Attachment C:

Explanation and Assumptions for the Economic Impact Analysis for NR 140 Cycle 10 (Board Order DG-15-19)

Average annual cost over a 5-year permitting cycle: $3,284,171

Maximum 2-year cost: $9,537,243

The proposed rule establishes new and revised groundwater quality standards in ch. NR 140, Wis. Adm. Code. The proposed amendments to ch. NR 140, Wis. Adm. Code, add 13 new state groundwater quality standards and revise 9 existing standards. In accordance with s. 160.07, Wis. Stats., amendments to ch. NR 140, Wis. Adm. Code, groundwater quality standards for substances of public health concern are based on recommendations from the Wisconsin Department of Health Services (DHS).

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. PFAS includes new public health related groundwater standards for perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). VOCs includes revised public health related groundwater standards for: trichloroethylene (TCE), tetrachloroethylene (PCE), 1,4-dioxane, and 1,2,3-trichloropropane (1,2,3-TCP). Metals/Metalloids includes new public health related groundwater standards for hexavalent chromium and strontium, and revised public health related groundwater standards for: aluminum, boron, molybdenum, and cobalt. Agricultural Chemicals includes new public health related groundwater standards for: thiamethoxam, imidacloprid, clothianidin, isoxaflutole plus isoxaflutole DKN degradate, isoxaflutole BA degradate, thiencarbazone-methyl, glyphosate, glyphosate aminomethylphosphonic acid (AMPA) degradate, and sulfentrazone, and revised public health related groundwater standards for Dacthal that would include the Dacthal Tetrachloroterephthalic Acid (TPA) and Monomethyl tetrachloroterephthalic acid (MTP) degradates. Bacteria includes new public health related groundwater standards for *Escherichia coli* (*E. coli*) bacteria.

The department solicited information and advice from businesses, associations representing businesses, local governmental units, and individuals that may be economically affected by the regulatory programs that use groundwater standards included in this proposed rule. The department received a total of 8 letters with comments. Comments received pointed out specific requirements of ch. 227, Wis. Stat., that must be included in the rule economic impact analysis (EIA). Comments also suggested that:

- there is not a consistent opinion in the scientific community on the health impacts of PFAS, and that different standards for PFAS have been adopted in other places
- numerical PFAS standards could have net benefits that outweigh costs associated with compliance, as reducing exposure to PFAS compounds in drinking water could reduce potential health care treatment costs and associated losses of economic production and income of those impacted
- PFAS standards could have the benefit of reducing PFAS contaminated groundwater that might be used for livestock or irrigation, therefore reducing the likelihood of PFAS ending up in agricultural products and entering the food chain
- economic impacts of reducing the groundwater standard for TCE, including on additional investigation and remedial actions, need to be better defined, and that lowered TCE standards

could have significant economic impacts on small businesses already remediating TCE in groundwater
- economic impacts of reducing the groundwater standard for 1,4-dioxane, including on additional investigation and remedial actions, need to be better defined
- new groundwater standards for PFOS and PFOA could have significant economic effects on small business remediation and redevelopment sites, construction site dewatering activities, land application of wastewater biosolids and solid waste landfills, and that the economic impacts of proposed PFOS and PFOA groundwater standards need to be better defined
- proposed imidacloprid standards should be based on EPA's imidacloprid assessment and current registration review, and that proposed standards could significantly reduce the use of imidacloprid
- groundwater standards for pesticides could have the benefit of protecting Wisconsin pollinators, as pesticide contaminated irrigation water could adversely affect pollinators and non-target insects

In response to comments received, the department has further evaluated costs specifically associated with new and revised groundwater standards in the proposed rule. The department also reviewed its legal authority to address groundwater contamination at specific types of regulated sites. Additional information on the economic impacts of proposed PFOS and PFOA groundwater standards on the land application of wastewater, and wastewater related solids has been included in the rule EIA. Additional information on the economic impacts of proposed revised TCE and 1,4-dioxane groundwater standards has also been added.

1. Per- and Polyfluoroalkyl Substances (PFAS)

The proposed rule includes new public health-related groundwater standards for perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).

1.1. RR regulated release/spill sites

Wisconsin's remediation and redevelopment (RR) program requires responsible parties to take actions necessary to restore the environment from a discharge of a hazardous substance. The definition of hazardous substance is a narrative standard defined in s. 292.01(5), Wis. Stat. Since 2018, the department has regulated PFAS as a hazardous substance, requiring responsible parties to test for 36 PFAS compounds including PFOA and PFOS. When remediating for hazardous substances in groundwater that do not have a ch. NR 140, Wis. Adm. Code standard, responsible parties must propose a site-specific standard, which is usually based on the DHS recommended levels (see s. NR 722.09(2)(b)2., Wis. Adm. Code). When PFOS and PFOA are added to the groundwater standards in ch. NR 140, Wis. Adm. Code, responsible parties will see no change in their cleanup responsibilities. Because the RR program is already regulating these compounds under existing authority as hazardous substances, adding PFOA and PFOS to NR 140 groundwater standards will not add implementation or compliance costs for remediation sites or responsible parties. It may decrease costs for responsible parties, as they will not be required to do additional steps to propose groundwater cleanup standards for PFOA and PFOS.

1.2. Landfills

The department has existing discretion to approve sampling parameters for particular landfills and may "require analysis of additional parameters depending on the characteristics of the waste, the raw process materials used, or the provisions of ch. NR 140." s. NR 507.17(3), Wis. Adm. Code. Thus, the

department's existing authority allows for testing of PFOA and PFOS, regardless of whether the substances are included in NR 140 groundwater standards.

1.3. Pit trench dewatering

Pit trench dewatering is discharged to surface water, not groundwater. Costs for dewatering discharges to surface waters are being considered as part of proposed rule WY-23-19, which adds PFOA and PFOS to Wisconsin's surface water quality standards. Adding PFOS and PFOA to groundwater standards is not expected to add costs for pit trench dewatering projects because, in the department's experience with dewatering projects in urban areas, construction site managers that need to dewater a large site tend to propose to pump large volumes groundwater out of the construction site area and then discharge it to a surface water either directly or through a storm sewer or sanitary sewer. Because the purpose of dewatering projects at construction sites in urban areas is to remove groundwater from an area, the department has not seen, and does not expect to see, a proposed dewatering project where large volumes of PFOS or PFOA contaminated ground water would be immediately discharged back to the groundwater. This would make dewatering ineffective. Small dewatering projects that are low volume that may be temporarily contained and possibly discharged to groundwater are not expected to impact groundwater standards, and the vast majority of dewatering projects small or large are not pumping water contaminated with PFOA or PFOS. The promulgation of a PFOA or PFOS groundwater standard is therefore not expected to have impacts.

1.4. WPDES permitted discharges

Facilities regulated by the department that discharge under a Wisconsin Pollutant Discharge Elimination System (WPDES) permit, are required to comply with state groundwater quality standards in ch. NR 140 Wis. Adm. Code. Under s. 283.31(3) and (4), Wis. Stat., WPDES permits must include terms and conditions that prevent exceedances of groundwater standards. The discharge of waste through a land treatment/application system is considered a potential discharge to groundwater, and therefore a potential discharge to waters of the state. Industrial and municipal wastewater land treatment/application systems are required to be designed and operated to minimize the level of substances in groundwater, to comply with ch. NR 140 groundwater quality enforcement standards (ESs), and to prevent exceedance of ch. NR 140 groundwater quality preventive action limits (PALs) to the extent technically and economically feasible.

WPDES permits are reissued every 5 years. Generally, requirements related to sampling and reducing PFOA/PFOS levels in discharged wastewater would be added to a facility's next reissuance of its WPDES permit and subsequent reissuances. Therefore, the department anticipates that approximately 20% of permitted facilities would be affected every year for the first 5 years after proposed PFOA/PFOS groundwater standards go into effect.

The department anticipates that some municipal and industrial wastewater treatment facilities may have PFOA/PFOS in the liquid wastewater and/or solids, or sludges, discharged under a WPDES permit to the land surface or groundwater through a land treatment/application system. The department has reviewed effluent sampling results in Wisconsin and information compiled by the State of Michigan, to evaluate the possibility that PFOS/PFOA in discharged liquid wastes or solids/sludges might result in the attainment or exceedance of proposed PFOS and PFOA groundwater quality standards. Based on this evaluation, the department has determined that certain categories of industrial facilities are likely to generate or handle liquid or solid/sludge waste that contains PFOS/PFOA, or are likely to be contributing PFOS/PFOA containing wastes to a publicly owned treatment works (POTW).

The department anticipates requiring PFOS/PFOA discharge sampling in WPDES permits for industrial facilities that are likely to generate or handle liquid or solid/sludge waste containing PFOS/PFOA and that discharge through a land treatment/application system or POTW. Although the department has existing authority under the WPDES rules to require, on a case-by-case basis, that a permittee sample for a pollutant that the department believes may be present in a discharge, the promulgation of a PFOA and PFOS groundwater standard may result in more regular monitoring of potential PFOA and PFOS wastewater sources to determine if land application/treatment activities would potentially exceed the PFOA and PFOS groundwater standards.

Whether WPDES permitted facilities must take actions to reduce discharges of PFOS/PFOA depends on the concentration of PFOS/PFOA in their discharge and whether the level of PFOS/PFOA in the discharge has the reasonable potential to attain or exceed proposed standards. Actions may include identifying sources of PFOS/PFOA and implementing feasible measures and best management practices to reduce PFOS/PFOA concentrations in a discharge. For the few facilities in the state where source reduction measures do not sufficiently reduce levels of PFOS/PFOA in their discharge, treatment and/or reduced land application loading may be necessary.

1.4.1. Industrial facilities that discharge liquid wastewater or biosolids through land treatment system (6 facilities total)

The department used data outlined in the Michigan Dept. of Environment, Great Lakes and Energy (EGLE)'s comprehensive study of industrial sources of PFOS in Michigan to identify potential sources of PFOS in Wisconsin.[1] After a review of EGLE's Standard Industrial Classification (SIC) codes of industries with significant PFAS levels, the department identified 18 industrial facilities, from the department's data base of industrial facilities with an individual or general WPDES permit, as potential sources of PFOS/PFOA.

One facility on the list is a paper and packaging manufacturer that has land application outfalls in its WPDES permit, but review of the facility land application data shows that the facility has not land applied sludge for the past 10 years. Therefore, this facility is not expected to be affected by proposed PFOS/PFOA groundwater standards. Three of the facilities on the list primarily handle food processing waste, which the FDA has indicated are not likely sources of PFOA/PFOS. Eight facilities are "waste haulers" that accept municipal biosolids and land apply liquid and/or solid/sludge waste. The department has included these eight industrial facilities in section 1.4.3., which addresses municipal biosolids compliance costs.

Thus, the department anticipates that 6 of the 18 identified industrial facilities, including paper and packaging manufacturers and centralized waste treatment facilities, may be impacted by the proposed PFOA and PFOS standard as they are permitted to discharge liquid and/or solid waste, such as papermill sludge or industrial wastewater, that may contain PFOS/PFOA at levels that may attain or exceed proposed PFOS/PFOA groundwater standards.

As stated above, the department anticipates that approximately 20% of permitted facilities would be affected every year for the first 5 years after proposed PFOA/PFOS groundwater standards go into effect. The department anticipates that these facilities would be required to test for PFOA/PFOS in their effluent 4 times per year.

---

[1] "*Identified Industrial Sources of PFOS to Municipal Wastewater Treatment Plants*" document, dated August 2020.

Unlike most surface water dischargers, land application or land treatment of wastewater is not a continuous discharge activity. The anticipated cost for PFOA/PFOS analysis for a wastewater sample is $600/sample. Source control/reduction measures may be required if sampling indicates that PFOA/PFOS levels are high enough to cause exceedances of groundwater standards.

1.4.1.1. Paper and packaging manufacturers that currently land apply biosolids (5 entities)

Five paper and packaging manufacturers have land application outfalls in their WPDES permits which they currently utilize. Because the land applied waste from these facilities may contain PFOS/PFOA at levels that may attain or exceed the proposed PFOS/PFOA groundwater standards, the department expects to require sampling of the land-applied sludge for PFOS and PFOA 4 times per year. The facility cost for this sampling is estimated to be $600/sample, for a total cost of $2,400 per year for each facility.

1.4.1.2. Centralized waste treatment facilities that discharge industrial liquid waste through an absorption/seepage pond land treatment system (1 entity)

This industrial facility discharges liquid waste to an absorption/seepage pond land treatment system. Because the discharged waste may contain PFOS/PFOA at levels that may attain or exceed proposed PFOS/PFOA groundwater standards, the department expects to require sampling of the liquid waste being discharged to the land treatment system for PFOS and PFOA 4 times per year. The cost to sample is estimated at $600/sample, for a total cost of $2,400 per year.

The department also anticipates requiring this facility to conduct quarterly sampling of groundwater monitoring wells (8 wells anticipated) at their land treatment system site. The cost to sample groundwater for PFOS and PFOA is expected to be $300/sample (current WI State Laboratory of Hygiene (SLH) cost to analyze a water sample for PFOS and PFOA). The total annual cost for quarterly groundwater sampling for PFOS and PFOA is therefore expected to be $9,600.

1.4.1.3. Implementation and compliance costs

Table 1 below summarizes the industrial facilities that the department anticipates will be impacted by the proposed PFOS/PFOA groundwater standards.

Table 1: Number of Industrial Facilities Impacted (that discharge liquid wastewater or solids/sludges through a land application/treatment system)

Industrial facilities that discharge liquid wastewater or solids/sludges through a land application/treatment system	
Paper and Packaging Manufacturers that currently land apply sludge	5
Centralized Waste Treatment Facility that discharges industrial liquid waste through an absorption/seepage pond land treatment system	1
Total	**6**

As discussed previously, the department anticipates that approximately 20% of these entities (1 to 2 entities out of 6) will have their WPDES discharge permit reissued each year. WPDES discharge permits for the impacted facilities that are reissued after the proposed PFOS/PFOA groundwater standards go into effect will require effluent sampling each year over a 5-year period to assess compliance with PFAS standards. Table 2 below presents the assumed permit schedule sequence used for the purpose of this EIA. It is based on the proportions of industry categories presented in Table 1 above.

Table 2: Permitting Schedule for Impacted Industrial Facilities (discharge liquid wastewater or solids/sludges through a land treatment system)

Industrial facilities that discharge liquid wastewater or solids/sludges through a land treatment system						
	Number of Entities	Year 1	Year 2	Year 3	Year 4	Year 5
Paper and Packaging Manufacturers that currently land apply sludge	5	1	1	1	1	1
Treatment Facility that discharges industrial liquid waste through an absorption/seepage pond land treatment system	1	1				
Total	**6**	**2**	**1**	**1**	**1**	**1**

1.4.1.3.1. Costs of Sampling

The sampling cost presented below in table 4 reflects the average sampling cost for each type of industrial facility and the number of entities assumed to be impacted each year in table 2 above. The sampling cost assumes that in any year all entities requiring permit review will sample effluent (and ground water if required). Note, for Paper and Packaging Manufacturers an additional facility would be permitted every year until all 5 are permitted and sampling, but only one treatment facility discharging through an absorption/seepage pond is expected to be required to sample. Therefore, in any year, sampling costs are expected to range between $14,400 and $24,000.

1.4.1.3.2. Costs of potential treatment, best management practices, and responses

In addition to sampling costs, the department must estimate the total number of WPDES permitted facilities that may potentially have levels of PFOA or PFOS in their land applied or land treated wastes that would result in additional facility costs for treatment, best management practices (BMPs), or alternative application methods. To account for the unknown of which type of entity may exceed the groundwater PFOA/PFOS standard in any given year, the department estimated the potential cost for a typical industry in each of the two categories of entities listed in table 1 above.

1.4.1.3.2.1. Potential Compliance Cost 1: Paper and packaging manufacturers that land apply biosolids and exceed groundwater PFOA/PFOS standards

Based on the department's experience, the costs for these facilities to reduce PFOA/PFOS land application loading rates to ensure that PFOA/PFOS groundwater standards are not exceeded includes:

a) Cost of mobilizing and transporting a portion of their sludge meant for their existing land spread area to other land areas to limit PFOA/PFOS loading on existing land. This additional cost is approximately $30,000 per year per entity impacted. This is a 12% - 20% increase in transportation/hauling cost per year.
b) Cost related to soliciting landowners who would be willing to take the sludge and potential costs of obtaining department approval for such new sites. This cost is estimated at approximately $25,000 per facility per year.
c) Cost for consultant, and for modelling of spreading sites, to determine acceptable spreading rates is estimated to be approximately $17,500 per entity per year.

For paper and packaging manufacturing entities that currently land apply sludge, the estimated compliance cost for existing facilities to take actions (reduce PFOA/PFOS land application loading rates by obtaining access to additional application sites/acreage) to comply with PFOA/PFOS groundwater standards is estimated to be $72,500 per entity per year.

1.4.1.3.2.2. Potential Compliance Cost 2: Centralized waste treatment facilities that discharge industrial liquid waste through an absorption/seepage pond land treatment system and exceed PFOA/PFOS groundwater standards

This category of industrial waste treatment facilities would have to install treatment to reduce PFOA/PFOS levels. The likely treatment option for these facilities would be granular activated carbon (GAC) systems. There is only one facility in this category in the state. Using the flow rate of the potential entity that may be impacted (20 gpm), the cost of treatment using a GAC system is presented in table 3 below.

Table 3: Treatment Cost for Centralized Waste Treatment Facility

Annual Treatment Cost for Industrial PFAS Source (20 gpm Facility)		
	1st Year of Operation	Per Year After 1st Year
One-Time Treatment System Installation Cost	$70,000	-
Annual Operational Costs for Installed Treatment (recurring)	$379,852	$379,852
Total	**$449,852**	**$379,852**

1.4.1.3.2.3. Total Cost Scenarios (impacted industrial facilities that discharge liquid wastewater or biosolids through a land application/treatment system)

The following compliance cost range assumes two possible scenarios:

Scenario A: All facilities that require reissuance of its WPDES permit each year do not exceed the PFOA/PFOS groundwater standard (Table 4 below). Sampling cost is the only compliance cost incurred.

Scenario B: At least one facility in each identified industrial category (paper and packaging manufacturers and treatment facilities that discharge through absorption/seepage pond) would be both sampling and

taking action/treatment to reduce PFOA/PFOS in their discharge to assure that proposed PFOA/PFOS groundwater standard are not attained or exceeded in any year.

Table 4 below shows Scenario A, which assumes that none of the potentially impacted facilities would likely exceed PFOA/PFOS groundwater standards, so only sampling would be required. In any year, the maximum and minimum compliance cost ranges between $14,400 - $24,000.

Table 4: Scenario A: Compliance cost of impacted industrial facilities that discharge liquid wastewater or solids/sludges through a land treatment system (sampling only - no likely exceedance of PFOA/PFOS)

Industrial facilities that discharge liquid wastewater or solids/sludges through a land treatment system						
	Maximum Number of Entities Per Year	Year 1	Year 2	Year 3	Year 4	Year 5
Paper and Packaging Manufacturers that currently land apply sludge ($600 * 4 times per year)	1	$2,400	$4,800	$7,200	$9,600	$12,000
Treatment Facility that discharges industrial liquid waste through an absorption/seepage pond land treatment system ($600 * 4 times per year)	1	$2,400	$2,400	$2,400	$2,400	$2,400
Treatment Facility that discharges industrial liquid waste through an absorption/seepage pond - groundwater monitoring 8 wells ($300 * 8 wells * 4 times per year)	1	$9,600	$9,600	$9,600	$9,600	$9,600
Total		**$14,400**	**$16,800**	**$19,200**	**$21,600**	**$24,000**

For Scenario B, it is assumed that two industrial facilities (at least one in each identified category, Paper and Packaging Manufacturers & Treatment Facilities that discharge through absorption/seepage pond) might exceed the PFOA/PFOS groundwater standard in any year. A combination of possible outcomes was compared to identify the minimum and maximum compliance costs in any year, over the first 5 years of the rule.

The combination that yielded the minimum compliance cost per year (sampling plus action/treatment costs in any of the first 5 years) was in the first year of the assumed 5 year permitting cycle (see Table 2). In this year it is assumed that one paper and packaging manufacturing facility and one treatment facility discharging through an absorption/seepage pond would be both sampling and taking action/installing treatment to reduce PFOA/PFOS in their discharge. The total costs then would be: sampling = $14,400 (per Table 4), the cost for a paper and packaging manufacturing facility to take action to reduce PFOA/PFOS land application loading = $72,500, the cost for treatment facility that discharges through an absorption/seepage pond to install and operate a treatment system = $449,852 (per Table 3). The total first year costs, that yielded the minimum compliance cost per year, was then = $536,752.

The combination that yielded the maximum compliance cost per year (treatment and sampling cost in any of the years in the first 5 years) was in the fifth year of the assumed 5 year permitting cycle (see Table 2). In this year it is assumed that five paper and packaging manufacturing facilities and one treatment facility discharging through an absorption/seepage pond would be both sampling and taking action/operating a treatment system to reduce PFOA/PFOS in their discharge. The total year five costs then would be: sampling = $24,000 (per Table 4), the cost for 5 paper and packaging manufacturing facilities to take action to reduce PFOA/PFOS land application loading = $362,500 (5*$72,500), the annual cost for

treatment facility that discharges through an absorption/seepage pond to operate a treatment system = $379,852 (per Table 3). The total fifth year costs, that yielded the maximum compliance cost per year, was then = $766,352.

Table 5: Comparison of estimated compliance cost for industrial facilities that discharge liquid wastewater or solids/sludges through a land treatment system under scenarios A and B

Comparison of Compliance Costs under Scenarios A and B		
	Maximum in any Year	Minimum in any Year
Scenario A: PFOA/PFOS Sampling Costs only	$24,000	$14,400
Scenario B: Total Costs related to PFOA/PFOS	$766,352 *	$536,752 *
Range of Potential Compliance Cost (Total Per Year)	**$14,400 - $766,352 per year**	

*includes sampling costs

1.4.2. Municipal wastewater treatment facilities that discharge treated wastewater through a land treatment/application system (7 facilities total)

The department evaluated municipal wastewater treatment facilities that discharge treated effluent to groundwater through a land treatment/application system. The department queried the internal System for Wastewater Applications, Monitoring, and Permits (SWAMP) for all publicly owned treatment works (POTW) that discharge effluent to groundwater. Based on the results of this query, the department identified 7 POTWs with at least one significant industrial user (SIU) contributing flow to their discharge. Without effluent data to the contrary, the department assumes that these facilities may be discharging wastewater that could potentially cause an exceedance of PFOA/PFOS groundwater standards, and therefore could potentially be impacted by the proposed rule. The department expects that POTWs without an SIU that discharge to groundwater will not be impacted by this rule because department sampling in 2021 of WPDES-permitted facilities found no (0 of 21) POTWs without an SIU had effluent with PFOA and PFOS concentrations exceeding the proposed groundwater enforcement standard of 20 ng/L.

In order to reasonably estimate the potential impacts for municipal wastewater facilities with SIUs, the department evaluated its data for POTWs with a surface water discharge that had at least one significant industrial user and did not have an industrial pretreatment program. Approximately 12% (4 of 33) of the POTWs in this category which were sampled by the department were discharging wastewater effluent above the proposed PFOA/PFOS groundwater enforcement standard. Assuming a similar percentage (12%) applies to the 7 municipal wastewater treatment facilities identified above, only 1 facility is anticipated to be discharging wastewater effluent above the proposed PFOA/PFOS groundwater enforcement standard.

The department anticipates requiring the 7 identified municipal wastewater treatment facilities to sample effluent for PFOS and PFOA for the first two years after their permit becomes effective in order to evaluate the exact concentrations of PFOS and PFOA in the effluent being discharged through the land treatment/application system. Of the 7 facilities, one facility has a surface water outfall as its primary discharge outfall (discharges to their seepage cell only during emergencies) and is therefore included in the surface water quality standard rule EIA and is not included in this EIA. Two facilities discharge at flows greater than 1 million gallons per day (MGD), and four discharge at flows less than 1 MGD. The department expects to require the two facilities with the greater flow to sample every other month

(6x/year), and to require the four facilities with the smaller flow to sample quarterly (4x/year).* The cost to sample wastewater effluent for PFOS and PFOA is estimated to be $600/sample, for a total facility cost of $2,400 - $3,600 per year for the first two years after permit reissuance.

The one facility assumed to be discharging wastewater effluent above the proposed PFOA/PFOS groundwater enforcement standard may be required to sample their land treatment/application system site groundwater monitoring wells for PFOS and PFOA to assess compliance with proposed PFOS/PFOA groundwater standards. The cost to sample groundwater for PFOS and PFOA is expected to be $300/sample (current State Lab of Hygiene cost to analyze a water sample for PFOS and PFOA). Assuming a municipal wastewater treatment facility discharging through a land treatment/application system will have at least 3 land treatment/application site monitoring wells, and be required to sample quarterly, the total annual facility cost for groundwater sampling for PFOS and PFOA is estimated to be $3,600.

The department anticipates that the impacted municipal wastewater treatment facility will identify the source of PFOA/PFOS in its incoming wastewater and require an identified PFOA/PFOS source facility to install treatment before accepting the waste. For the purpose of this EIA, the department assumes that a single industrial source has an average flow rate of 10 gpm (flow rate based on the department's data of potential industrial sources discharging to a POTW). Based on this assumed flow rate, the compliance cost of a granular activated carbon treatment system was estimated as part of the compliance cost for the industry identified as the source of PFOS/PFOA exceedance to the POTW.

Compliance Cost: The department estimates the total compliance cost for this category of entities ranges from $6,000 - $434,126 per year for the municipal waste facility and its industrial user. This compliance cost range takes into account both possibilities, that the potentially impacted facility does not discharge effluent that might potentially exceed the PFOA/PFOS groundwater enforcement standard, and that the entity does discharge effluent that might exceed the PFOA/PFOS groundwater enforcement standard.

If the potentially impacted facility does not discharge effluent with PFOA/PFOS levels that might potentially exceed the PFOA/PFOS groundwater enforcement standard, sampling cost would be the only compliance cost incurred. The department anticipates that wastewater effluent would be sampled 4 times per year for a cost per year of $2,400 (4 * $600/sample), and that groundwater sampling of 3 monitoring wells, 4 times per year would be required, for a cost per year of $3,600 (4 * 3 wells * $300/sample).

If the potentially impacted facility does discharge effluent with PFOA/PFOS levels that might potentially exceed the PFOA/PFOS groundwater enforcement standard, the department anticipates that in addition to sampling costs incurred by the treatment facility, an identified industrial PFOA/PFOS source would have to install treatment to reduce their PFOA/PFOS contribution to the treatment facility's wastewater influent. Those treatment costs are estimated to include a onetime cost of $70,000 to install the treatment system, and annual treatment system operating costs of $358,126 per year.

Tables 6a and 6b below summarize the anticipated compliance cost scenarios for municipal waste facilities and their industrial users.

Table 6a: Compliance Cost for Industrial PFOA/PFOS Source Treatment System (Granular Activated Carbon Treatment)

Annual Treatment System Cost for Industrial PFAS Source (10 gpm Facility)*		
	1st Year of Operation	Per Year After 1st Year
One-Time Treatment System Installation Cost	$70,000	-
Annual Operational Costs for Treatment System (recurring)	$358,126	$358,126
Total	**$428,126**	**$358,126**

*WDNR consulted a number of consultants on treatment cost

Table 6b: Compliance Cost of Municipal Wastewater Treatment Facilities that discharge treated wastewater through a land treatment/application system (includes industrial source treatment to reduce PFOA/PFOS)

Compliance Cost Scenarios		
	Year 1	Per Year After Year 1
Municipal Waste Facility Costs - effluent sampling	$2,400	$2,400
Industrial PFOA/PFOS Source Treatment System Costs	$428,126	$358,126
Groundwater Sampling Costs ($300 * 3 wells * 4 times/year)	$3,600	$3,600
Total Costs (if effluent PFOA/PFOS levels > groundwater standard)	$434,126	$364,126
Total Costs (if effluent PFOA/PFOS levels< groundwater standards)	$6,000	$6,000
Range of Potential Compliance Cost (Total Per Year)	**$6,000- $434,126 per year**	

*WDNR consulted a number of consultants on treatment cost

1.4.3. Municipal wastewater treatment facilities that land apply biosolids and waste haulers that accept municipal biosolids

The management and land application of biosolids is regulated through the WPDES permit program and this subsection of the EIA is based on costs that may be incurred through that permit program. With municipal wastewater treatment plants (publicly owned treatment works or "POTW"), PFOA/PFOS primarily comes into the treatment plant from industrial sources that send wastewater to the plant for treatment. When a POTW treats the wastewater from industries and residences through a mechanical treatment system, it produces both a liquid wastewater that may contain PFOS/PFOA and is subsequently discharged to surface waters, and it also produces a solid or semisolid or semi-liquid sludge referred to as biosolids that is either land applied (pollutants can reach groundwater) or it is sent to another contractor or facility for further treatment, land application, or disposal. The liquid wastewater that is discharged to surface water is addressed in the EIA for the proposed PFOA/PFOS water quality standard rule. This EIA covers costs associated with the recycling or land application of biosolids. The land application of biosolids requires WPDES permit coverage.

Biosolids facilities evaluated within this section of the EIA include the following:

- Publicly owned wastewater treatment works (POTWs) that land apply biosolids including Class B, non-EQ biosolids and provide distribution of EQ biosolids.
- POTWs that dispose of biosolids into a land licensed landfill
- POTWs that send biosolids to POTWs to be further treated
- POTWs that send biosolids to permitted WPDES contractors who mix biosolids with either other biosolids or with other wastes to create a mixture which is later land applied.
- Industrial wastewater treatment facilities that do not meet the biosolids exemption of s. NR 204.02(1)(b)5., Wis. Adm. Code
- WPDES permitted contractors that collect and mix (combine) biosolids with other biosolids and/or with other wastes.

A number of facilities were excluded from this analysis because they either meet exemptions under s. NR 204.02(1)(b)5., Wis. Adm. Code, incinerate their biosolids, or mix biosolids with other regulated wastes. The department does not anticipate these entities will be impacted by this rule because they are unlikely to generate biosolids that contains significant levels of PFOS or PFOA or there is no discharge to groundwater.

1.4.3.1. Permitting and initial detection

Reissued WPDES permits will focus on monitoring wastewater and, if necessary, require activities such as monitoring biosolids should wastewater show it is necessary. If a biosolid sample contains elevated concentrations of PFAS, then a permitted facility that generates or manages biosolids may need to take additional measures to reduce concentrations of PFOS and PFOA, including source identification/reduction, storing biosolids, applying sludge to more acreage, or in some limited situations, finding alternative methods of disposing of biosolids.

As stated above, WPDES permits have five year permit terms. The department reissues approximately 20% of the total number of individual WPDES permits in any given year. This section of the analysis is based on the staggered permit reissuance cycle, which results in staggered costs for permitted facilities throughout the state. The highest estimated costs for two consecutive years over the estimated WPDES permit reissuance schedule is $5,998,733. The average annual cost over the estimated WPDES permit reissuance schedule (9 years) is approximately $1,671,111 (see Table 3).

The department anticipates that municipal wastewater treatment facilities (WWTFs) that have potential industrial contributors of PFAS, or are near a contamination site, may need to sample for PFOA/PFOS in their incoming wastewater. If the incoming wastewater shows no signs of PFOA or PFOS, then treatment in the effluent prior to discharge would not be necessary, and no additional measures to prevent exceedances of a PFOS and PFOA groundwater standard would be needed with regard to the handling and application of biosolids generated at the wastewater treatment facility.

If the incoming sewage has detectable amounts of PFOA or PFOS, then the WWTF would need to assess the appropriate management options by determining if the effluent and biosolids also have detectable levels of PFOA and PFOS. It is likely that many facilities will continue to monitor wastewater and potentially biosolids if there is an indication of PFOS/PFOA impact to the biosolids.

Biosolids monitoring for PFOS/PFOA compounds is necessary for those WWTFs with industrial wastewater contributors that are potential PFOA/PFOS sources and for WWTFs that are located near PFAS contaminated sites to determine potential impacts on biosolids management. Nearly 85 percent of biosolids generated in Wisconsin is beneficially used as a soil amendment and nutrient source through land application and distribution.

1.4.3.2. Assumptions and considerations

1.4.3.2.1. Reduction of PFAS through voluntary measures

The department is aware that source identification of PFAS in wastewater is currently underway at some WPDES permitted facilities and indirect dischargers (that send wastewater to a permitted WWTF) in Wisconsin. In many cases, source reduction measures are already being implemented by these facilities.

1.4.3.2.2. Interim recommendations for land application of biosolids containing PFAS

The department anticipates that the WPDES permit program that regulates the land application of biosolids may propose rules in the future to implement the PFOA and PFOS groundwater standards, as required by s. 160.19, Wis. Stat. For purposes of completing this EIA, the department will evaluate permitted facilities with potential PFOA/PFOS sources that generate biosolids on a case-by-case basis and will include permit terms using existing regulatory statutory authority and interim recommendations until future amendments to administrative rules are promulgated. Future rules are outside the scope and authority of this proposed rule.

The department anticipates it will primarily focus on:

- Sample and analyze biosolids suspected to contain PFAS prior to land application, pursuant to existing authority in s. NR 204.06(2)(b)9, Wis. Adm. Code.
- PFAS analytical results from biosolids sampling will dictate the level of source identification and reduction efforts. While PFAS sources are often associated with industrial manufacturing, other sources, including some commercial businesses have the potential to substantially contribute PFAS loading to WWTFs.
- Communicating PFAS concentrations in biosolids with the landowner and/or farmer receiving biosolids.

At the request of WWTFs in the state, the department is in the process of developing an interim recommendation to help WWTFs evaluate when their biosolids have concentrations of PFOA and PFOS at levels of public health concern. This will help WWTFs determine when it is appropriate to identify/reduce PFAS influent wastewater sources to the plant, and provide factors to consider when land application will not pose public health risks, and provide information for WWTFs to consider as to whether biosolids management procedures should be modified to protect public health (i.e. not cause exceedances of groundwater standards). Modified management procedures may include expanding land application acreage or disposing of biosolids in another manner or implementing additional treatment of biosolids.

1.4.3.2.3. Make-up of WWTFs

The department anticipates that smaller WWTFs that lack a robust pretreatment program may be more likely impacted (i.e. have higher concentrations of PFOA or PFOS in biosolids) from a single industrial or commercial source of PFOA and PFOS sending wastewater to the treatment system compared to larger

WWTFs. This is because larger WWTFs treat larger, more diverse wastewater streams and therefore, the larger WWTFs' higher volume of discharge dilutes the concentration of PFOA and PFOS. A smaller WWTF with a single PFOS or PFOA industrial contributor will discharge a higher concentration on PFOA or PFOS per gallon of wastewater. Also, larger WWTFs often will have economies of scale relating to costs, resulting in less cost per user.

1.4.3.2.4. Number of estimated WWTFs potentially impacted by PFOA and PFOS groundwater standards

In predicting the number of potentially impacted facilities, the department relied on best professional judgment based on information shared between Michigan and Wisconsin, information and samples collected by the department from Wisconsin's WPDES-permitted facilities that have known PFAS issues, and modeling for sites based on statewide application of various inputs related to land application.

1.4.3.3. Recommendations for PFOA and PFOS levels at landspreading sites

The department is developing recommendations for biosolids that contain PFOS and PFOA and are land applied. To determine whether a WWTF permitted facility that generates biosolids containing PFOA or PFOS may land apply the biosolids to a particular field without causing an exceedance of the proposed groundwater standards and posing a public health risk, the department has to model the fate and transport of PFOS and PFOA in biosolids through the soil to groundwater. The department is developing interim recommendations using the United States Environmental Protection Agency PRZM model. The goal of the modeling effort was to ensure that the recommended groundwater enforcement standard level of 20 nanograms per liter (ng/L), or parts per trillion (ppt), for combined PFOA and PFOS was not exceeded. The department's PRZM modelling effort considered PFOS/PFOA chemical soil transport parameters, soil properties, Wisconsin meteorological data, cropping/land use, surface runoff, depth to groundwater, and irrigation impacts.

In addition to the model, the interim recommendations use PFAS data collected by Michigan. In its current drafting stage, the interim recommendations use a screening approach for concentrations of PFOA and PFOS in biosolids that the department may consider on a case-by-case basis when determining whether additional terms and conditions are necessary in a particular permit to protect groundwater. These interim recommendations include a summary list of actions recommended for WWTFs and other biosolids generators for follow up:

- Concentrations of <u>>150 ug/kg PFOA/PFOS combined</u>
    - Designate as industrially impacted biosolids
    - Ongoing sampling of effluent discharge and biosolids
    - Determine sources and implement PFOS/PFOA source reduction
    - Hold biosolids in storage
    - Arrange for alternative treatment or disposal of biosolids
- Concentrations of <u>>50 to <150 ug/kg PFOA/PFOS combined</u>
    - Ongoing sampling of effluent discharge and biosolids
    - Determine sources and implement PFOS/PFOA source reduction

- Reduce land application rates to approximately 1.5 dry tons or less per acre or alternatively submit to the department for approval an alternative risk mitigation strategy in an updated biosolids management plan
- Provide analytical PFOS/PFOA data to landowner and farmer
- Track all land application of biosolids and corresponding concentrations and PFOS/PFOA loadings
- Consider alternative treatment or disposal of biosolids

- Concentrations <u>>20 to <50 ug/kg PFOA/PFOS combined</u>
  - Sample effluent discharge and biosolids
  - Determine sources and implement PFOS/PFOA source reduction
  - In some cases, potentially reduce land application rates to 1.5 dry tons or less per acre or alternatively submit to the department for approval an alternative risk mitigation strategy in an updated biosolids management plan
  - Provide analytical PFOS/PFOA data to landowner and farmer
  - Track all land application of biosolids and corresponding concentrations and PFOS/PFOA loadings
- Concentrations <u><20 ug/kg PFOA/PFOS combined</u>
  - Sample effluent discharge and biosolids for a period of time

On a case-by-case basis using existing statutory and regulatory authority, the department may impose additional conditions or restrictions on land application activities in permits for WWTF or contractors that land apply biosolids if there are elevated levels of PFOA/PFOS in the biosolids that are stored/land applied and it is determined necessary to prevent an exceedance of the PFOA/PFOS groundwater standard. The department, using the model, will take into account the variability of concentrations in the biosolids generated by the permitted facility, the type of soils on the fields used, depth to groundwater, location of nearby water supply sources, etc. when establishing terms and conditions. The department has existing regulatory authority to sample for PFOA/PFOS in chapter NR 204, Wis. Adm. Code, if the department believes it may be present in the biosolids.

1.4.3.4. Cost of implementation and compliance

Biosolids have historically been beneficially used as nutrient sources and as soil amendments. Historically, WWTFs have had to implement pre-treatment measures to ensure the biosolids (end product) are safe for bulk land application. Ensuring that PFOS and PFOA concentrations are minimal within biosolids will require WWTFs to build on their existing pretreatment programs independently and/or through assistance with the DNR.

The department anticipates that if PFOS/PFOA substances are found in their biosolids, WWTFs will demand that generators stop contaminating the WWTF's biosolids products. Many WWTFs are implementing PFAS sampling and source identification programs, as well as working with specific industries and individual generators to implement PFOS/PFOA reduction/elimination from wastewater being treated at the WWTF.

The following provides background information that is helpful to understanding the impact of PFOS/PFOA groundwater standards:

- Each WWTF collects wastewater from a wide variety of sources. While domestic wastewaters (e.g. sewage residences) in communities are somewhat similar from WWTF to WWTF, the industrial contribution to the wastewater collected significantly differs depending upon the characteristics of the industry and the pre-treatment program employed by that WWTF.

- While each WWFT uses similar processes such as preliminary treatment, primary treatment, secondary (biological) treatment, disinfection and some sort of biosolids treatment, WWTFs often have differing equipment and differing sets of circumstances at their location.

- The majority of WWTFs land apply their biosolids as non-EQ (non-exceptional quality) biosolids. Others employ more sophisticated treatment (Class A pathogen treatment) so that the biosolids (referred to as EQ product) can be distributed to the public by selling it as fertilizer (bagged products), selling to contractors and farmers in bulk, and through giveaway programs oftentimes located at their WWTF facilities.

- Farmers in many cases choose to use biosolids for the cost/benefits associated. Free or reduced cost nutrients, organic carbon for soil amendments, and sometimes liming potential, all contribute to a farmer's the acceptance of biosolids on fields. If PFOS/PFOA concentrations in biosolids become an issue for farmers in the future, this may result in fewer farmers accepting biosolids for land application. This may force WWTFs to locate application land further away (increasing transportation and application costs), lease additional land or, in some cases, purchase land. This may occur even if the groundwater standards are not promulgated.

- Predicting trends of PFOS/PFOA concentrations in wastewater, and corresponding trends of PFOS/PFOA concentrations in biosolids, is challenging given the number of wastewater and biosolid samples collected and analyzed to date.

In estimating the cost of PFOA and PFOS groundwater standards for WWTFs, it is important to note that certain assumptions must be made. Conclusions and further assumptions are made using best professional judgement. The purpose of this document is to present best available information at this time so that decision makers can utilize the information moving forward.

1.4.3.4.1. Assumptions and considerations

- PFOS and PFOA have been voluntarily removed from industrial use in the United States for several years, and therefore, significant PFOS and PFOA concentrations in wastewater is primarily a legacy issue and is not expected to be found in significant concentrations at most WWTFs. However, as seen at some Michigan industrial facilities, generators that once discharged wastewater at high levels of PFOS/PFOA continue to discharge wastewater with PFOS/PFOA even after the use of PFOS/PFOA were discontinued. While the discharge has lower concentrations of PFOS/PFOA, these generators are still contributing to PFOS/PFOA being received at WWTFs and potentially impacting biosolids.

- When PFOS/PFOA concentrations in wastewater are higher, it is expected that the biosolids will be impacted as well. Sampling is required to determine the impact PFOS/PFOA has on biosolids.

- The level of PFOS/PFOA concentrations in biosolids will determine if land application can proceed using current practices, or if the land application practices must be modified or if

biosolids need to be stored until additional treatment and/or disposal options are evaluated and implemented.

- It is expected that liquid biosolids impacted by high concentrations of PFOS/PFOA will, in some instances, require dewatering and potentially dedicated storage at the WWTF, or approved offsite storage. Further, it is expected that many options for disposing of biosolids with high concentrations of PFOS/PFOA may require dewatering as a prerequisite to long distance transportation and/or disposal.
- Disposal options could include landfilling or incineration.
- Land application of biosolids at most facilities will likely not require significant modifications if the wastewater and biosolids are shown to have low concentrations of PFOS/PFOA.
- Some facilities may address PFOS/PFOA issues as follows.
    - If farmers decide to no longer accept biosolids onto their lands, WWTFs may have to identify additional fields, contract for the use of these fields, and even purchase lands for land application activities.
    - Some WWTFs may consider abandoning their current land application program and:
        - Landfilling their biosolids;
        - Working with other facilities to incinerate their biosolids;
        - Further treating their biosolids to reduce storage, transportation, and application costs;
        - Require industrial PFAS contributors to pretreat or take source reduction actions, such as removing legacy PFAS contamination (by replacing pipes, treatment systems, etc.) or changing products.
- Once significantly impacted PFOS/PFOA biosolids are treated and/or applied, additional monitoring of wastewater and generated biosolids will be necessary at the WWTF. This continued monitoring is to ensure proper source reductions continue and that newly generated biosolids is not impacted by PFOS/PFOA.
- In some cases, it is expected that WWTFs may not be able to reduce PFOS/PFOA concentrations immediately and will continue to generate biosolids that has PFOS/PFOA concerns. Newly generated biosolids may need to continue to be handled and disposed as significantly impacted PFOS/PFOA biosolids in lieu of land application.
- Modeling assumptions were based on statewide conservative values. An individual WWTF with moderate concentrations may be able to modify the inputs into a modeling program such as PRZM to show that land application may continue unchanged or with slight modifications.
- Data provided to the department to date has shown that the large WWTFs, that generate large amounts of biosolids, appear to not have issues with PFOS/PFOA in their biosolids at this time.
- Mid-sized and smaller WWTFs appear most likely to generate biosolids that is moderately to significantly impacted by PFOS/PFOA. Industrial and commercial dischargers to these WWTFs can significantly impact biosolids concentrations.

1.4.3.4.2. Estimated number of wastewater treatment facilities with contaminated biosolids

According to 2019 department data collected from WWTFs annual reports:

- Approximately 240 WWTFs reported biosolids land application activities.
- Approximately 170 WWTFs reported their biosolids to be hauled to another facility for treatment.
- Approximately 15 WWTFs reported distributing EQ biosolids.
- One facility reported to incinerate biosolids.

Note that the mass of biosolids land applied from facilities can be variable and that not all WWTFs that land apply biosolids will land apply each year. Some WWTFs alternate land application each year. Some WWTFs intermittently land apply and dispose of biosolids based on the type of treatment at the WWTF, such as reed beds and lagoons.

The number of WWTFs that have impacted biosolids were estimated by department biosolids staff using best professional judgement after reviewing data from the department's database, including reviewing wastewater and biosolids data from individual WWTFs, along with extensive discussions with wastewater operators and other wastewater professionals including consultants and other state/federal regulators.

Known PFOA or PFOS contamination*:* To date, Wisconsin has had three WWTFs that have had moderately or more significantly impacted by PFOA or PFOS contamination in their biosolids. One wastewater sewage lagoon system was impacted with AFFF foam from a military installation and two WWTFs were impacted by industrial processes for generating AFFF foam and similar materials.

Last year, the department contacted WPDES permitted WWTFs potentially receiving PFOS/PFOA impacted wastewater and suggested screening of wastewater at the facilities to help identify potential issues and help limit the number of facilities having to deal with PFOS/PFOA impacted biosolids. The department estimates that approximately 14 additional WWTFs will possess biosolids with concentrations of PFOS/PFOA that are "significant" or "moderate", where extensive treatment or more costly disposal methods will be needed.

Potential economic impacts to mid-size and large wastewater treatment facilities*:* Data provided to the department to date shows that larger WWTFs have minimal PFOS/PFOA concentrations in their biosolids. The department anticipates that with robust pretreatment programs there will be few economic impacts to larger WWTFs.

Potential economic impacts to small wastewater treatment facilities*:* The department estimates that biosolids from smaller WWTFs that have an industrial source that has PFOA/PFOS will be impacted by elevated concentrations of PFOS/PFOA because these facilities often do not operate a pretreatment programs, and the size of the WWTF relative to the potential of having a PFOS/PFOA generator/user, makes it likely for additional actions to be required to reduce concentrations of PFOA/PFOS or modification in biosolid management activities. Therefore, the economic impact may be significantly higher for smaller WWTFs with PFOS/PFOA an industrial contributor.

1.4.3.4.3. Additional estimated number of wastewater treatment facilities with contaminated biosolids

***Significantly impacted facilities*:** Based on review of annual biosolids reports and department biosolids experts best professional judgement, the department estimates approximately 4 additional facilities will need to address significant biosolids issues related to PFOS/PFOA. These situations may require additional treatment to the biosolids and/or very specific or highly specialized disposal methods until the industrial contribution of PFOA/PFOS is better controlled or minimized. The department estimates that the WWTF size is limited to small (<100 dry tons per year) or medium sized (100 to <1000 dry tons per year) facilities. If the WWTF desires to land apply after significant source reduction, it is likely that additional sites will need to be secured.

***Moderately impacted facilities*:** Based on review of annual biosolids reports and department biosolids experts best professional judgement, the department estimates that 10 additional facilities will need to address moderate levels of PFOS/PFOA in their biosolids. This could include modifying processes within the WWTF to hold biosolids, blend biosolids, create more storage, acquire more acreage, etc. to provide more time for the WWTF to determine an appropriate treatment/disposal solution. The department estimates that the size of WWTFs with moderate PFOS/PFOA levels in their biosolids is limited to small (<100 dry tons per year) or medium sized (100 to <1000 dry tons per year) facilities. If land application continues from these facilities, additional sites will be required in addition to necessary source reduction measures.

***Low, but impacted facilities*:** Based on review of annual biosolids reports and department biosolids experts best professional judgement, the department estimates that 20 additional WWTF will be impacted with relatively low levels of PFOS/PFOA in their biosolids. Some of these facilities will likely require additional land application sites.

***Low impact*:** Based on review of annual biosolids reports and department biosolids experts best professional judgement, the department estimates that an additional 40 may require periodic wastewater monitoring and potentially need some source reduction.

Table 7 Anticipated Number of WWTFs Impacted

Entity Thresholds	PFOS/PFOA Concentration in Biosolids	Number of WWTFs
SIGNIFICANT	>150 ug/kg	4
MODERATE	150 to >50 ug/kg	10
LOW, BUT IMPACTED	50 to >20 ug/kg	20
LOW	≤20 ug/kg	40

1.4.3.4.4. Total estimated costs for wastewater treatment facilities with PFOA or PFOS contamination

When WWTFs determine through sampling that they have biosolids that contain PFOS/PFOA, each WWTF may be required, on a case-by-case basis, to:

- More frequently monitor biosolids for continued PFOS/PFOA impacts.
- Initiate source identification of PFOS/PFOA in the collection system
- Initiate source reduction and elimination of PFOS/PFOA in the collection system.
- Determine if land application of biosolids can be done in a manner that is cost effective and protective of public health, and if so, further determine the application rates. If application rates dictate, additional lands may need to be required for land application of biosolids.

The department predicts that there would be a greater number of smaller facilities economically impacted, therefore the estimated average costs per facility were adjusted to reflect the greater distribution of smaller WWTFs compared to larger WWTFs in Wisconsin.

Cost of monitor biosolids for PFOA and PFOS: Costs to monitor PFOS/PFOA in biosolids are not included in this EIA because, pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code, the department has existing authority to require a permittee test their biosolids for any pollutant that may endanger public health. Regardless of ch. NR 140, Wis. Adm. Code groundwater standards, the department may require PFOA and PFOS biosolids testing if a permitted WWTF's biosolids are believed to have high levels of PFOS/PFOA.

Source identification: Monitoring and investigative activities that will help identify PFOS/PFOA contributions from industrial dischargers to the WWTF are estimated to range from $25,000 for a very small facility to $250,000 or more for larger facilities.

Source reduction/elimination programs: In some instances, source reduction can be simply identifying the source and asking commercial and industrial facilities to review their inventory of chemicals and requesting changes. In much more complex situations such as a complex industrial process, a specific process or chemical may need to be modified for individual industrial facilities, or legacy PFAS contaminated piping or storage may need to be removed. Where WWTFs collect sewage from much larger areas, many more industries may be impacted. Estimated costs to reduce PFOS/PFOA is $5,000 to $500,000 over a 5-year permit period.

Facilities with low but impacted PFOA or PFOS biosolids: Many WWTFs may have low but impacted PFOS/PFOA concentrations of biosolids. The resulting impacts to the individual WWTF will only likely be limited to land application activities after source identification and limited source reduction measures are taken.

In these situations, WWTFs may need to identify additional land application acreage. In these circumstances it is estimated that 10 percent more acres may be needed. While these acres may not be purchased, but used with cooperation of the landowner, the estimated range of costs is $5,000 to $25,000 per WWTF per year.

Storage and alternative treatment and disposal: Costs for storing biosolids ranges from using existing onsite storage when unused capacity exists to locating offsite storage. Additionally, storage could consist of additional dewatering and storing cake storage. The department estimates storage and/or dewatering to cake biosolids for storage to be $5000 to $250,000 in the first year of storage with a reduction in the following year to a maximum of $100,000.

Costs relating to additional treatment and/or alternative disposal of biosolids, such as in a Type 3 landfill or through incineration, are estimated at between $25,000 to $1,250,000, depending upon the size of the

WWTF, the volume of biosolids impacted, the extent of impacted biosolids and how quickly industry and the WWTF are able to reduce continued PFOS/PFOA sources into the WWTF. Given the high costs of these alternative disposal methods, WWTFs will more likely find other options for management and treatment of PFOS/PFOA contaminated biosolids.

Tables 2 and 3 provide cost ranges and summaries with the following assumptions and determinations:

- The PFOS/PFOA groundwater standards are established relatively soon (months as opposed to years). WPDES permits in queue to be processed will include PFOS/PFOA compliance permit language. It is likely that 6-12 months may elapse between the groundwater standard being established and finally reissuing WPDES permits with terms and conditions to prevent exceedances of the PFOA/PFOS groundwater standards.
- Cumulative costs are provided in Table 8.
- Each year, approximately 1/5 of the total number of WWTF WPDES permits will be reissued. WPDES permits will be reissued based on expiration dates of current WPDES permits. As WPDES permits expire, the permits will then include the new PFAS related sludge requirements.
- POWT's biosolids WPDES permits may include additional PFAS related requirements (PFAS source identification/reduction, biosolids testing, storing and alternative treatment/disposal if PFAS concentration determined to be significant, communication with farmers/landowners, department notification and modification of biosolids management plan), including those permits that currently have limited requirements because the sludge is hauled to a different facility for additional biosolids treatment. The purpose of the additional requirements is to identify potential problems at, or very close to, the source of the PFAS issue.
- The interim recommendations for land application of biosolids containing PFAS will be finalized for WWTFs prior to the next spreading season (Spring/Fall) when biosolids testing dictates. WPDES permitted POTWs asked for these recommendations regardless of whether they will voluntarily used by a POTW, or if the groundwater standard is promulgated, they will be used by the department when considering terms and conditions to include in a WPDES permit on a case-by-case basis to prevent exceedances of the PFOA/PFOS groundwater standard from the land application of biosolids that contain elevated levels of PFOA/PFOS.
- Table 9 breaks estimated costs out over five years for each of the WPDES permit reissuances which are based on five year roll out of reissued permits. The two consecutive years that have the highest costs are predicted in year 5 ($2,951,267), and year 6 ($2,934,000). Estimated costs for two consecutive years is $5,885,267 total across years 5 and 6 (see Table 9).

Table 8. Estimated Cost of Compliance for Each Compliance Category

Compliance Categories	Anticipated Year in Permit cycle	est.* is estimated due to number of facilities that are smaller than larger calculated as: [(high-low)/4+low]			Number of Facilities			
					SIGNIFICANT >150 ug/kg	MODERATE 150 to >50 ug/kg	LOW, BUT IMPACTED 50 to >20 ug/kg	LOW ≤20 ug/kg
		RANGE			4	10	20	40
		low	est.*	high	est.*	est.*	est.*	est.*
Monitor Wastewater	Year 1	500.00	1,166.67	2,500.00	4,666.67	11,666.67	23,333.33	46,666.67
Source Identification	Year 2	2,500.00	85,000.00	250,000.00	340,000.00	850,000.00	1,700,000.00	
Source Reduction/Elimination	Year 3	5,000.00	170,000.00	500,000.00	680,000.00	1,700,000.00	3,400,000.00	
(note, Source Reduction/Elimination Includes capital and operating costs)								
Acquire More Sites	Year 2	5,000.00	11,666.67	25,000.00	46,666.67	116,666.67	233,333.33	
Store Biosolids (Temporary) – Year 3	Year 3	5,000.00	86,666.67	250,000.00	346,666.67	866,666.67		
Store Biosolids (Temporary) – Year 4	Year 4	2,500.00	35,000.00	100,000.00	140,000.00	350,000.00		
Treat/Alt Disposal (One Time)	Year 5	25,000.00	433,333.33	1,250,000.00	1,733,333.33	2,166,666.67		

Table 9: Costs Spaced Over 5 Year Rotating WPDES Permit Renewals w/Cumulative Expenses For Each Year

	COSTS SPACED OVER 5 YEAR ROTATING WPDES PERMIT RENEWALS W/CUMULATIVE EXP FOR EACH YEAR								
	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9
Monitor Wastewater	$17,267	$17,267	$17,267	$17,267	$17,267				
Source Identification		$578,000	$578,000	$578,000	$578,000	$578,000			
Source Reduction/Elimination			$1,156,000	$1,156,000	$1,156,000	$1,156,000	$1,156,000		
Acquire More Sites		$79,333	$79,333	$79,333	$79,333	$79,333			
Store Biosolids (Temporary) Year 3			$242,667	$242,667	$242,667	$242,667	$242,667		
Store Biosolids (Temporary) Year 4				$98,000	$98,000	$98,000	$98,000	$98,000	
Treat/Alt Disposal (One Time)					$780,000	$780,000	$780,000	$780,000	$780,000
Total Cost	$17,267	$674,600	$2,073,267	$2,171,267	$2,951,267	$2,934,000	$2,276,667	$878,000	$780,000

2. VOCs

Proposed amendments to ch. NR 140, Wis. Adm. Code, would add revised groundwater quality standards for: trichloroethylene (TCE), tetrachloroethylene (PCE), 1,4-dioxane and 1,2,3-trichloropropane (1,2,3-TCP).

2.1. Trichloroethylene (TCE)

At all remedial action sites where TCE is present, tetrachloroethylene (PCE) is also present. TCE and PCE are already included in ch. NR 140 Adm. Code standards. The Cycle 10 DHS recommendations and the proposed rule decrease the existing TCE standard and increase the existing PCE standard. Generally, the cost of remediation at a remediation and redevelopment (RR) site is determined more from the cost of

PCE remediation than of TCE remediation. The proposed PCE groundwater standards will yield a cost savings for responsible parties at sites where TCE and PCE are present. However, the department anticipates certain specific TCE related costs at remedial action sites.

2.1.1. Open RR sites

2.1.1.1. Site investigation costs

The department evaluated potential additional site investigation costs associated with the proposed TCE groundwater standards for open, active RR sites where TCE is a contaminant of concern. There are 517 open, active RR sites with TCE tracked as a contaminant of concern. Depending on the site conditions, a responsible party is tasked with defining the degree and extent of contamination. In a minority of RR sites with larger amounts of TCE in the groundwater, additional wells may be necessary to define the degree and extent of contamination.

The department is using a conservative estimate that 25% of the 517 active open TCE sites (129 sites) will need additional monitoring wells and monitoring to complete a site investigation. Assuming an additional 3 monitoring wells at 20-foot depth are necessary at each site, at $4,000 per monitoring well for installation, with 8 rounds of sampling efforts and labor amounting to $4,800 per well, the total cost per site would be $26,400. For the estimated 129 sites, the total cost is $3,405,600. Assuming the average RR site takes 15 years to complete cleanup, the average per year cost is $227,040.

2.1.1.2. Remedial action costs

The most common actions to address TCE contamination include installation of a vapor mitigation system and in situ remediation at the source. Regarding vapor mitigation systems, there will be no added costs per year because entities are already installing these systems where required. Regarding the in-situ source reduction, some sites will incur more upfront costs for treatment chemicals to implement the remedy over a longer period.

The department is using a conservative estimate that 25% of the 517 active open TCE sites (129 sites) will need additional source reduction or in-situ remediation. An average cost for a TCE remedy is approximately $200,000 (using data from the Dry Cleaning Environmental Fund grant program sites). Assuming conservatively that the lower TCE groundwater standard increases the costs of in-situ remediation by 15% at the 129 TCE sites, the cost is approximately $3,870,000. Assuming the average remedial action cleanup takes 15 years, the average per year cost of these additional remedial action costs is $258,000.

2.1.2. Closed RR sites

2.1.2.1. Number of sites that would be reopened

The department evaluated the potential costs associated with reopening closed sites. Section NR 727.13(1), Wis. Adm. Code allows the department to require additional response actions, including monitoring, for any case which has previously been closed by the department if information regarding site or facility conditions indicates that contamination on, or from, the site or facility poses a threat to public health, safety, or welfare, or the environment. If new information like groundwater sampling results are shared with the department, it may consider reopener criteria and exercise discretion to re-open or not re-open a case.

Of the 27,863 closed sites tracked by the RR database, only 132 sites (0.47%) have been reopened in the history of the program. And of the 27,863 closed sites, 754 had TCE. Only10 sites (0.034%) in the history

of the program have been reopened due to the presence of TCE. Of the 754 TCE closed sites, approximately 4 RR sites would be reopened using the general reopener rate (.0047 reopener rate x 754 closed sites), or approximately 0 RR sites would be reopened if we use the TCE rate (.000359 reopener rate x 754).

2.1.2.2. Cost for reopened sites

Assuming the conservative estimate of 4 reopened RR sites, all 4 would require additional site investigation work. The department assumes that only 1 of the 4 (25%) would need additional source reduction or remedial action work. The estimated costs for 4 reopened sites is $ 135,600 ((4 sites x $26,400 additional investigation cost/site) + (1 site x $30,000 additional source reduction/remedial action costs/site)). Additional site investigation and additional source reduction/remedial action would not be expected to all be implemented in the same year. Assuming the average remedial action cleanup takes 15 years, the maximum per year cost of additional site investigation and additional source reduction/remedial action work is $9,040.

2.1.3. New RR sites

Because TCE is already included in the NR 140 groundwater standards, the department does not anticipate more new sites because of the proposed lower TCE groundwater standards, beyond the number RR sites estimated to be opened under the existing standards. The department anticipates that the lower TCE groundwater standards will not require additional site investigation because new RR sites may use existing techniques to monitor for the lower level of TCE over the same area.

As stated above, the department estimates source reduction or remedial action to cost an additional $30,000 for in-situ remedies. The department averages 165 new sites per year based on a five-year average. Assuming conservatively that 20% of the 165 new sites have TCE, there will be 33 new RR sites with TCE, with a total cost of $990,000 attributable to the lower TCE groundwater standard. Assuming a 15 year average to close an RR site, the cost will be $66,000 per year.

Table 10: Summary of TCE Compliance Cost

Cost Category	Number of Sites	Total Cost Over 15 Years	Average Cost Total Cost Per Year
Estimated re-opened R&R TCE sites that will require additional site investigation (Conservatively assumed 100% of RR Reopen rate)	4	$105,600.00	$ 7,040.00
Estimated re-opened R&R TCE sites that may require additional source reduction or remedial action (Conservatively assumed 25% of RR Reopen rate)	1	$ 30,000.00	$ 2,000.00
Estimated opened R&R TCE sites that require additional site investigation (Conservatively assumed 25%)	129	$ 3,405,600.00	$ 227,040.00
Estimated opened R&R TCE Sites that may require additional source reduction or remedial action (Conservatively assumed 25%)	129	$ 3,870,000.00	$ 258,000.00
Estimated additional cost to future R&R TCE Sites (Potential Increase in Source Control Cost)	33	$ 990,000.00	$ 66,000.00
Total		**$ 8,401,200**	**$ 560,080**

2.2. 1,4-Dioxane

2.2.1. Open RR sites

There are 627 open RR sites associated with chlorinated solvents and TCE. In a 2012 United States Air Force study evaluating associations of contamination with chlorinated solvents, 17% of all remedial

action sites associated with TCE and chlorinated solvents were associated with 1,4-Dioxane. This percentage is a conservative value for remedial action sites in Wisconsin. Based on this study, the department estimates that approximately 107 open RR sites involve 1,4-Dioxane.

2.2.1.1. Site investigation costs

For site investigations, most responsible parties can determine the degree and extent of contamination for 1,4-Dioxane without increasing the number of monitoring wells already necessary for a particular RR site. The department conservatively estimates 25% of open RR sites (26 sites) with 1,4-Dioxane will need additional wells and monitoring to complete a site investigation. An additional 3 monitoring wells at 20-foot depth will cost $4,000 per monitoring well for installation, with 8 rounds of sampling and labor, totaling $4,800 per well. Three monitoring wells at 26 sites will cost approximately $686,400. The average RR site cleanup takes 15 years, so the average per year cost of the additional site investigation costs is $45,750.

2.2.1.2. Remedial action costs

The department expects the most common remedy for a 1,4-Dioxane remediation to be in-situ or ex-situ chemical oxidation. Some sites will incur additional treatment costs related to increased volume of chemical oxidation materials and costs related to additional applications necessary to achieve the lower clean up levels. Using an estimate of 25% of the active open 1,4-Dioxane RR sites, 26 sites will need additional remediation. Assuming an average cost for a 1,4-Dioxane remedy is approximately $200,000 and that the new 1,4-Dioxane groundwater standards increase the costs of remediation by 15% at these 26 RR sites, the added cost is approximately $780,000. Assuming the average RR site cleanup takes 15 years, the average per year cost is $52,000.

2.2.2. Closed RR sites

2.2.2.1. Number of reopened RR sites

The department evaluated the potential costs associated with reopening closed sites. Section NR 727.13(1), Wis. Adm. Code allows the department to require additional response actions, including monitoring, for any case which has previously been closed by the department if information regarding site or facility conditions indicates that contamination on, or from, the site or facility poses a threat to public health, safety, or welfare, or the environment. If new information like groundwater sampling results are shared with the department, it may consider reopener criteria and exercise discretion to re-open or not re-open a case.

Of the 27,863 closed RR sites tracked by the RR database, only 132 sites (0.47%) have been reopened in the history of the program. There are 0 sites in the history of the program have been reopened due to the presence of 1,4-Dioxane.

Based on the 2012 United States Air Force study evaluating associations of contamination with chlorinated solvents, 17% of all remedial action sites associated with TCE and chlorinated solvents are assumed associated with 1,4-Dioxane. This percentage is a conservative value for remedial action sites in Wisconsin. Of the 27,863 closed RR sites, the department estimates that 2,679 are associated with TCE and chlorinated solvents, therefore 455 closed case are estimated to be associated with 1,4-Dioxane (2,679 sites x 17%). Applying the 0.47% reopener rate described above to these 455 closed RR sites, 2 sites would be reopened due to the lower 1,4-Dioxane groundwater standard.

2.2.2.2. Cost of reopened RR sites

Assuming that the 2 RR sites that will be reopened will both require additional site investigation work but that only 1 of the 2 (50%) would need additional source reduction or remedial action work, the estimated costs for 2 reopened RR sites is $82,800 ((2 sites x $26,400 additional investigation cost/site) + (1 site x $30,000 additional source reduction/remedial action costs/site)). Additional site investigation and additional source reduction/remedial action would not be expected to all be implemented in the same year. Assuming the average remedial action cleanup takes 15 years, the maximum per year cost of additional site investigation and additional source reduction/remedial action work is $5,520.

2.2.3. New RR sites

Because 1,4-Dioxane is already included in the NR 140 groundwater standards, the department does not anticipate more new sites because of the proposed lower TCE groundwater standards, beyond the number RR sites estimated to be opened under the existing standards.

The department anticipates that the lower 1,4-Dioxane groundwater standards will not require additional site investigation because new RR sites may use existing techniques to monitor for the lower level of TCE over the same area.

As stated above, the department estimates source reduction or remedial action to cost an additional $30,000 for in-situ remedies. The department averages 165 new sites per year based on a five years of data. Assuming conservatively that 10% of the 165 new sites have 1,4-Dioxane, there will be 17 new RR sites with 1,4-Dioxane, with a total cost of $510,000 attributable to the lower 1,4-Dioxane groundwater standard. Assuming a 15 year average to close an RR site, the cost will be $34,000 per year.

Table 11: Summary of 1,4-Dioxane Compliance Cost

Cost Category	Number of Sites	Total Cost Over 15 Years	Average Cost Total Cost Per Year
Estimated re-opened R&R 1,4-Dioxane Sites that may Require Additional Site Investigation (Conservatively assumed 100% of RR Reopen rate)	2	$ 52,800.00	$ 3,520.00
Estimated Re-Opened R&R 1,4-Dioxane Sites that may Require Additional Source Reduction or Remedial Action (Conservatively assumed 50% of RR Reopen rate)	1	$ 30,000.00	$ 2,000.00
Estimated Opened R&R 1,4-Dioxane Sites that may Require Additional Site Investigation (Conservatively assumed 25%)	26	$ 686,400.00	$ 45,760.00
Estimated Opened R&R 1,4-Dioxane Sites that may Require Additional Source Reduction or Remedial Action (Conservatively assumed 25%)	26	$ 780,000.00	$ 52,000.00
Estimated Additional Cost to Future R&R 1,4-Dioxane Sites (Potential Increase in Source Control Cost)	17	$ 510,000.00	$ 34,000.00
Total		**$2,059,200.00**	**$137,280.00**

3. Metals/Metaliods

Proposed amendments to ch. NR 140, Wis. Adm. Code, would add new groundwater quality standards for: hexavalent chromium and strontium, and revised groundwater quality standards for: aluminum, boron, molybdenum, and cobalt.

3.1. Hexavalent chromium

Wisconsin's RR program requires responsible parties to take actions necessary to restore the environment from a discharge of a hazardous substance. The definition of hazardous substance is a narrative standard defined in s. 292.01(5), Wis. Stat. According to s. NR 722.09(2)(b)2, Wis. Adm. Code, for evaluating groundwater for hazardous substances at a remedial action cleanup, responsible parties may utilize a recommended ch. 140 standard from Wisconsin DHS if no ch. NR 140 standard exists.

The RR program is already regulating hexavalent chromium as a hazardous substance and responsible parties are currently able to cleanup to these recommended values. Therefore, adding hexavalent chromium to NR 140 groundwater standards will not create implementation or compliance costs for remediation sites or responsible parties.

3.2. Aluminum boron, molybdenum, and cobalt

Review of existing groundwater standards for the metals/metalloids aluminum, boron, molybdenum, cobalt, and barium was requested because these inorganic substances are associated with coal combustion residuals (CCR). Revised groundwater quality standards were recommended by DHS for aluminum, boron, molybdenum, and cobalt. The department does not expect significant economic impact related to revised groundwater standards for these substances.

Required sampling parameters and frequency under ch. NR 507, Wis. Adm. Code, for CCR landfills will not change as a result of revised groundwater standards for aluminum, boron, molybdenum, and cobalt, as the department will not require additional sampling for these substances. The department does not expect required site remediation costs to change significantly, as remediation costs for sites are based on a number of factors in addition to groundwater quality standards.

4. Agricultural Chemicals

Proposed amendments to ch. NR 140, Wis. Adm. Code, would add new groundwater quality standards for the agricultural pesticides and pesticide degradation products: thiamethoxam, imidacloprid, clothianidin, isoxaflutole, isoxaflutole DKN degradate, isoxaflutole BA degradate, thiencarbazone-methyl, Dacthal TPA and MTP degradates, glyphosate, glyphosate aminomethylphosphonic acid (AMPA) degradate, and sulfentrazone.

The creation of a groundwater standard under ch. NR 140, Wis. Adm. Code, does not compel any end user of a pesticide to change their existing use patterns or application rates. Based on this information, it is difficult for the department to determine the economic impact of these rule changes on agricultural and commercial/residential users of pesticides. Uses and application rates for pesticides are determined by the U.S. Environmental Protection Agency (EPA) and the pesticide registrant through the EPA's Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 3 labeling process.

The creation of groundwater standards under ch. NR 140, Wis. Adm. Code, does not affect labels for any pesticides included in this proposed rule. Consequently, any changes in use patterns that might result from promulgation of the proposed groundwater standards would only occur through voluntary changes in use. It is difficult to estimate how many end users of these pesticides might change their use patterns, but it is likely that some end users may voluntarily do so out of concern for water quality.

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) samples for agricultural pesticides in groundwater in field edge monitoring wells and in private water supply wells. DATCP has detected most of the agricultural chemicals for which new groundwater quality standards

are proposed in field edge monitoring wells and, to a much lesser extent, in private water supply wells. Except for imidacloprid, all detected concentrations for the pesticide compounds in this rule have been less than their DHS recommended Preventive Action Limits (PALs).

DATCP sampling programs collect and analyze samples from private wells statewide on an annual basis to meet the requirements of ch. 160, Wis. Stat. DATCP anticipates an increase in the number of private drinking well samples it will collect in response to the proposed rule. Under its sampling programs, whenever a sample from a private well exceeds an Enforcement Standard (ES) for a pesticide, DATCP returns to collect a verification sample. Once the ES exceedance has been verified, DATCP collects additional samples from homes near the impacted well to assess the extent of the impact and to evaluate a response action and any administrative controls that may be necessary to regain compliance with the ES in the area effected. DATCP estimates collection and analyses of an additional 10 samples annually for the compound imidacloprid following promulgation of the proposed rule, at a cost to the state of $2,660 per year. DATCP assumptions related to this cost estimate are: 2 hours of staff time per sample, at $52 per hour labor with fringe (2h)($52)(10s/yr) = $1,040/yr; travel and equipment expenses of $12 per sample ($12)(10s/y) = $120/yr; DATCP Bureau of Laboratory Services (BLS) cost of $150 per sample ($150)(10s/y) = $1,500/yr.

DATCP BLS currently analyzes water samples for the agricultural chemicals for which new groundwater quality standards are proposed and would not need to develop new test methods. BLS does not provide public testing services. DATCP intends to absorb the anticipated increase in cost within its existing segregated fund spending authority. This will be accomplished through a realignment of other sampling work.

5. 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. Groundwater quality standards currently exist in ch. NR 140 for total coliform bacteria. The department does not anticipate significant economic impacts related to establishing groundwater quality standards for *E. coli* bacteria. Any exceedance of standards for *E. coli* bacteria would already be an exceedance of existing total coliform bacteria standards.