. The state of Minnesota has established RAAs for: strontium (3,000 ug/L) and boron (500 ug/L).

Michigan The state of Michigan has established state groundwater protection quality standards. Michigan "Drinking Water Criteria and Risk Based Screening Levels" (RBSLs) are Michigan state groundwater protection standards authorized in accordance with Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451 (NREPA). Michigan has established a Drinking Water Criteria/RBSL for: hexavalent chromium (100 ug/L), strontium (4,600 ug/L), glyphosate (700 ug/L), PFOA + PFOS (70 ng/L), TCE (5 ug/L), PCE (5 ug/L), 1,2,3-TCP (42 ug/L), and 1,4-dioxane (7.2 ug/L).

Illinois The state of Illinois has established state groundwater quality standards for "potable resource groundwater." Illinois Groundwater Quality Standards are state groundwater protection standards promulgated in 35 Ill. Adm. Code

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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

620, environmental protection regulations. Illinois state "Groundwater Quality Standards for Class I: Potable Resource Groundwater" have been established for: TCE (5 ug/L), PCE (5 ug/L), boron (2,000 ug/L), and 1,4-dioxane (7.7 ug/L).

Iowa The state of Iowa has not established specific state groundwater protection standards. In accordance with Iowa Environmental Protection Regulations 567 IAC Chapter 133, Iowa uses established federal EPA LHAs, "negligible risk levels" (NRLs) for carcinogens, the estimate of one additional cancer case per million people over a lifetime of exposure, and federal drinking water MCLs as "Action Levels" in their regulation of practices and activities that may adversely impact groundwater quality. As noted in section 17 above, federal LHAs have been established for: strontium (4,000 ug/L), the sum of Dacthal and its degradates (MTP and TPA) (70 ug/L), perfluorooctanoic Acid (PFOA) (70 ng/L), perfluorooctane sulfonate (PFOS) (70 ng/L), boron (6,000 ug/L), molybdenum (40 ug/L), and 1,4-dioxane (200 ug/L). EPA cancer slope factors have been established that can be used to determine NRLs for carcinogens. EPA cancer slope factors have been established for: hexavalent chromium [EPA OPP = 0.791 (mg/kg-day)-1, EPA IRIS draft = 0.5 (mg/kg-day)-1], isoxaflutole [0.0114 (mg/kg-day)-1], 1,2,3-trichloropropane (1,2,3-TCP) [30 (mg/kg-d)-1], and 1,4-dioxane [0.01 (mg/kg-d)-1]. Federal drinking water MCLs have been established for: glyphosate (700 ug/L), *Escherichia coli* (*E. coli*) bacteria (0 bacteria present), trichloroethylene (TCE) (5 ug/L), and tetrachloroethylene (PCE) (5 ug/L).

19. Contact Name	20. Contact Phone Number
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STATE OF WISCONSIN
DEPARTMENT OF ADMINISTRATION
DOA-2049 (R09/2016)

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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

ATTACHMENT A

1. Summary of Rule's Economic and Fiscal Impact on Small Businesses (Separately for each Small Business Sector, Include Implementation and Compliance Costs Expected to be Incurred)

The regulatory programs in state regulatory agencies that use ch. NR 140, Wis. Adm. Code groundwater standards may impact small business, particularly groundwater quality standards for VOCs including TCE and PCE. Revisions to these standards may impact small businesses such as dry cleaners whose properties are the sites of spills or releases of these substances and have contaminated groundwater. Revised standards may necessitate additional site monitoring and investigation, and potentially additional compliance response actions. It should be noted that while the proposed standards for TCE are lower than current standards, the proposed PCE standards are higher than the current standards. Therefore, while site investigation and compliance action costs may increase in some cases, they may decrease in others, depending on the contaminant of concern at a specific regulated site.

For entities impacted by ch. NR 140, Wis. Adm. Code groundwater standards, the department assumed the following are small business based on available data and the agency's expertise:
Approximately 30% of the entities impacted by revisions to 1,4 Dioxane and TCE standards are small businesses. As a result, the department assumes small businesses will incur 30% of the average annual compliance cost for revisions to 1,4 Dioxane and TCE standards ($209,208 per year).
Approximately 30% of biosolids management source identification and reduction cost over a 5-year permitting cycle ($346,800) is anticipated to be a small business compliance cost.
Based on these assumptions, the department estimates $556,008 per year of compliance costs to small businesses.

A detailed assessment of potential compliance cost and benefits are presented in question #14 and #15 of DOA 2049 form attached.

2. Summary of the data sources used to measure the Rule's impact on Small Businesses

In its determination of the effect of this proposed rule on small businesses, the department used analysis and supporting information from a combination of data sources. These include: Wastewater Applications, Monitoring, and Permits (SWAMP) database, annual biosolids reports, EPA biosolids sampling documents, Bureau for Remediation and Redevelopment Tracking System (BRRTS) database, data from environmental consultants, DNR Remediation and Redevelopment Program staff expertise, DNR Program wastewater and biosolids staff expertise.

3. Did the agency consider the following methods to reduce the impact of the Rule on Small Businesses?

☐ Less Stringent Compliance or Reporting Requirements
☐ Less Stringent Schedules or Deadlines for Compliance or Reporting
☐ Consolidation or Simplification of Reporting Requirements
☐ Establishment of performance standards in lieu of Design or Operational Standards
☐ Exemption of Small Businesses from some or all requirements
☒ Other, describe:

This rule revision proposes new and revised state groundwater quality standards. The state regulatory agencies enforce groundwater quality standards through their groundwater protection programs. In exercising their statutory authority and duties, state regulatory agencies establish groundwater protection rules and regulations that assure that regulated facilities and activities will not cause state groundwater quality standards to be exceeded. State statutes require that groundwater quality standards apply to all regulated facilities, practices, and activities that may impact groundwater

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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

quality. State statutes do not allow the department to establish different groundwater quality standards based on the size of a business. Groundwater quality standards apply to all regulated businesses regardless of size.

4. Describe the methods incorporated into the Rule that will reduce its impact on Small Businesses

State statutes do not allow the department to establish different groundwater quality standards based on the size of a business. Groundwater quality standards apply to all regulated businesses regardless of size.

5. Describe the Rule's Enforcement Provisions

Ch. NR 140, Wis. Adm. Code groundwater standards are not independently enforceable and are not self-implementing. State regulatory agencies enforce groundwater quality standards through their groundwater protection programs. In exercising their statutory authorities and duties, state regulatory agencies establish groundwater protection rules that assure regulated facilities and activities will not cause state groundwater quality standards to be exceeded. A state regulatory agency may establish specific design and management criteria to ensure that regulated facilities and activities will not cause the concentration of a substance in groundwater, affected by the facilities or activities, to exceed state groundwater quality standards at an applicable "point of standards application" location.

6. Did the Agency prepare a Cost Benefit Analysis (if Yes, attach to form)
☐ Yes ☒ No

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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

Attachment B: List of Stakeholders Contacted

Businesses
Toymotive LLC

Consultants
AECom
Anchor QEA
Antea Group
Barr Engineering
Benchmark Environmental Services
Brice Engineering
Brown and Caldwell
Burns and McDonnell
Cardno
Davy Inc
Deigan and Associates
EA engineering
Eaton company
Emerson
Environmental Audits
Environmental solutions and innovation Inc.
Environmental, Energy and Industrial Services
Essity
Eurofin USA
Fehr Graham
GAI consultants
Gannett Fleming
General Engineering
Geosyntec - consultants
Giles Engineering
GLEC Wastewater
GZA
Ingrahm Technical Services
Integral corporation
Kapur Inc - consultant
Martenson and Eisele
Mead and Hunt
MSA
NextEra Energy
RA Smith
Ramaker Associates
Ramboll

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ADMINISTRATIVE RULES
Fiscal Estimate & Economic Impact Analysis

Robert E Lee Associates
RPS Group
Ruekert - Mielke
SCS Engineers
SEH
Shannon and Wilson
Sigma Group
SolvePFAS
Stantec
Strand Associate
Styberg Engineering
Terracon
The OS Group LLC
The Sigma Group
Xcelenergy

Government
City of Appleton
City of Brown Deer
City of Elkhorn
City of Fond du Lac
City of Green Bay
City of Janesville
City of Juneau
City of Madison
City of Menasha
City of Milwaukee
City of Pleasant Prairie
City of Sheboygan
City of Two Rivers
Columbia County
Dane County
US EPA
Forest County
LaCrosse County
Milwaukee County
Outagamie County
Public Health Madison and Dane County
Rock County
WI State Lab of Hygiene

Healthcare

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Augusta Health and Rehab - healthcare

Laboratory Services
WI State Lab of Hygiene
Northern Lakes Service
Pace Labs
Stresau Laboratory, Inc.
Test America
Tetratech
Law Firms
Axley-Brynelson
Boardman Clark
Crowell and Moring LLC
Environmental Law and Policy center
Foley Lardner
Foth and Van Dyke
Mayer Brown
Murphy-Desmond
Winthrop and Weinstine

Legislator
State Senator Rob Cowles

Lobbying Firms
Capitol Strategies
Enhesa
Hamilton

Manufacturers
A.P. Nonweiler
Bayer Crop Science
Cedar Corp
Georgia Pacific
Headwaters
John Deere
Perimeter Solutions
Regalware
Regenesis Bioremediation Inc
Signicast Corp
Yamaha -Motor

Mining
Badger Mining Corp

Journalists
Wispolitics

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Nonprofits
American Chemistry Council
Bay-Lake Regional Planning commission
Clean Wisconsin
Cooperative Network
CouleeCap
Crossroads at Big Creek - nature center Heckrodt
Wetland Preserve
International Society of Arboriculture
League of Women Voters
Midwest Environmental Advocates
Minnesota Brownfields
Wisconsin Manufacturing and Commerce
Wisconsin Rural Water Resources
Wisconsin Wetlands
Environmental Law and Policy center

Recyclers
Dynamic Lifecycle Innovations
Lamp Recycling

Utilities
Alliant Energy
Dairyland Power
MGE
WeEnergies
Wood PLC