Fiscal Note for Proposed Adoption of 15A NCAC 02B .0513 and 02H .0924

Rule Citation: 15A NCAC 02B .0513 and 15A NCAC 02H .0924

Rule Topic: 1,4-Dioxane Monitoring and Minimization

Agency: Environmental Management Commission (Water Quality Committee)

DEQ Division: Division of Water Resources

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Impact Summary:

State government	☒	G.S. 150B-21.4(a)
Local government	☒	G.S. 150B-21.4(b)
Private sector	☒	G.S. 150B-19.1(e)
Substantial economic impact (*costs + benefits)*	☒	G.S. 150B-21.4(b1)

Threshold Summary:

Required by federal law or to comply with a federally delegated state program?	☐	G.S. 150B-19.4(c) G.S. 150B-21.3(b3)
Aggregate financial cost $1M/5YR	☒	G.S. 150B-19.4(a)
Aggregate financial cost $10M/5YR	☒	G.S. 150B-19.4(b)
Aggregate financial cost $20M/5YR	☒	G.S. 150B-21.3(b3)

Authority: G.S. 143-215(a); 143-215.1(a); 143-215.1(b); 143-215.1(c); 143-215.3(a)(1); 143-215.3(a)(2); 143-215.3(a)(14); 143-215.6A; 143-215.6B; 143-215.6C; 143-215.65; 143-215.66; 143-215.67; 143-215.69

Necessity: Rules 15A NCAC 02B .0513 and 15A NCAC 02H .0924 are intended to achieve key objectives set forth by the EMC for a state-wide rule aimed to monitor and minimize 1,4-dioxane discharges. These updated rules and fiscal note specifically address comments received from OSBM after reviewing the submission that targeted all permittees regardless of their association with 1,4-dioxane. This document addresses OSBM's specific concerns and contains updates rules that require (1) monitoring for the presence of 1,4-dioxane in discharges from targeted industrial NPDES dischargers and their associated indirect dischargers (i.e., SIUs) known to be associated with 1,4-dioxane industry types, and (2) development of minimization plans for affected entities that identify approaches to reduce 1,4-dioxane (where applicable) discharges directly or indirectly to surface waters.

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Abbreviations

Abbreviation	Term
BMP	Best management practice
DEQ	Department of Environmental Quality
DWR	Division of Water Resources
EMC	Environmental Management Commission
EPA	U.S. Environmental Protection Agency
IUs	Industrial Users
µg/L	Micrograms per liter
NAICS	North American Industry Classification System
NC	North Carolina
NCAC	NC Administrative Code
NCGS	North Carolina General Statutes
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly owned treatment works
PQL	Practical Quantitation Limit
PV	Present Value
SIC	Standard Industrial Classification
SIUs	Significant Industrial Users
UCMR 3	Third Unregulated Contaminant Monitoring Rule
WQC	Water Quality Committee

I. Reason for Rule Adoption

1,4-dioxane is an organic synthetic chemical that has been used as a stabilizer of chlorinated solvents and as a solvent in specialized industrial processes rather than across broad sectors of the economy. Because its use is limited to specific applications, the compound is not expected to be widely present across all industries or facilities in North Carolina. Examples of products historically associated with 1,4-dioxane include pharmaceuticals, rubber, plastics, paints, and adhesives. This chemical can also be found in lesser amounts as a by-product in consumer products such as laundry detergents, personal care products, and cosmetics.[1] 1,4-dioxane may enter the environment where it is produced or used as a solvent through discharges to surface water and groundwater.[2] Scientific studies have shown that exposures to 1,4-dioxane may be linked to harmful human health effects such as liver and kidney toxicity and may increase the risk of the development of cancer in humans.[3,4,5] A groundwater quality standard for 1,4-dioxane has been established in by the Environmental Management Commission in North Carolina in 1989 based on potential health effects.[6]

The rationale for this proposed rule adoption is to support the state's commitment towards understanding and characterizing the extent of 1,4-dioxane levels from NPDES dischargers. The EMC has prioritized and committed to taking the first steps towards understanding the sources and levels of 1,4-dioxane and promoting voluntary actions by affected entities to reduce these discharges to the environment. The Environmental Management Commission's (EMC) Water Quality Committee (WQC) passed the following motion in March 2025: "*The committee direct[s] DEQ staff to complete the 1.4-dioxane rule as discussed today for monitoring and minimization plan and the associated regulatory impact analysis and bring that to the committee at the May meeting for our approval to send to the EMC*." These proposed rules and Fiscal Note are intended to meet this directive. The initial draft rule framework focused on requiring NPDES POTWs with pretreatment programs (receiving discharges from SIUs associated with 1,4-dioxane), industrial direct dischargers, and significant industrial users (SIUs) to conduct baseline monitoring. In the review of the fiscal note, OSBM noted that these rules "*do not fully meet these principles and that the accompanying fiscal note lacks the necessary analysis and documentation to support certification*" and specifically noted the following:

- Reduce compliance burdens while still achieving the stated regulatory objectives in a more cost-effective manner,
- Adequately justify the preferred approach relative to proposed alternatives, and
- Justification why additional data is needed beyond what is currently available.

In response to these comments, this revised document retains the intent of the Water Quality Committee's request but makes the following key changes:

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[1] Interstate Technology and Regulatory Council (ITRC)
[2] North Carolina Collaboratory Legislative Report
[3] North Carolina Collaboratory Legislative Report
[4] https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/final-risk-evaluation-14-dioxane
[5] https://wwwn.cdc.gov/TSP/PHS/PHS.aspx?phsid=953&toxid=199
[6] 15A NCAC 02L .0202 Groundwater Quality Standards

- Remains a statewide request
- Targeted focus on 1,4-dioxane as opposed to requiring every permittee and SIU to conduct baseline sampling.

A. Prevalence of the 1,4-Dioxane in NC Surface Waters

Results from the U.S. EPA's Third Unregulated Contaminant Monitoring Rule (UCMR 3[7]) sampling efforts indicated the presence of 1,4-dioxane in North Carolina with elevated concentrations in drinking water supplies in the Cape Fear River Basin. DWR proceeded to conduct instream ambient monitoring to further examine the prevalence of 1,4-dioxane in surface waters across the state. Table 1 summarizes monitoring results and reports the number of stations sampled, the number of detections and non-detections, as well as the minimum and maximum concentrations reported. Table 1 summarizes ambient monitoring results for all 17 NC river basins from 2017 through 2024. Three river basins, the Cape Fear, the Neuse and the Yadkin-Pee Dee had detections, with the most elevated detections and maximum detection level of 1,000 µg/L (1,000,000 ppt) reported in the Cape Fear River Basin. Noting that the remaining basins that were tested showed non-detects in areas sampled.

The Division of Water Resources (DWR) continues to monitor surface waters in NC for 1,4-dioxane, with results annually reported to the EMC WQC and updated data posted online (Cape Fear River Basin 1,4-Dioxane Wastewater Discharge Data).

Table 1. All NC Basins 1,4-Dioxane results (µg/L), November 2017 – December 2024

Basin	# Stations	# Results	# Nondetects	% Detects	Minimum	Maximum
Broad	5	44	44	0	<1	<1
Cape Fear	61	1546	1003	35	<1	1000
Catawba	16	89	89	0	<1	<1
Chowan	1	9	9	0	<1	<1
French Broad	11	69	69	0	<1	<1
Hiwassee	3	12	12	0	<1	<1
Little Tennessee	13	65	65	0	<1	<1
Lumber	3	16	16	0	<1	<1
Neuse	33	494	493	0.2	<1	1
New	3	23	23	0	<1	<1
Pasquotank[+]	0	0	No data	No data	No data	No data
Roanoke	13	82	82	0	<1	<1
Savannah^	0	0	No data	No data	No data	No data
Tar-Pamlico	4	25	25	0	<1	<1
Watauga	1	6	6	0	<1	<1
White Oak	4	17	17	0	<1	<1
Yadkin-Pee Dee	51	859	826	3.8	<1	12

[+]Pasquotank River Basin will be sampled May-September 2025

^Savannah River Basin was not sampled and it should be noted that there are no Significant Industrial Users in that basin

[7] UCMR3 is the most current monitoring campaign that included 1,4-dioxane - https://tinyurl.com/cwyvsuhd

DWR's NPDES Permitting Unit currently adds 1,4-dioxane monitoring to industrial direct discharge permits as they are renewed, if they are known to discharge 1,4-dioxane, or if they have an SIC code or Toxics Release Inventory (TRI) information identifying that it could be a possible source of 1,4-dioxane. In addition, the permitting staff add 1,4-dioxane monitoring to POTW's that have Significant Industrial Users (SIUs) that are possible sources based on SIC and TRI information as well. Currently about 73 NPDES wastewater facilities are monitoring for 1,4-dioxane. To date, the most elevated levels of 1,4-dioxane discharged from direct or indirect (SIUs) industrial facilities have been from industries located in the Cape Fear River Basin. Regulating these discharges has been difficult given current litigation over the 1,4-dioxane state narrative standard.

II. Proposed Rules

The proposed rules are intended to achieve two key objectives:

1. Characterize the presence of 1,4-dioxane in discharges from direct industrial NPDES dischargers (individual and POTWs) outlined in the rules and their associated indirect dischargers (i.e., SIUs going to POTWs with pretreatment programs) for industries known to be associated with 1,4-dioxane use.

2. Require affected entities (industrial direct dischargers and SIUs that are discharging 1,4-dioxane) to develop and implement minimization plans that identify approaches to reduce 1,4-dioxane discharges directly or indirectly to surface waters

These rules require POTWs and industrial direct dischargers to report their monitoring data and minimization activities (where applicable) directly to DEQ. Minimization efforts and activities implemented by the SIUs will be reported in the associated POTW's annual pretreatment report. This information will be made available to the public through a dedicated website maintained by the Department. This website will show aggregated results for each industrial direct discharger and POTW (including SIU information as reported in the POTW's pretreatment annual report). These rules also establish a process that allows a facility to demonstrate that 1,4-dioxane detected in its discharge originate from its intake water (when the levels in the intake water are comparable to those found in the facility's discharge) rather than from the facility's own industrial processes. The effect of 1,4-dioxane present in the intake will be considered on a case-by-case basis at the request of the facility.

B. NPDES Schedule for Implementing Proposed 1,4-Dioxane Minimization Rules

Based on the rule making process, these rules could be effective as early as July 2026. Considering requirements outlined in the proposed rule, the following timeline is projected (Table 2). Since each minimization plan must be updated every two years, the overall period used to determine the fiscal impacts of these rules are selected to be 2026 to 2031.

Table 2. Summary of Rule Implementation Process and Projected Timeline

Rule Implementation Process	Timeline
Rule Effective Date	July 2026
Notification of Baseline Sampling (60 days from effective date)	Sep 2026
Start Baseline Monitoring (within 3 months of notification)	Dec 2026
End Baseline Monitoring (sample quarterly for one year)	Dec 2027
Control Authority receives all baseline monitoring data (within one month of last sample)	Jan 2028
Notification of Ongoing Monitoring and Minimization Plan requirement (within 120 days of receiving all baseline monitoring data)	Apr 2028*
Start Minimization Plan Development	Apr 2028*
Start Ongoing Monitoring (start within 3 months of notification; ongoing semi-annually)	Jul 2028*
Submit Minimization Plan for Review (within 180 days of notification)	Oct 2028*
Minimization Plan Approval (within 120 days of receipt of complete plan)	Feb 2029*
Start Minimization Plan Implementation (within 120 days of plan approval)	Jun 2029*

*Facilities with historical data documenting 1,4-dioxane in discharges above the lowest reportable concentration will move directly to developing a minimization plan and complete the starred tasks approximately 18 months prior to the dates in Table 2.

III. Estimating the Fiscal Impacts

An agency must prepare a regulatory impact analysis for permanent rule changes as required by G.S. 150B-21.4. The purpose of conducting a regulatory impact analysis is to improve rule design, inform decision-makers, and communicate with the regulated community and the public. These analyses identify, describe, and quantify the expected effects of the proposed rule changes to the greatest extent possible. This section discusses the fiscal impacts of implementing the 1,4-dioxane monitoring and minimization rules aimed to determine the presence of 1,4-dioxane in industrial wastewaters discharging to POTWs/Municipality facilities and industrial individual NPDES permittees discharging directly to surface waters for 1,4-dioxane Toxic Release Inventory associated industry types. The fiscal impacts of this rule were estimated through a systematic approach that included the following steps:

- Identification of potentially affected permittees and related sources
- Evaluation of 1,4-dioxane data for each permit and related sources to determine the potential for needing continuous monitoring and development of a minimization plan
- Determination of costs for monitoring, minimization plan development, and minimization plan implementation and ongoing compliance
- Projection of fiscal impacts for private (i.e., industries) and public entities (i.e., local and state government).
- Review of potential impacts to DEQ program from proposed rules including understanding qualitative analysis of impacts to human health and other applicable benefit categories.

C. Potential Impacts to DEQ Programs from Proposed Rules

1. NPDES Discharge Individual Permits

The proposed rules state that the following permit programs will be required to conduct monitoring and develop minimization plans for 1,4-dioxane if they are associated with 1,4-dioxane associated industry type as outlined by EPA's TRI program: (1) POTWs with local pretreatment programs (monitor only), (2) industrial direct dischargers with an individual NPDES permit (majors and minors), and (3) SIUs. The proposed rules also specify the types of permit programs not required to monitor for 1,4-dioxane and develop minimization plans (i.e., one-hundred percent domestic wastewater treatment plants, water treatment plants with an individual NPDES permit, seafood processing or aquaculture facilities with an individual NPDES permit, and NPDES facilities with General Permits). The associated TRI industry types required to monitor along with the permit types not required to monitor for 1,4-dioxane are outlined in the rule text.

Other permitting programs not expected to be impacted include:

- General NPDES Permits for Industrial Stormwater Dischargers - Since this rule focuses on process wastewaters containing 1,4-dioxane the intent of the rule is not to target general NPDES for Industrial Stormwater Dischargers. Therefore, these entities would not be required to sample and develop a minimization plan as a result of the proposed rules
- DWR Non-Discharge and Animal Feeding Operations - These programs do not discharge wastewater to surface waters. Wastewaters from these facilities are applied to land.
- DWR Ambient Monitoring Program - DEQ does not anticipate any changes to the ambient monitoring program from the proposed rules.

D. Affected Sources

The proposed rules specifically outline requirements for direct and indirect dischargers and specify the affected NPDES permit types. Under the indirect discharger rules, all SIUs that fall within an industry type that is known to be associated with 1,4-dioxane through TRI's program and send wastewater to POTWs with pretreatment programs are required to complete baseline monitoring. The direct discharger rules affect all industrial direct dischargers (except one-hundred percent domestic wastewater treatment plants, water treatment plants with an individual NPDES permit, seafood processing or aquaculture facilities with an individual NPDES permit, and NPDES facilities with General Permit) that fall within an industry type that is known to be associated with 1,4-dioxane through TRI's program and POTWs with local pretreatment programs issued through DWR with SIUs that fall within an industry type that is known to be associated with 1,4-dioxane through TRI's program. Based on these requirements, the number of facilities affected by the proposed rules are as follows:

Indirect Dischargers (15A NCAC 02H .0923)

- Significant Industrial Users: 155

Direct Dischargers (15A NCAC 02B .0512)

- Industrial Direct Dischargers: 34

- POTWs with Pretreatment Programs: 75

A summary of the industry types across all 155 SIUs and 34 industrial permits are summarized in Appendix A (Tables 2 and 3). These industry types are based on the permit's SIC code for each facility.

1. Selection of Sites Projected to Monitor for 1,4-Dioxane

The proposed rules specify that all affected permittees which are not exempted in the rule and affected entities (SIUs) and fall within the list of 1,4-dioxane industries will conduct initial baseline monitoring. All sites within these industry codes were estimated to incur expenses related to 1,4-dioxane monitoring and personnel costs for reporting. Further, POTWs with pretreatment programs receiving flow from an SIU associated with a 1,4-dioxane industry will monitor their discharges and incur associated costs of sampling and reporting of data to DEQ. If the monitoring entities reports a concentration above the lowest reporting concentration (i.e., not a non-detect) of 1,4-dioxane, they will be required to continue monitoring.

2. Selection of Sites Projected to Have Ongoing Monitoring and Develop a Minimization Plan

Once all SIUs (indirect dischargers), and industrial direct dischargers (identified above) complete baseline monitoring, a subset of these entities are expected to develop minimization plans and perform ongoing monitoring. The trigger for continued monitoring and the development of minimization plans is based on an entity that reports a concentration above the lowest reporting concentration (i.e., not a non-detect) of 1,4-dioxane. Currently, the lowest reporting concentrations ranges for 1,4-dioxane is 1 µg/L[8]. Setting the trigger at the lowest reportable level ensures a precautionary approach and supports maintaining optimal drinking water quality in the absence of an EPA MCL. Therefore, having a trigger at or above the lowest reportable level is protective of designated uses of surface waters across NC. The entities pulled into this group were projected based on historical site-specific 1,4-dioxane data that has been collected by DWR since 2016. If no data was available, the site's associated NAICS/SIC codes were assessed to determine whether that industry is known to be associated with 1,4-dioxane. EPA maintains a list of industries that manage 1,4-dioxane as part of the TRI program. The industry codes associated with these industries were compiled from this database (SIC and NAICS) and from existing data on known industries that discharge 1,4-dioxane from industrial users in NC. A list of these industry codes can be found in Appendix A. Domestic wastewater that is non-industrially impacted is not likely to have 1,4-dioxane at detectable levels. Water treatment plants may discharge 1,4-dioxane, but they are passive receivers (do not create/generate these compounds). Therefore, these facilities are not being identified to take action until the sources upstream are addressed first. Seafood processing and General permits do not apply to any of the industry types associated with discharging 1,4-dioxane based on EPA's industry category list.

A 1,4-dioxane "Minimization Plan" means a strategy to reduce or eliminate pollutants at the source before they are discharged into the environment. A minimization plan includes:
a) identification of applicable best management practices (BMPs), such as:

[8] https://www.epa.gov/sites/default/files/2015-10/documents/method_624_1984.pdf

- preventative measures to control and reduce pollution
- pollution prevention techniques
- good housekeeping practices
- identifying and eliminating 1,4-dioxane in raw materials
- predicting processes or operations generation of 1,4-dioxane as byproducts
- improving operational efficiency to minimize the quantity of waste generation
- product substitution to eliminate the introduction or generation of 1,4-dioxane
- installing treatment technologies

Although wastewater treatment is included as a possible BMP, this fiscal note does not project costs for facilities choosing to implement treatment technology as this is not the focus of the proposed rules.

b) A timeline for implementation
c) Estimated annual reductions from implementation
d) Reduction goals, such as target concentration or % reduction.

The number of facilities projected to be required to develop a minimization plan and perform ongoing monitoring is summarized in Table 3 and their locations are shown in Figure 1. These facilities were identified by either historical data or the association with a 1,4-dioxane industry code outlined in Appendix A. A breakdown of these facilities by river basin are included in Table 4. The EPA's BMPs for minimizing pollution focus on preventing pollution at the source whenever feasible, then recycling and treating pollution that cannot be prevented. Selection of any particular BMP is left up to the discretion of the SIU or industrial direct discharger. The associated costs of implementing the minimization plan can be variable based on the size of the facility, the type of BMPs implemented, complexity of operation, and the scale of the targeted reduction. The cost factors for individual BMPs are not available. For this reason, a range of costs per facility is estimated for the purpose of this fiscal analysis. Providing a narrow range of costs per facility would not be accurate, as it would fail to capture the full variability of potential costs. This approach would introduce significant uncertainty, since it would not reflect the entire range of possible expenses that facilities might incur. Table 5 outlines some of the commonly deployed BMPs to minimize 1,4-dioxane discharges in process wastewaters. Additional details that outline what is entailed for each BMP can be found in Appendix B. These costs vary depending on scope and scale of the actions necessary to minimize this pollutant. Regardless of the type of BMP deployed, the following factors will impact these costs: size of the facility and process complexity, concentration, disposal of residuals requirements, desired reduction target, and operation and maintenance requirements of a selected BMP. Specific factors that can affect the costs of BMPs outlined in Table 5 are outlined in Appendix B. After reviewing 1,4-dioxane minimization plans submitted to EPA’s TRI program the following minimization methods have been deployed:

- Removed chemical from process/shutdown process
- New wastewater stripping column (treatment)
- Source Reduction - the 1,4 dioxane is in the scrubber wash water. The plant optimized the replacement of the wash water to reduce 1,4 dioxane disposed
- Less toxic alternative

- Use of recycled PET as opposed to virgin materials (reduced 1,4-D production)

Overall, the EPA's analysis of source reduction projects across chemical pollutants found that implementation of these BMPs resulted in an average reduction in chemical releases of between 9 and 16% in the year the project was implemented. [9]

Table 3. Number of Facilities Anticipated to Conduct Baseline and Continued Monitoring and Develop a Minimization Plan

Permit/Facility Type	Baseline Monitoring	Continued Monitoring Only	Continued Monitoring and Minimization Plans
Significant Industrial Users	155	N/A	155
Industrial Direct Dischargers	34	N/A	34
POTWs with Pretreatment Programs	75	75	N/A

Table 4. Summary of the Breakdown of1,4-Dioxane Associated Industries by River Basin

	SIUs Under POTW Pretreatment Control Authority	NPDES Industrial Direct Dischargers Under DEQ Control
Broad	1	1
Cape Fear	49	10
Catawba	25	4
Chowan	0	0
French Broad	3	1
Hiwassee	0	0
Little Tennessee	1	0
Lumber	8	1
Neuse	25	1
New	0	1
Pasquotank	0	0
Roanoke	3	3
Savannah	0	0
Tar-Pamlico	9	2
Watauga	0	0
White Oak	0	0
Yadkin	31	9
Total	**155**	**34**

[9] https://www.epa.gov/toxics-release-inventory-tri-program/measuring-impact-source-reduction

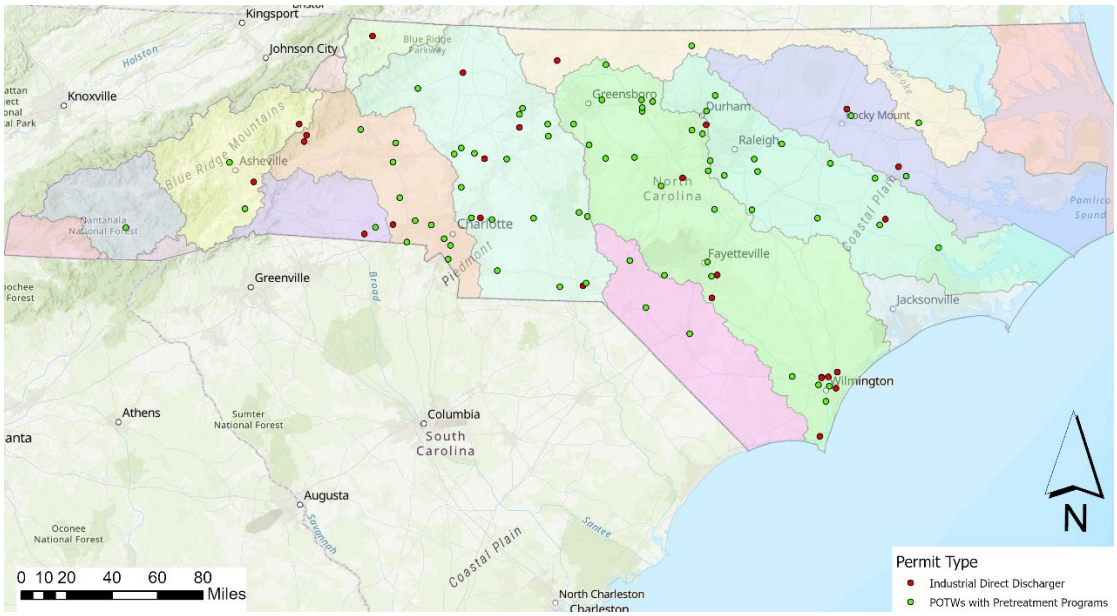

Figure 1. Map of Affected POTWs and Industrial Direct Dischargers
(not shown are locations of SIUs discharging to POTWs)

Table 5. List of Best Management Practices to Minimize 1,4-Dioxane in Process Wastewaters[10]

BMPs	Estimated Values
General Housekeeping Approaches	Costs will vary
Spill containment	Costs will vary
Research and Development Process Redesign costs[11]	$50,000 to over $1 million per facility
Proper disposal of 1,4-dioxane	Costs will vary
Leachate Minimization	Costs will vary
Cease the use of 1,4-dioxane/product replacement[12,13]	10-30% increase in material costs

[10] Cost citations have been added to Appendix B.

[11] These costs reflect the investment in the research and development to identify ways to redesign the process to minimize or eliminate 1,4-dioxane (https://dec.ny.gov/sites/default/files/2023-12/subpart352-1sapadocs.pdf)

[12] https://dec.ny.gov/sites/default/files/2023-12/subpart352-1sapadocs.pdf

[13] https://cen.acs.org/business/consumer-products/companies-getting-14-dioxane-home/98/i11

E. Estimated Costs

For the purpose of this analysis, the regulatory baseline is the absence of rule requiring 1,4-dioxane monitoring and development of Minimization plans. For the regulated community, the cost-benefits for the proposed rules were compared to a "zero cost" baseline.

The cost analysis approach is based on executing the minimization rules which includes (1) baseline monitoring, (2) continued monitoring, (3) development of minimization plans (SIUs and industrial direct dischargers only), and (4) implement minimization plans. Noting that the entities that are affected by this rule are for SIUs or industrial direct dischargers that fall within an industry type that is known to be associated with 1,4-dioxane through EPA's TRI program. The POTWs that are projected to be affected by this rule are those that received process wastewater from SIUs that are associated with a 1,4-dioxane industry type. The proposed rules will result in costs to public and private entities. The anticipated costs to a regulated entity include baseline monitoring, personnel time, development of a minimization plan, review time for control authorities (POTWs and DEQ) to evaluate and approve the minimization plans, continued monitoring, and implementation of minimization plans.

Active POTWs with pretreatment programs, industrial direct dischargers, and SIUs (summarized in Table 3) will be required to undergo a specified period of monitoring of their effluent to determine the presence and concentrations of 1,4-dioxane. Monitoring costs consider the sampling that is required during the baseline monitoring period, which consists of quarterly sampling. Quarterly sampling is also required for ongoing monitoring for sites detecting 1,4-dioxane and required to develop a minimization plan. Ongoing monitoring is not required of sites with 1,4-dioxane at levels below the lowest reportable concentration. These costs include supplies; staff time to collect samples, analyze results, and report to NCDEQ or the control authority (i.e., SIUs report to POTWs); and the lab fees to analyze and report data back to the permittee. The anticipated costs to the SIUs were based on a POTW requiring each of their pretreatment permittees to conduct monitoring if they were associated with a 1,4-dioxane industry type.

These rules will be enforced through existing mechanisms. POTWs are inspected or audited 3 times within a 5-year period. At that time records and enforcement activities are reviewed. Additionally, POTWs must submit for review annual reports identifying 1,4-dioxane minimization plan requirements and reduction activities by SIUs. In accordance with G.S 143.215.6, up to a $25,000 civil penalty can be assessed for violating a rule of the Commission. This fiscal analysis did not project civil penalties.

Discounting was used to compare costs occurring at different points and times. All calculated costs were discounted at a rate of 7% to determine an overall present value (PV in 2026 dollars). The estimated costs of the proposed rules are projected to impact the private sector, NC local governments, and NC state government. The respective costs for each group will be outlined separately as well as summarized at the end of this section. All costs are based on the timing associated with proposed rule text and requirements.

1. Private Sector Costs

The private sector includes industrial direct dischargers and SIUs. Out of the 216 industrial permits, a total of 34 were included in the costs associated with baseline monitoring, developing a minimization plan and continued monitoring. A total of 155 SIUs discharging collectively into 126 POTWs were projected to incur costs for baseline monitoring, development of a minimization plan, and to continue monitoring.

Industrial Direct Dischargers

The following cost categories were associated with industrial direct dischargers:

- ***Monitoring***
  Monitoring was projected to take place quarterly for one year for 34 of the 216 permittees starting 60 days from the effective dates of these rules assuming to be July 2026. Baseline monitoring is assumed to be completed by fourth quarter of 2027. The monitoring frequency for the facilities required to develop a minimization plan does not change and continues on a quarterly basis when the permittee is notified of this requirement (i.e., develop a minimization plan).
- ***Minimization Plan***
  Permittees have 180 days to develop a minimization plan, anticipated to be April 2028. The Control Authority has 120 days to review and approve, then the permittee has 120 days to implement the plan, anticipated to be by June 2029.
- ***Implementation of Minimization Plans***
  Once the control authority approves the minimization plan the permittee has 120 days to implement. The associated costs of implementing the minimization plan can be variable based on the size of the facility, the type of BMPs implemented, complexity of operation, and the scale of the implementation. The cost factors for individual BMPs are not available. For this reason, a range of cost per facility is estimated for the purpose of this fiscal analysis.

Significant Industrial Users

The following costs categories were associated with significant industrial dischargers:

- ***Monitoring***
  Monitoring was projected to take place quarterly for one year for 155 of the 595 SIUs starting 60 days from the effective dates of these rules assuming to be July 2026. Baseline monitoring is assumed to be completed by fourth quarter of 2027. The frequency associated with monitoring for the facilities required to develop a minimization plan does not change and continues on a quarterly basis when the permittee is notified of this requirement (i.e., develop a minimization plan).
- ***Minimization Plan***
  Permittees have 180 days to develop a minimization plan, anticipated to be April 2028. The Control Authority has 120 days to review and approve, then the permittee has 120 days to implement the plan, anticipated to be by June 2029.

- ***Implementation of Minimization Plans***
  Once the control authority approves the minimization plan the permittee has another 120 days to implement. The associated costs of implementing the minimization plan can be variable based on the size of the facility, the type of BMPs implemented, complexity of operation, and the scale of the implementation. The cost factors for individual BMPs are not available by industry type. For this reason, a range of cost per facility is estimated for the purpose of this fiscal analysis.

Summary of Impacts to the Private Sector

The impacts to the private sector are summarized in Table 6, which include monitoring and the development of minimization plans. These costs reflect expenses from 2026-2031 that have been escalated based on the projected rule schedule and year expenses were realized and discounted at 7% following NC general statute requirements[14]. An annual breakdown of these costs is provided in Appendix C including an example of how the costs were determined for each component. Costs expected beyond 2031 will be continued monitoring and minimization for facilities that do not minimize their 1,4-dioxane to below levels outlined in the rule.

Table 6. Estimated Direct Costs to the Private Sector (2026-2031; Million $2026)

	Private Sector	Direct Costs (7% discount)
Monitoring, Reporting, and Minimization Plan Development	**Industrial Direct Dischargers**	
	Monitoring	$1.3M
	Minimization Plan Development	$2.0M
	Significant Industrial Users	
	Monitoring	$5.8M
	Minimization Plan Development	$9.2M
	Estimated Costs	**$18.34M**
Implementation of Minimization Plan	**Estimated Cost Range per site**	**$0.05M to over $1.0M**

2. North Carolina Local Governments Costs

North Carolina local governments included in this analysis were POTWs with pretreatment programs. Seventy-five POTWs with active permits were projected to incur quarterly baseline monitoring costs for one year (i.e., four sampling events). Since continued monitoring is required until detections less than the lowest reportable concentrations are achieved, only POTWs receiving discharges from SIUs identified to be associated with 1,4-dioxane were projected to continue monitoring on a quarterly basis. The rule does not require POTWs with local pretreatment programs to develop a minimization plan but it is anticipated that these facilities would provide technical support, when possible, to their affected SIUs through personnel time.

[14] NCGS 150B-21.4. Fiscal and regulatory impact analysis on rules

- ***Monitoring***
  Monitoring was projected to take place quarterly for one year for 75 of the 126 POTWs with pretreatment programs starting 60 days from the effective dates of these rules assuming to be July 2026. Baseline monitoring is assumed to be completed by in fourth quarter of 2027 (i.e., completing four quarters of monitoring by fourth quarter of 2027). The frequency associated with monitoring for the facilities that must continue monitoring stays at quarterly.
- ***Minimization Plan Development Support and Review***
  All POTWs with a pretreatment program will need to work with their SIUs to notify them of the sampling requirements and any further requirements for continued sampling and minimization plan development. It is projected that 15 hours per SIU would be needed to provide this support. Additional details on these costs are found in Appendix C. Therefore, staff time to provide this support and review is included in costs for local governments.

Summary of North Carolina Local Government Costs

The estimated cost to North Carolina local governments is estimated to be $3.959 million for monitoring, reporting, and personnel time to direct and provide technical assistance for minimization plan development by the SIUs, review, and approval. This estimated cost is over a five-year period and is distributed among 31 POTWs with pretreatment programs. These costs reflect expenses from 2026-2031 that have been escalated based on the year that expenses were realized and discounted at 7% following N.C. General Statutes.[15] Costs per year are summarized in Appendix C. This table breaks down costs by monitoring and personnel time to support the SIUs to develop and approve minimization plans.

3. North Carolina State Government

The cost to North Carolina state could be largely attributed to staff requirements to review baseline monitoring data for all direct dischargers and the associated SIUs that discharge to POTWs with local pretreatment programs and determine and manage the permittees that are required to develop and submit minimization plans, which includes staff approving these plans. It is projected that DEQ would need 2.0 FTEs at a cost of $1.218 million from 2026-2031. The efforts associated with these rules will be allocated between existing FTEs.

[15] NCGS § 150B-21.4. Fiscal and regulatory impact analysis on rules

4. Summary of Estimated Costs to Private and Public Sectors

The cumulative costs to all entities associated with the proposed rules are summarized in Table 7. The estimated costs come out to $23.521 for monitoring and minimization plan development and a projected range of $0.050 to over $1.000 per site to implement BMPs.

Table 7. Estimated Direct Costs to Private and Public Sectors (2026-2031; Million $2026)

	Direct Costs (7% discount)	
Monitoring and Minimization Plan Development	**Private Sector -** Monitoring and Minimization Plan Development	$18.3M
	NC Local Government –Monitoring and SIU Support, and Minimization Plan Review and Approval	$4.0M
	NC State Government - Personnel Costs	$1.2M
	Estimated Cost*	**$23.5M**
Implementation of Minimization Plans	**Private Sector Cost**	**$0.05M to over $1.0M per facility**

* Present value in 2026$ at a 7% discount

IV. Benefits to the State and North Carolinians

These rules are projected to provide benefits to the state and North Carolinians through increased understanding and awareness of 1,4-dioxane discharges and the outcomes associated with the development and implementation of minimization plans. A benefit of these rules is the creation of a mandatory monitoring and reporting program that increases transparency of information from industry to DEQ as well as other state and local government regulators and their individual and collective contributions of 1,4-dioxane to the surface waters of the state. These rules will further expand DEQ's database of 1,4-dioxane levels in discharges across NC for various NPDES permittees and indirect dischargers (SIUs) allowing for data-driven decision making. Examples of these data-driven decisions could include assessing the regulatory and fiscal impacts of potential, future water quality standard(s) for this compound if deemed necessary by the EMC, determination of associated effluent limitations for permitted sources if a surface water standard was established, targeted surface water monitoring requirements in areas with detections of 1,4-dioxane, and understanding of the relative contribution of industrial impacts versus background (i.e., household) levels at POTWs. An additional outcome of the monitoring requirements in this rule is an increase in public awareness of where 1,4-dioxane is detected. Identifying and implementing BMPs through these rules could be an additional opportunity for industry to show environmental stewardship through voluntary minimization of 1,4-dioxane in their discharges.

These rules also require the development of minimization plans that aim to minimize 1,4-dioxane in wastewater discharges. It is expected that industries will comply by proposing and implementing BMPs that will decrease 1,4-dioxane levels to some extent. There are currently no standardized approaches to 1,4-dioxane BMPs across industry that would be broadly used to project expected reductions from the

rule. Since these rules require site-specific BMPs to be developed and deployed, they have the potential to encourage the development of innovative approaches to minimize 1,4-dioxane. Although it is not possible to predict what specific minimization actions will be taken, it can be qualitatively stated that there is very likely to be some reductions in 1,4-dioxane loadings to surface waters. These reductions will be especially important in the Cape Fear since there are measurable impacts as shown in Table 1. Although these rules do not propose mandatory reduction levels, studies of existing programs have shown that mandatory reporting of contaminants can lead to voluntary reductions, even in the absence of regulatory limits. Examples of such programs include EPA's TRI Program, EPA Greenhouse Gas (GHG) Reporting Program, California's Mandatory GHG Reporting (AB 32 Program), and New Jersey Environmental Results Program. Reporting such data has led to varying levels of voluntary reductions through public pressure, investor influence, avoided reputational risk, internal benchmarking, cost savings, and forecasting of future regulatory action.

The detections of 1,4-dioxane at certain levels could cause concern in potential impacts on human health and natural resources. Therefore, reductions in 1,4-dioxane releases to the environment will help decrease the presence of these compounds in North Carolina's water, air, fish, and soil. It is important to note that natural resources broadly across the state are vital economic assets that play a significant role in supporting NC's economy. Since scientific studies have shown that exposure to 1,4-dioxane in the environment may be linked to harmful health effects in humans and animals, the reduction of these compounds will contribute to overall reductions in exposure to North Carolinians. Although it is not possible to quantify the direct health benefits of the proposed rule, qualitatively we can provide an example of how reductions in 1,4-dioxane can benefit NC. As shown in Table 1, the Cape Fear River Basin is one example across the state where there are detections of 1,4-dioxane and could cause concern in regards to potential impacts on human health and natural resources. Reductions in 1,4-dioxane releases from entities in this basin to the environment would help decrease the presence of these compounds in North Carolina's water, air, fish, and soil. Examples of how this rule specifically relates to each of these areas will be discussed further.

The benefit of this rule contributes to the protection of designated uses of surface water to ensure suitability for various human and ecological uses. One use of surface water is for drinking water supply. Reductions in this pollutant going into surface water will reduce its presence in intakes that are downstream of a direct discharger or multiple dischargers. This impact can translate to reduced downstream drinking water treatment needs. Even if reductions do not negate the need for treatment for 1,4-dioxane at a public water supply, the cumulative reduction in long-term operation and maintenance costs could be meaningful in some cases. Reductions in 1,4-dioxane to surface waters will also reduce the potential for accumulation of these compounds in fish, animals, and food. This is another exposure pathway for humans that can be positively impacted through this rule.

1,4-dioxane has been linked to various probable harmful health impacts when exposed to these compounds over time. These impacts could result in significant healthcare costs to those that are exposed. Through this rule, reductions in 1,4-dioxane may contribute to reductions in exposure to North

Carolinians. Exposures to these compounds may lead to liver and kidney toxicity and may increase the risk of the development of cancer in humans.[16,17,18]

Minimizing 1,4-dioxane at the industrial and SIU level (prior to discharge) is the most cost-effective strategy to prevent these compounds from entering the environment and to avoid shifting costs onto the public and local governments. This proactive approach ensures that a polluter-pays framework is maintained. Removing 1,4-dioxane that has been dispersed in a POTW or in surface waters will be more costly than minimizing it as the source. Although there have not been estimates completed on the costs to treat at a POTW vs at the source, the complexity of the removal technologies are similar to PFAS. Therefore, as an example it is estimated that removing and destroying PFAS from municipal wastewater at POTWs can cost between $2.7 million and $18 million per pound. Implementing minimization plan BMPs that reduce 1,4-dioxane in SIU discharges will lower the levels of 1,4-dioxane entering POTWs. Any degree of minimization should also lead to reduced 1,4-dioxane discharges into surface waters.

Outcomes from this rule will achieve the objectives outlined in the motion including monitoring and minimizing 1,4-dioxane in discharges to surface water. The EMC's responsibility includes continually reviewing the need for surface water standards and will use data gathered from these rules to support future rulemaking efforts that aim to protect, preserve, and enhance the state water resources. The WQC has specifically committed to leverage these data in the next phase of developing surface water standards for 1,4-dioxane.

[16] North Carolina Collaboratory Legislative Report

[17] https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/final-risk-evaluation-14-dioxane

[18] https://wwwn.cdc.gov/TSP/PHS/PHS.aspx?phsid=953&toxid=199

V. Estimated Cost and Benefit Summary

Table 8 summarizes the costs and benefits discussed in the previous sections. The total direct cost across all sectors for the 2026-2031 time period for monitoring and minimization plan development is estimated at $23.5 million and a projected range of between $50,000 to over $1 million per facility to implement minimization plan BMPs. While it is difficult to precisely quantify the costs and benefits of minimization activities, since the specific actions industries will take to reduce 1,4-dioxane are not yet known, monitoring and increased transparency of this information for the public and policymakers are expected to result in reductions of this compound. The resulting decreases in future discharges of 1,4-dioxane should reduce the relative presence of the compound in surface waters. Scientific studies have shown that exposure to 1,4-dioxane is linked to harmful health effects in humans and animals. As such, reducing the discharge of 1,4-dioxane at its source will lower the overall exposure for North Carolinians. While these benefits are currently only qualitatively described, the cumulative impact of reduced 1,4-dioxane exposure and lower concentrations in wastewater discharges is expected to provide significant long-term value to both the environment and public health in North Carolina.

The cost and benefit estimates presented in this analysis should be viewed as indicative, serving as a directional guide for assessing the overall fiscal impacts. Actual costs may vary depending on the cost estimation methods used and the uncertainties described in Subsection V.D (below). The data presented in this fiscal analysis have been quantified to the "greatest extent possible" as required under G.S. 150B-19.1. Uncertainties and limitations are described in the next section.

Table 8. Summary of Estimated Costs and Benefits for the Proposed Rule (2026-2031; Million $2026)

	Direct Costs (7% discount)		**Benefits**
Monitoring and Minimization Plan Development	**Private Sector -** Monitoring and Minimization Plan Development	$18.3M	• Mandatory minimization plan and reporting program • Increases transparency of information for the facilities discharging significant levels of 1,4 dioxane • Source reduction approach • Decreases in 1,4 dioxane discharge to surface waters
	NC Local Government – Monitoring and SIU Support and Review	$4.0M	
	NC State Government - Personnel Costs	$1.2M	
	Estimated Cost*	**$23.5M**	
Implementation of Minimization Plans	**Private Sector Cost**	**$0.05M to over $1.0M per facility**	

VI. Uncertainties and Limitations

Uncertainties and limitations, within reason, are expected due to the nature of estimating statewide costs for efforts or impacts projected in the future. The data presented in this fiscal analysis are quantified to the "greatest extent possible". These uncertainties and limitations were minimized as much as possible using sound engineering and scientific judgement and leveraging external technical expertise (i.e., national engineering firms and associated experts). This section provides a summary of the primary uncertainties/limitations associated with this analysis.

1. Affected Sources

- 1,4-Dioxane Industries

  To estimate the anticipated costs and impacts to affected entities, understanding the universe of where 1,4-dioxane could be found in dischargers for industrial direct dischargers, POTWs with pretreatment programs, and SIUs is important. This analysis relied on a database of 1,4-dioxane industries that have been identified as sources through EPA's TRI reporting database and DWR's database of 1,4-dioxane sampling data from POTWs and industrial users since 2016. In addition, the rule also stipulates that a detectable concentration would require minimization. It is probable that some industries that are captured would not have a detectable contribution of 1,4-dioxane in their effluent or when their discharge enters the POTW's headworks. This approach ensures that the projected costs are not underestimated and were reasonable despite the potential uncertainty about exactly which entities will actually be affected. In addition, the proposed approach also helps reduce non-essential expenditures for sampling at industries not known to be associated with 1,4-dioxane.

2. Rule Design

- Monitoring Frequency for Baseline Monitoring

  The monitoring frequency that is included in the proposed rules is quarterly sampling. Quarterly sampling was selected to capture a representative profile based on EPA guidance for NPDES programs. This frequency captures variability over time (e.g., seasonality or operational changes), reduces sampling burdens due to the complexity of testing and the higher costs relative to conventional parameters, ensures practical implementation, and keeps consistency across NPDES programs.

  More frequent monitoring would offer more detailed data, but the benefits do not outweigh the practical, technical, and economic limitations of such an increased frequency. There would be added financial burden for additional data that might not add sufficient value to make decisions about the need for minimization efforts. The increase in samples needed to be analyzed would also add additional stress on capacity constraints for commercial laboratories, potentially leading to delays in reporting of data. Historical NPDES programs have always used a quarterly frequency to sufficiently characterize trends and support permitting decisions. Therefore, increasing the frequency would deviate from established protocols that have proven effective in maintaining compliance with the Clean Water Act.

Reducing monitoring frequency would lower costs for affected entities; however, it would also result in insufficient data to support the rule's rationale and delay the collection of information needed for timely, informed regulatory decisions. Less frequent monitoring would fail to capture important variations due to seasonal changes, source contributions, and operational differences.

- Trigger for Continued Monitoring

  Results at or above the lowest reportable concentration for 1,4-dioxane would require a facility to do continued monitoring as well as develop and implement a minimization plan. This level is protective of designated uses of surface waters. If a higher trigger was used there would be fewer facilities that would be required to continue monitoring and develop and implement minimization plans. This would result in a lower total financial impact from the rule. It is estimated that increasing this trigger to 10 ppt could reduce the number of affected SIUs and POTWs by approximately 8-20% that would be required to continue monitoring and develop minimization plans (Table 9).

  While setting a higher trigger threshold would reduce the overall financial burden, it comes with important trade-offs. Increasing the threshold for continued monitoring and the development of minimization plans to a level above the MCLs would provide less protection for human health and designated uses. The proposed trigger is intended to strike a balance between minimizing financial impacts and safeguarding designated uses.

3. Cost Analysis

- Minimization Plan Development Costs

  The costs associated with developing a 1,4-dioxane minimization plan will vary depending on the scope, scale, and complexity of the industrial operation, as well as the relative costs of the consultant retained to perform the work. Therefore, there can be uncertainty associated with the fraction of industries that will require a more extensive evaluation of their processes and minimization planning versus others that will invest more time and resources to these plans. In addition, the costs associated with a consultant to develop these plans can varying depending on overhead and the level of effort and expertise needed to develop a minimization plan. It is estimated that on average the scope of work associated with developing a minimization plan could range from $50,000 to $100,000 and could exceed the upper range in some instances. For the purposes of this reasonableness analysis, a $75,000 average cost was used for 50% of the affected entities that are required to develop a minimization plan. This threshold represents an average level of effort that would broadly be projected for fiscal analysis purposes. Another 25% was projected to put forth a modest effort to develop these plans (i.e., smaller facility or production and limited needs to minimize the discharge of 1,4-dioxane) which translated to $10,000 cost per facility. The remaining 25% of these affected entities were projected to need a more expansive review and preparation at an approximate cost of $112,500 per facility for a higher level of effort. The cost estimate for the higher-level effort was based on a Class 5 cost estimate where we increased the average cost by 50%.

- Minimization Plan Implementation
  Beyond the costs of preparing the minimization plan and monitoring, the rule does not require specific minimization action by the affected entity. The selection of a particular BMP is left up to the discretion of the SIU or industrial direct discharger. Therefore, the associated costs cannot be reasonably quantified. This is an uncertainty in the fiscal analysis of this rule. There are varying degrees in which a facility could elect to minimize or not minimize 1,4-dioxane discharges from their facility. Therefore, the associated costs cannot be reasonably quantified and are presented as a range per facility.
- Discount Rate
  To account for differences in timing of impacts from the proposed rule, a discount rate was used to adjust the estimated costs of the proposed rules back to the initial year of the analysis, 2025. Present value calculations for costs and benefits were done using a 7% discount rate as required by NCGS 150B-21.4.
- Rate Payer Impacts
  The cost of 1,4-dioxane monitoring for facilities that have no reason to expect the presence of 1,4 dioxane in their effluent is not an expense that would be planned for in advance in the absence of regulations when considering financial forecasting. It is the decision of the private or public entity to determine how best to manage these expenses. One possibility is that utilities could pass along some of these costs to rate payers. These impacts will vary widely across utilities.

4. Benefits

- Indirect Benefits to Private Entities
  The implementation of this rule will result in increased need for professional services through consultant and analytical laboratory services. Baseline and continued monitoring will rely on private analytical laboratories to process the samples. Although it is certain that there will be an increase in sample analysis needs within the state, as of 2024, there were about 29 labs within NC that have certification for EPA Method 624.1[19]. This capacity may not be sufficient to handle the testing requirements for the affected entities. Therefore, an indirect benefit of this rule would be increasing utilization and revenue for these commercial labs in the state. It should be noted that commercial laboratories outside of the state would be expected to also take on the capacity needs for this rule. Meaning not all the indirect benefits would be realized within NC.

  The development of minimization plans will most likely rely on acquiring specialized technical support through consulting services within NC. It is understood that not all expertise needed for these reports would be found within these consulting firms in NC but could rely on expertise nationally within these companies. Regardless, the reliance on

[19] Lab Certification Link for Method 624.1: https://www.deq.nc.gov/6241-commercial-lab/open&sa=U&ved=2ahUKEwjoto7QlOqOAxXShYkEHRwLABAQFnoECAMQAQ&usg=AOvVaw1TRsZBqf2KnpooBCej1ssl&fexp=72986053,72986052

consulting services to develop the minimization plans will be another indirect benefit of this rule for private entities to some degree within NC.

- Quantification of Benefits
  Quantification is always the preferred approach in understanding the benefits of proposed regulations and weighing the costs versus these benefits. Although benefits may not be quantified, it does not mean that there is a lack of value of a rule to North Carolinians. Many benefits of cleaner water (e.g., improved ecosystem health, biodiversity, recreational use, or aesthetic value) do not have market prices that can be leveraged for such an analysis. This relationship can also be said for the value of knowledge through transparency and data sharing. As of July 2025, EPA still acknowledges that 1,4-dioxane "The Agency used the best available science to prepare this final supplement to the risk evaluation and has determined that 1,4-dioxane poses unreasonable risk to human health".[20] It is still unknown (1) How much people are exposed to 1,4-dioxane and (2) How harmful 1,4-dioxane are to people and the environment. Therefore, for the purpose of this fiscal note, qualitative discussions of the benefits were the preferred approach to limit uncertainty.

VII. Rules Alternatives

In accordance with N.C.G.S. 150B-21.4(b2)(5), the fiscal note for a proposed rulemaking with a substantial economic impact is required to contain a description of at least two alternatives to the proposed rules. As defined in N.C.G.S. 150B-21.4(b1), "substantial economic impact" means an aggregate financial impact on all persons affected of at least one million dollars ($1,000,000) in a 12-month period. As shown in Section IV of this fiscal note, the proposed rules are expected to have a substantial economic impact. Therefore, three alternatives have been evaluated in this section (Table 9).

[20] https://www.govinfo.gov/content/pkg/FR-2024-11-14/pdf/2024-26342.pdf

Table 9. Summary of Alternatives to the Proposed Rules that were Considered

	Proposed Rules	Alternative 1 (All SIUs, industrial direct dischargers, and POTW)	Alternative 2 (Absence of a Rule)
Minimization Plan Trigger	Targeted Industries that are Known to Discharge 1,4-Dioxane	Any Detection	None
Affected Sources	SIUs and Industrial Direct Dischargers that match to a 1,4-dioxane industry (based on SIC codes from TRI database and DWR's historical data) and POTWs that receive dischargers from these SIUs	All industrial direct dischargers, POTWs, and SIUs	None

A. Alternative 1: All SIUs, industrial direct dischargers, and POTWs with Pretreatment Programs

The first alternative evaluated was requiring all SIUs, industrial direct dischargers, and POTWs to conduct baseline monitoring regarding a facility's association with a known 1,4-dioxane industry type. This approach would pull in additional facilities to conduct baseline monitoring. The number of entities projected to continue monitoring and develop a minimization plan is the same as the proposed approach. This alignment is due to the established understanding of where 1,4-dioxane is used and the fact that it is not a ubiquitous compound that would be expected to be found broadly at levels that exceed the lowest reportable concentration (i.e., 1.0 µg/L also equal to 1,000 ppt). Extending the rules to include all entities that are not captured in the proposed approach, would increase the number of private entities affected by these rules and costs that could be viewed as not benefiting reductions in 1,4-dioxane above lowest reportable concentrations. The costs of this alternative would be greater than the amount estimated under the proposed approach. These increased costs are allocated in the baseline monitoring since the expenditures associated with continued monitoring and minimization plan development are the same as the proposed approach. Meaning this alternative would cost more for the same benefits as the proposed approach. This alternative was not selected because this approach is an increased cost burden and the additional entities that are captured are not projected to be significant contributors of 1,4-dioxane either indirectly or directly at levels that would exceed lowest reportable concentrations.

Table 10. Summary of Number of Entities Affected by the Proposed Approach versus Alternative 1

	Baseline Monitoring		Continued Monitoring		Minimization Plan Development and Continued Monitoring	
	Proposed	Alternative 1	Proposed	Alternative 1	Proposed	Alternative 1
SIUs	155	595	-	-	155	155
Industrial Direct Dischargers	34	216	-	-	34	34
POTWs with Pretreatment Programs	75	126	75	75	-	-

B. Alternative 2: Absence of a Rule

The second alternative evaluated was absence of a rule (taking no action). This alternative would not require baseline monitoring, ongoing monitoring or minimization plans for 1,4-dioxane. This alternative was not selected because 1,4-dioxane information would not be collected or disclosed by affected entities in an expedited manner. Therefore, selecting this alternative would not support informing the EMC better as to the sources of 1,4-dioxane across NC. Data is still being collected in the absence of the rule. The proposed approach allows DEQ to collect these data on an expedited timeline. DEQ has been unsuccessful in enforcing a 1,4-dioxane limit in NPDES permits (see ALJ decision on 9/12/24 and DEQ's petition for judicial review). Therefore, due to public health concerns especially in water supply waters this proposed rule allows for reductions through minimization plans which cannot be handled through NPDES permits at this time.

C. Summary of Comparisons

The proposed approach costs an estimated $23.5 million, which is less than Alternative 1 (Table 11). The costs increase when projecting the addition of more industrial users, resulting in a higher overall cost. Alternative 1 (baseline monitoring for all) would be an additional cost of approximately $6.7 million to the regulated community with similar benefits to North Carolinians compared with the proposed approach. Alternative 2 (absence of a rule/no action) would result in no costs to the regulated community and no associated benefits.

Table 11. Comparison of Estimated Costs and Benefits Under the Proposed Approach and Alternatives (2026-2031; Million $2026)

		Proposed Approach	Alternatives	
	Estimated Costs		**1**	**2**
Monitoring and Minimization Plan Development	**Private Sector**			
	SIUs – Monitoring and Minimization Plan Development	$15.1M	$18.7M	$0
	Industrial Direct Discharger – Monitoring and Minimization Plan Development	$3.3M	$4.9M	$0
	NC Local Government			
	POTW – Monitoring and Minimization Plan Development Support and Review	$4.0M	$5.3M	$0
	NC State Government			
	Personnel Costs	$1.2M	$1.2M	$0
	Total Estimated Costs	**$23.5M**	**$30.2M**	
Implementation of Minimization Plans	**Range Per Facility**	**$0.05M to over $1.0M per facility**		**$0**
	Estimated Benefits	**Proposed Approach**	**1**	**2**
	Benefits realized through actions taken by affected entities	• Mandatory minimization plan and reporting program • Increases transparency of information for the facilities discharging significant levels of 1,4 dioxane • Source reduction approach Decreases in 1,4 dioxane discharge to surface waters		**None**

Appendix A

Table 1A. Summary of Standard Industrial Classification (SIC) Codes Associated with 1,4-Dioxane Discharges

SIC	Industry Title
2111	Tobacco Manufacturing
2221	Broadwoven Fabric Mills
2297	Nonwoven Fabric Mills
2671	Paper Bag and Coated and Treated Paper Manufacturing
2672	Paper Bag and Coated and Treated Paper Manufacturing
2673	Paper Bag and Coated and Treated Paper Manufacturing
2754	Commercial Printing (except Screen and Books)
2800	Chemicals and allied Products
2812	Other Basic Inorganic Chemical Manufacturing
2816	Other Basic Inorganic Chemical Manufacturing
2819	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2821	Plastics Material and Resin Manufacturing
2823	Artificial and Synthetic Fibers and Filaments Manufacturing
2824	Artificial and Synthetic Fibers and Filaments Manufacturing
2833	Medicinal and Botanical Manufacturing
2834	Pharmaceutical Preparation Manufacturing
2841	Soap and Other Detergent Manufacturing
2842	Polish and Other Sanitation Good Manufacturing
2843	Surface Active Agent Manufacturing
2851	Paint and Coating Manufacturing
2861	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
2865	Petrochemical Manufacturing
2869	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2879	Pesticide and Other Agricultural Chemical Manufacturing
2891	Adhesive Manufacturing
2899	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2911	Petroleum Refineries
2992	Petroleum Lubricating Oil and Grease Manufacturing
3079	Miscellaneous Plastics Products
3081	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
3086	Urethane and Other Foam Product (except Polystyrene) Manufacturing
3089	All Other Plastics Product Manufacturing
3241	Cement Manufacturing
3291	All Other Miscellaneous Fabricated Metal Product Manufacturing

3321	Iron Foundries
3351	Copper Rolling, Drawing, Extruding, and Alloying
3354	Other Aluminum Rolling, Drawing, and Extruding
3444	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3498	Fabricated Pipe and Pipe Fitting Manufacturing
3499	All Other Miscellaneous Fabricated Metal Product Manufacturing
3511	Turbine and Turbine Generator Set Units Manufacturing
3519	Other Motor Vehicle Parts Manufacturing
3523	Saw Blade and Handtool Manufacturing
3534	Elevator and Moving Stairway Manufacturing
3537	All Other Miscellaneous Fabricated Metal Product Manufacturing
3555	All Other Industrial Machinery Manufacturing
3569	All Other Miscellaneous Textile Product Mills
3585	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3661	Telephone Apparatus Manufacturing
3669	Other Communications Equipment Manufacturing
3679	Other Electronic Component Manufacturing
3695	Manufacturing and Reproducing Magnetic and Optical Media
3711	Heavy Duty Truck Manufacturing
3714	Other Motor Vehicle Parts Manufacturing
3724	Research and Development in Nanotechnology
3751	Motorcycle, Bicycle, and Parts Manufacturing
3764	Research and Development in Nanotechnology
3861	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
3999	All Other Miscellaneous Chemical Product and Preparation Manufacturing
4953	Solid Waste Landfill
5161	Wholesalers machine tools
5172	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
7389	All Other Miscellaneous Chemical Product and Preparation Manufacturing
9511	Administration of Air and Water Resource and Solid Waste Management Programs

Table 1B. Summary of North American Industry Classification System (NAICS) Codes Associated with 1,4-Dioxane Discharges

NAICS	Industry Title
211130	Natural Gas Extraction
311942	Spice and Extract Manufacturing
312230	Tobacco Manufacturing
313210	Broadwoven Fabric Mills
313230	Nonwoven Fabric Mills
313310	Textile and Fabric Finishing Mills
314999	All Other Miscellaneous Textile Product Mills
316110	Leather and Hide Tanning and Finishing
321999	All Other Miscellaneous Wood Product Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
323111	Commercial Printing (except Screen and Books)
324110	Petroleum Refineries
324191	Petroleum Lubricating Oil and Grease Manufacturing
325110	Petrochemical Manufacturing
325120	Industrial Gas Manufacturing
325130	Synthetic Dye and Pigment Manufacturing
325180	Other Basic Inorganic Chemical Manufacturing
325193	Ethyl Alcohol Manufacturing
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325992	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326140	Polystyrene Foam Product Manufacturing

NAICS	Industry Title
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326199	All Other Plastics Product Manufacturing
327310	Cement Manufacturing
327910	Abrasive Product Manufacturing
331313	Alumina Refining and Primary Aluminum Production
331318	Other Aluminum Rolling, Drawing, and Extruding
331420	Copper Rolling, Drawing, Extruding, and Alloying
331511	Iron Foundries
332117	Powder Metallurgy Part Manufacturing
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332919	Other Metal Valve and Pipe Fitting Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333248	All Other Industrial Machinery Manufacturing
333310	Commercial and Service Industry Machinery Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333618	Other Engine Equipment Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333998	All Other Miscellaneous General Purpose Machinery Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing

NAICS	Industry Title
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334610	Manufacturing and Reproducing Magnetic and Optical Media
335131	Residential Electric Lighting Fixture Manufacturing
335210	Small Electrical Appliance Manufacturing
336110	Automobile and Light Duty Motor Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336390	Other Motor Vehicle Parts Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
337127	Institutional Furniture Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339930	Doll, Toy, and Game Manufacturing
339999	All Other Miscellaneous Manufacturing
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
425120	Wholesale Trade Agents and Brokers
541420	Industrial Design Services
541713	Research and Development in Nanotechnology
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators
562219	Other Nonhazardous Waste Treatment and Disposal
562920	Materials Recovery Facilities
812320	Drycleaning and Laundry Services (except Coin-Operated)
924110	Administration of Air and Water Resource and Solid Waste Management Programs

Table 2. Summary of SIU Industry Types by River Basin

River Basin	Industry Description
Broad	All Other Miscellaneous Chemical Product and Preparation Manufacturing
Cape Fear	Solid Waste Landfill
	All Other Miscellaneous Fabricated Metal Product Manufacturing
	Paint and Coating Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Solid Waste Landfill
	Solid Waste Landfill
	Other Motor Vehicle Parts Manufacturing
	Pharmaceutical Preparation Manufacturing
	Solid Waste Landfill
	Solid Waste Landfill
	Solid Waste Landfill
	Plastics Material and Resin Manufacturing
	Paint and Coating Manufacturing
	Solid Waste Landfill
	Plastics Material and Resin Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Fabricated Metal Product Manufacturing
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Plastics Material and Resin Manufacturing
	Solid Waste Landfill
	Soap and Other Detergent Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Polish and Other Sanitation Good Manufacturing
	Plastics Material and Resin Manufacturing
	Plastics Material and Resin Manufacturing
	Tobacco Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Soap and Other Detergent Manufacturing
	Soap and Other Detergent Manufacturing

	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Solid Waste Landfill
	Plastics Material and Resin Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Surface Active Agent Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	All Other Plastics Product Manufacturing
	Solid Waste Landfill
	Soap and Other Detergent Manufacturing
	Pharmaceutical Preparation Manufacturing
Catawba	Solid Waste Landfill
	Nonwoven Fabric Mills
	Plastics Material and Resin Manufacturing
	Plastics Material and Resin Manufacturing
	Heavy Duty Truck Manufacturing
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Solid Waste Landfill
	Solid Waste Landfill
	Solid Waste Landfill
	Petrochemical Manufacturing
	Pharmaceutical Preparation Manufacturing
	Solid Waste Landfill
	Paper Bag and Coated and Treated Paper Manufacturing
	All Other Miscellaneous Textile Product Mills
	Other Motor Vehicle Parts Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Plastics Product Manufacturing
	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	All Other Miscellaneous Textile Product Mills
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing

	#N/A
	Solid Waste Landfill
French Broad	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Other Motor Vehicle Parts Manufacturing
	Nonwoven Fabric Mills
Little Tennessee	Solid Waste Landfill
Lumber	Petroleum Refineries
	Solid Waste Landfill
	Solid Waste Landfill
	Solid Waste Landfill
	Solid Waste Landfill
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Fabricated Metal Product Manufacturing
Neuse	All Other Plastics Product Manufacturing
	Other Motor Vehicle Parts Manufacturing
	Nonwoven Fabric Mills
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Saw Blade and Handtool Manufacturing
	Pharmaceutical Preparation Manufacturing
	Other Motor Vehicle Parts Manufacturing
	All Other Miscellaneous Fabricated Metal Product Manufacturing
	Solid Waste Landfill
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Iron Foundries
	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	Medicinal and Botanical Manufacturing
	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	Saw Blade and Handtool Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing

	Solid Waste Landfill
	Solid Waste Landfill
	Pharmaceutical Preparation Manufacturing
Roanoke	Other Motor Vehicle Parts Manufacturing
	Nonwoven Fabric Mills
	All Other Miscellaneous Fabricated Metal Product Manufacturing
Tar-Pamlico	Plastics Material and Resin Manufacturing
	Pharmaceutical Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
	Other Motor Vehicle Parts Manufacturing
	Other Communications Equipment Manufacturing
	Solid Waste Landfill
	Pharmaceutical Preparation Manufacturing
	Pharmaceutical Preparation Manufacturing
Yadkin	Paper Bag and Coated and Treated Paper Manufacturing
	Pesticide and Other Agricultural Chemical Manufacturing
	Plastics Material and Resin Manufacturing
	Other Motor Vehicle Parts Manufacturing
	Solid Waste Landfill
	Other Motor Vehicle Parts Manufacturing
	Surface Active Agent Manufacturing
	Surface Active Agent Manufacturing
	All Other Plastics Product Manufacturing
	Soap and Other Detergent Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Solid Waste Landfill
	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	Solid Waste Landfill
	Pharmaceutical Preparation Manufacturing
	Soap and Other Detergent Manufacturing
	All Other Miscellaneous Chemical Product and Preparation Manufacturing
	Solid Waste Landfill
	Solid Waste Landfill
	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	Medicinal and Botanical Manufacturing

	Pharmaceutical Preparation Manufacturing
	Tobacco Manufacturing
	Tobacco Manufacturing
	Paper Bag and Coated and Treated Paper Manufacturing
	Pharmaceutical Preparation Manufacturing
	Plastics Material and Resin Manufacturing
	All Other Miscellaneous Fabricated Metal Product Manufacturing
	Solid Waste Landfill
	Solid Waste Landfill

Table 3. Summary of Industry Direct Discharger Industry Types by River Basin

River Basin	Industry Description
Broad	Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers
Cape Fear	Industrial Inorganic Chemicals, Not Elsewhere Classified
	Manufacturing Industries, Not Elsewhere Classified
	Pharmaceutical Preparations
	Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers
	Pesticides and Agricultural Chemicals, Not Elsewhere Classified
	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments
	Plastics Products, Not Elsewhere Classified
	Industrial Inorganic Chemicals, Not Elsewhere Classified
	Medicinal Chemicals and Botanical Products
Catawba	Industrial Inorganic Chemicals, Not Elsewhere Classified
	Pharmaceutical Preparations
French Broad	Electronic Components, Not Elsewhere Classified
Neuse	Manmade Organic Fibers, Except Cellulosic
New	Electronic Components, Not Elsewhere Classified
Roanoke	Rolling, Drawing, and Extruding of Copper
Tar-Pamlico	Pharmaceutical Preparations
	Pharmaceutical Preparations
Yadkin	Manufacturing Industries, Not Elsewhere Classified
	Commercial Printing, Gravure
	Industrial Inorganic Chemicals, Not Elsewhere Classified
	Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers
	Manmade Organic Fibers, Except Cellulosic

Appendix B – Best Management Practices

BMPs	Description
General Housekeeping Approaches	**1. Chemical Handling and Storage** • **Use closed systems** for storage and transfer of 1,4-dioxane or mixtures that contain it. • Store drums and containers in **secondary containment** to capture leaks or spills. • Inspect tanks, fittings, valves, and hoses regularly for **signs of corrosion or wear**. • Clearly **label containers** to prevent mishandling or mixing errors. **2. Spill Prevention and Response** • Develop and practice a **spill response plan** that includes 1,4-dioxane-specific procedures. • Use **absorbent pads, berms, or sump systems** in areas where spills might occur. • Maintain **spill kits** and train personnel to respond promptly. • **Clean spills immediately** and dispose of absorbents as hazardous waste, if appropriate. **3. Equipment Maintenance and Cleaning** • Implement **routine maintenance schedules** for pumps, reactors, and piping to prevent leaks. • Avoid "hose-down" cleaning methods that **flush residues to drains**. • Use **dry cleaning methods** (e.g., scraping, vacuuming) where possible before wet cleaning. • Capture and manage **rinsates or wash water** separately for treatment or off-site disposal. **4. Inventory and Waste Management** • Maintain an accurate **chemical inventory** to minimize over-purchasing and storage time. • Segregate waste streams that contain 1,4-dioxane for **off-site treatment**. • Use **drip pans and covers** to reduce evaporation or wash-off from process equipment. **5. Process Documentation and Training** • Establish and update **Standard Operating Procedures (SOPs)** that include emission prevention steps.

	• Train operators and maintenance staff on:
	  o The **properties and hazards** of 1,4-dioxane
	  o **Best handling practices**
	  o Proper **disposal and decontamination** techniques
	
	6. Wastewater Source Control
	
	• Identify and monitor **unit processes** or inputs that introduce 1,4-dioxane.
	• Substitute or eliminate **1,4-dioxane-containing ingredients** where feasible.
	• Use **segregated drainage systems** to keep 1,4-dioxane-contaminated flows separate from sanitary or less-contaminated wastewater.

Spill containment	**1. Secondary Containment Systems** For storage tanks, drums, and totes: • Use **impervious secondary containment** (e.g., concrete or coated steel) to catch leaks or spills. • Ensure the containment system can hold at least **110% of the largest container** or 10% of the total volume stored, whichever is greater. • Keep the containment area **covered or drained** to prevent accumulation of rainwater, which can become contaminated. • Regularly **inspect for cracks or deterioration**, especially since 1,4-dioxane is miscible with water and can infiltrate poorly maintained barriers. **2. Spill Control Materials & Kits** • Maintain **spill kits** in all areas where 1,4-dioxane is stored, transferred, or used. o Kits should include: absorbent pads, pillows, socks/booms, nitrile gloves, goggles, disposal bags, and neutral pH cleaners. • Use **sorbents compatible with organic solvents** — some are not effective with 1,4-dioxane. • Label kits and train staff on **how and when to deploy them**.

	3. Process Area Containment and Equipment Design
	
	• Place **drip pans or trays** under valves, pumps, and hose connections.
	• Install **spill berms** or raised edges around process areas where 1,4-dioxane is transferred or blended.
	• Use **closed transfer systems** (piping instead of hoses) to minimize disconnection risks.
	• Install **leak detection systems** near sumps, trenches, or floor drains.
	
	4. Drainage and Flow Control
	
	• Isolate floor drains in areas where 1,4-dioxane is used.
	• Equip drains with **automatic shutoff valves**, containment sumps, or oil-water separators to capture runoff before it enters the sewer system.
	• Use **sloped floors** to direct spills to controlled collection points.
	
	5. Spill Response and Containment Procedures
	
	• Develop a **site-specific Spill Prevention, Control, and Countermeasure (SPCC) plan** (required for many facilities under federal law).
	• Ensure procedures include:
	  ○ Immediate notification of supervisors and environmental staff
	  ○ Use of PPE specific to 1,4-dioxane exposure (e.g., vapor-resistant gloves, respirators if necessary)
	  ○ Collection of contaminated materials in **labeled hazardous waste containers**
	  ○ Proper documentation and reporting
	
	6. Routine Inspections and Maintenance
	
	• Inspect storage and handling areas **weekly or daily** for signs of leaks or drips.
	• Perform **preventive maintenance** on pumps, flanges, valves, and transfer lines.
	• Document inspections and corrective actions.
	
	7. Stormwater Management Integration

	• Design outdoor areas to **divert clean stormwater away** from potential spill zones. • Use **curbing, covered storage, and sealed transfer stations** to prevent stormwater contact. • Ensure any contaminated stormwater is **collected and treated**, not discharged.

Process Redesign costs	**1. Substitute or Eliminate 1,4-Dioxane**
	
	• **Review chemical formulations** and raw materials to identify sources of 1,4-dioxane.
	• Replace:
	  o Solvents, surfactants, or stabilizers that degrade into 1,4-dioxane.
	  o Ingredients that are known precursors (e.g., ethoxylated compounds).
	• Consider alternative products with **safer chemical profiles**, such as:
	  o Non-ethoxylated surfactants
	  o Solvents with lower volatility and toxicity
	• Partner with vendors to **identify or co-develop safer substitutes**.
	
	2. Modify Production Steps to Reduce Formation
	
	• In processes where 1,4-dioxane is a **byproduct** (e.g., ethoxylation reactions), reduce formation by:
	  o **Lowering reaction temperatures** and pressure
	  o Using **catalysts** that favor cleaner reactions
	  o Controlling reaction time and molar ratios more precisely
	• Add **in-process controls or purging steps** to remove trace levels before discharge.
	
	3. Close the Loop – Recovery and Reuse
	
	• Install **condensers or scrubbers** to capture 1,4-dioxane vapors for recovery.
	• Integrate **distillation or advanced separation** units to recycle contaminated process water.
	• Convert **open-batch processing** to **closed-loop systems** to limit fugitive emissions.

	4. Minimize Waste and Rinsing Steps
	
	• Redesign cleaning or flushing processes to:
	  o Use **less water** or solvents.
	  o Shift from **wet cleaning to mechanical or dry cleaning**.
	• Replace once-through cleaning systems with **recirculating or staged rinse systems**.
	
	5. Redesign Equipment for Containment and Efficiency
	
	• Install **fully enclosed mixing or blending tanks** with vapor capture.
	• Use **double-sealed mechanical seals** on pumps and agitators.
	• Modify floor layouts to segregate "clean" and "contaminated" zones, reducing cross-contamination and unnecessary chemical use.
	
	6. Pilot Testing and Process Optimization
	
	• Run **pilot-scale tests** to compare emissions and product quality under new conditions.
	• Use **process modeling or life cycle analysis (LCA)** to evaluate emission trade-offs and economic impacts.
	• Involve **multidisciplinary teams** (e.g., EH&S, process engineering, R&D) in redesign initiatives.
	
	7. Incorporate P2 and Green Chemistry Principles
	
	• Apply **green chemistry principles**, such as:
	  o Designing less hazardous synthesis pathways.
	  o Using renewable feedstocks or safer solvents.
	• Build **pollution prevention reviews** into management of change (MOC) procedures.

Proper disposal of 1,4-dioxane	**1. Identify and Characterize All Waste Streams** • **Test process wastewaters**, cleaning solutions, and spent chemicals for 1,4-dioxane content.

	• Characterize waste streams under **RCRA hazardous waste rules** — especially if mixed with other hazardous solvents or if exhibiting ignitability or toxicity.
	• Clearly **label and segregate** 1,4-dioxane-containing waste from other waste streams.
	
	2. Prevent Disposal to Sanitary or Storm Sewer
	
	• Do **not discharge** 1,4-dioxane-containing wastes to municipal wastewater treatment plants unless explicitly permitted — most facilities **cannot treat it effectively**.
	• Prevent any runoff or intentional disposal to **stormwater drains**, which lead directly to surface waters.
	• Evaluate permit conditions under **NPDES** if discharging to surface water — limits may apply or be added.
	
	3. Send to a Permitted Hazardous Waste Incinerator
	
	• The preferred method of disposal is **high-temperature incineration** at:
	  ○ **>1000°C (1832°F)** with
	  ○ **>2 seconds residence time**, and
	  ○ **Proper air pollution control** to capture byproducts.
	• Use a **RCRA Part B–permitted hazardous waste treatment, storage, and disposal facility (TSDF)**.
	
	4. Use Certified Hazardous Waste Transporters
	
	• Manifest and transport wastes using a **registered and insured hazardous waste transporter**.
	• Maintain copies of **hazardous waste manifests** and TSDF receipts to document proper disposal.
	• Track waste volumes under **Biennial Reporting** requirements (if you're a Large Quantity Generator).
	
	5. Manage Containers and Residues Carefully
	
	• Triple-rinse empty containers that held 1,4-dioxane — capture rinsate as hazardous waste.
	• Dispose of contaminated PPE, absorbents, or rags as hazardous waste.

	• Use **closed, compatible, and clearly labeled containers** with secondary containment. **6. Explore Solvent Recycling — With Caution** • Solvent recovery systems may be able to recover 1,4-dioxane under controlled conditions. • Recovered solvent must meet **product specifications** or be treated as a **hazardous secondary material** under RCRA's recycling rules. • Evaluate **on-site vs. off-site recycling** with care — residues and sludges may still require hazardous waste disposal. **7. Keep Records and Maintain Compliance** • Document all waste determinations, disposal methods, volumes, and dates. • Train personnel on **handling and disposal procedures**. • Keep up-to-date with local, state, and federal regulations (e.g., **CERCLA reporting**, **TRI Form R**, **state-specific listings**).

Leachate Minimization	**1. Stormwater Management**
	
	• **Goal**: Prevent clean surface water (rainfall/runoff) from infiltrating the waste mass.
	• **Practices include**:
	  ○ Grading and sloping to divert water away from active and closed areas
	  ○ Perimeter drainage ditches and berms
	  ○ Temporary and permanent stormwater ponds
	  ○ Use of sediment and erosion controls (e.g., silt fences, matting)
	
	2. Daily and Intermediate Cover
	
	• **Goal**: Limit water infiltration and reduce leachate formation.
	• **Methods**:
	  ○ **Daily cover**: 6 inches of soil or alternative daily cover (ADC) like tarps, foams, or synthetic films

	◦ **Intermediate cover**: 12–24 inches of soil or geosynthetics on inactive areas ◦ ADCs reduce the amount of soil used while limiting rainfall exposure **3. Final Cover Systems (Capping)** • **Goal**: Permanently seal closed sections of the landfill to minimize infiltration. • **Design typically includes**: ◦ Geomembrane layer (e.g., HDPE) ◦ Compacted clay or geosynthetic clay liner (GCL) ◦ Drainage layer to remove surface water ◦ Vegetative layer for erosion control **4. Leachate Recirculation Control** • **Some landfills recirculate leachate** to enhance waste degradation and gas production, but uncontrolled recirculation can increase leachate volume. • Minimization involves: ◦ Controlled recirculation with engineered systems ◦ Monitoring to prevent hydraulic overloading **5. Phased Cell Construction** • **Goal**: Reduce the exposed surface area at any given time. • Construct the landfill in **discrete cells** and cover them quickly after reaching capacity. • Limits the volume of water that can enter each phase. **6. Synthetic Liners and Drainage Layers** • While not minimizing leachate generation directly, they: ◦ **Prevent leachate migration into groundwater**

	○ **Facilitate collection and removal** of leachate to minimize accumulation **7. Vegetative Covers and Evapotranspiration** • Encourage **native or drought-resistant vegetation** on final cover to: ○ Absorb precipitation ○ Enhance **evapotranspiration**, reducing infiltration into the waste **8. Landfill Gas Collection** Capturing landfill gas can also **draw moisture away** from the waste (via vacuum pressure), indirectly reducing leachate in certain conditions.
Cease the use of 1,4-dioxane/product replacement	**1. Inventory and Identify All Uses of 1,4-Dioxane** • Review: ○ Raw materials, intermediates, and formulations ○ Cleaning agents, stabilizers, solvents, and surfactants • Pay attention to **ethoxylated compounds**, as 1,4-dioxane is often a **byproduct** of ethoxylation (common in detergents, foaming agents, and degreasers). • Use **SDSs** and consult chemical suppliers for hidden sources. **2. Select and Qualify Alternative Products** • Choose **functionally equivalent, lower-toxicity replacements**, such as: ○ **Alcohol-based or ester-based solvents** ○ **Non-ethoxylated surfactants** or those manufactured with "low-dioxane" processes ○ **Green seal–certified cleaners or degreasers** • Evaluate substitutes for: ○ Performance ○ Health and environmental safety ○ Regulatory compliance (TSCA, REACH, etc.) ○ Total cost of ownership

	3. Eliminate Need Through Process Redesign
	
	• Modify operations to **avoid use of stabilizers or solvents** altogether.
	  o Example: Switching from solvent-based to **water-based formulations** in product manufacturing or parts cleaning.
	• Use **physical or mechanical cleaning** where chemical agents were previously used.
	
	4. Update Procedures, Training, and SOPs
	
	• Revise SOPs to reflect new chemicals or processes.
	• Train staff on:
	  o Safe handling of substitute materials
	  o Recognition of 1,4-dioxane on labels and SDSs
	  o Changes to waste management, labeling, or PPE
	
	5. Notify Regulatory Authorities (if applicable)
	
	• If you previously reported 1,4-dioxane to EPA under the **Toxics Release Inventory (TRI)** or to your state, notify them that use has ceased.
	• Update **stormwater pollution prevention plans (SWPPPs)**, **hazardous waste profiles**, or **air permits** to reflect the change.
	
	6. Verify the Substitution Is Truly Safer
	
	• Conduct a **hazard assessment** to ensure the alternative doesn't introduce new risks (e.g., flammability, acute toxicity, persistence).
	• Use tools such as:
	  o EPA's **Safer Choice** list
	  o **GreenScreen® for Safer Chemicals**
	  o California's **Alternatives Analysis Guide**

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Increase Costs for Replacements

- How companies are getting 1,4-dioxane out of home and personal care products - https://cendevqa.acs.org/business/consumer-products/companies-getting-14-dioxane-home/98/i11
- New law regarding 1,4-dioxane levels confusing for cosmetics and personal care product manufacturers - https://www.cosmeticsdesign.com/Article/2023/02/20/aci-responds-to-ny-law-limiting-solvent-in-personal-care-products/?utm_source=copyright&utm_medium=OnSite&utm_campaign=copyright

Appendix C - Cost Calculations

This section outlines example calculations on how costs were calculated in this fiscal note. Industrial direct dischargers, SIUs, and POTWs were calculated using the same method. The example below reflects an industrial direct discharger.

Monitoring Costs for an Industrial Direct Discharger or SIU

Each affected entity was calculated to conduct baseline monitoring for four consecutive quarters. The following example calculations represent costs associated with one industrial direct discharger. This approach was also used for a POTW or SIU. Table 1 outlines the various cost categories and associated components. Since costs for baseline monitoring are realized in 2026 and 2027, escalation factors were used. During each sampling event, a POTW was required to collect a sample from both the influent and effluent locations. For quality assurance and quality control purposes, it was projected that one duplicate sample was taken for every 10 samples collected. Since this sampling event only included two locations, one duplicate was included. Therefore, each sampling event included three samples that were collected and sent off for analysis. The average cost for the analysis of one sample was $150 at a commercial lab. Costs associated with sampling also should include the supplies, staff time (i.e., collecting samples, coordination of analysis, review of data, and reporting of data to DEQ). A total of 24 hours of staff time were included for each sampling event at a loaded rate of $70 per hour. This loaded rate is calculated based on a $35.98[1] unloaded labor rate, benefits percentage of 29.7%[2], and overhead of 50%[3].

Table 1. Summary of Cost Categories and Components to Determine Monitoring Costs

Cost Categories	Cost Component Descriptions	Cost
Lab Costs to Analyze Samples	Number of Samples per Sampling Event	3
	Cost of 1633 per Sample	$150
	Total Laboratory Analysis Costs	$450
Supplies and Labor to Collect Samples/Review Results	Supplies	$50.00
	Field Staff Hourly Rate ($/hr)	$70.00
	Average Labor Time (hr)[3]	24
	Field staff labor costs (and/or estimates of field time)	$1,680.0
Future cost escalation factors	Lab Costs	0.73%
	Labor Costs - AWI (2000-2022)	3.22%
	Supply Costs - (2000-2022)	2.49%

Minimization Plan Development for an Industrial Direct Discharger or SIU

If an industrial direct discharger or SIU has concentrations of 1,4-dioxane, they will be required to develop a minimization plan. A facility could elect to develop this plan with existing staff or hire a consultant. After

[1] Rate based on early- to mid-career scientist in environmental, chemical, or life sciences
[2] https://www.bls.gov/news.release/pdf/ecec.pdf
[3] Reflects the higher end for private and profits, mid-range for state government, and lower end for a university.

reviewing minimization plan submittals from EPA's TRI, many of these facilities did cite that a consultant was hired to develop this deliverable. Therefore, it was projected that each facility would hire a consultant at a rate that aligns with the level of effort needed to complete the minimization plan development. This extent of effort will be facility specific depending on the scope and scale of the process and to what extent the facility wants to voluntarily comply with the rule and minimize their discharges of 1,4-dioxane. Based on best professional judgement, conversations with consultants and previous consultant contracts of similar efforts, it is estimated that on average the scope of work associated with developing a minimization plan could range from $50,000 to $100,000 and could exceed the upper range in some instances. For the purposes of this reasonableness analysis, a $75,000 average cost was used for 50% of the affected entities that are required to develop a minimization plan. This threshold represents an average level of effort that would broadly be projected for fiscal analysis purposes. Another 25% was projected to put forth a modest effort to develop these plans (i.e., smaller facility or production and limited needs to minimize the discharge of 1,4-dioxane) which translated to $10,000 cost per facility. The remaining 25% of these affected entities were projected to need a more expansive review and preparation at an approximate cost of $112,500 per facility for a higher level of effort. The cost estimate for the higher-level effort was based on a Class 5 cost estimate where we increased the average cost by 50%. This cost component was considered once in the projections since the time period was six years which takes a facility through baseline monitoring, continued monitoring, and the two-year period under the initial minimization plan. After 2031, a facility that does not minimize to less than the lowest reportable concentration would have to submit an updated plan. The level of effort needed to update this plan will vary and will be site specific.

		Level of Effort and Undiscounted Costs*		
Permit/Facility Type	Entities Projected to Development Minimization Plans	Modest ($10,000)	Average ($75,000)	Higher ($112,500)
Significant Industrial Users	155	39	77	39
Industrial Direct Dischargers	34	9	17	8
Total	190	$480,000	$7,050,000	$5,287,500

* cost presented in the fiscal note are discounted following APA and are undiscounted here for illustrative purposes.

Minimization Plan Implementation for Industrial Direct Discharger or SIU

Costs associated with implementing minimization plan best management practices were not calculated cumulatively across all affected entities. This estimate was not determined due to the uncertainty associated with the scope and scale of the reductions that would be elected to be achieved by each affected entity. Costs associated with a range of best management practices are outline in Appendix B.

Summary of Cost Projections by Year from 2026-2031 for the Proposed Rules

Summary of Costs (2026$), Converted to Present Value (PV) @ 7% Discount Rate						
	Baseline Monitoring Period		**Continued Monitoring Period**			
Calendar Year	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Private						
Monitoring						
Industrial Direct	$147,139	$151,125	$310,465.95	$318,934.82	$327,664.33	$336,662.75
SIUs	$653,504	$672,091	$1,382,517	$1,422,051	$1,462,821	$1,504,867
Monitoring and Mitigation Plan Development						
Industrial Direct	-	-	$2,265,000	-	-	-
SIUs	-	-	$10,552,500	-	-	-
Total Discounted	$800,643	$769,360	$12,674,018	$1,421,163	$1,365,953	$1,312,985
Total (Present Value | $2026)	**$18,344,122**					
Local Government						
POTWs Monitoring	$344,857	$354,199	$727,655	$747,503	$767,963	$789,053
Personnel Time	$162,750	$167,400	$172,661	$177,841	$183,177	$188,672
Total Discounted	**$507,607**	**$487,476**	**$786,371**	**$755,357**	**$725,620**	**$697,105**
Total (Present Value | $2026)	**$3,959,535**					
State Government						
Personnel (2 FTEs)	$222,870	$229,556	$236,443	$243,536	$250,842	$258,367
Total Discounted	**$222,870**	**$214,538**	**$206,518**	**$198,798**	**$191,366**	**$184,212**
Total (Present Value | $2026)	**$1,218,303**					
Total Costs to Private, Local Government, and State Government						
Total	**$1,531,120**	**$1,574,371**	**$15,647,242**	**$2,909,866**	**$2,992,467**	**$3,077,622**
Total Discounted	**$1,531,120**	**$1,471,374**	**$13,666,907**	**$2,375,318**	**$2,282,939**	**$2,194,302**
Total (Present Value | $2026)	**$23,521,960**					

15A NCAC 02B .0513 1,4-DIOXANE MONITORING AND MINIMIZATION PROGRAM

(a) For purposes of this Rule, the following definitions shall apply:

(1) "1,4-Dioxane" means any of the following substances: 1,4-dioxane, *p*-dioxane, diethylene dioxide, diethylene ether, diethylene oxide, 1,4-dioxacyclohexane, 1,4-diethylene dioxide, dioxyethylene ether, 1,4-dioxin, tetrahydro-, dioxane, *p*-dioxan, dioxan, 1,4-dioxan, NE 220, and NSC 8728. Chemical Abstracts Service (CAS) Registry Number 123-91-1.

(2) "Industrial Direct Dischargers" means a person with an industrial discharge as defined in Rule .0202 of this Subchapter. Industrial Direct Dischargers does not include persons listed in 15A NCAC 02H .0102(b).

(3) "IDD-IP" means an Industrial Direct Discharger with an individual NPDES permit and an activity classified under one or more of the following SIC or NAICS codes:

(A) SIC codes:

SIC	Name
2111	Tobacco Manufacturing
2221	Broadwoven Fabric Mills
2297	Nonwoven Fabric Mills
2671	Paper Bag and Coated and Treated Paper Manufacturing
2672	Paper Bag and Coated and Treated Paper Manufacturing
2673	Paper Bag and Coated and Treated Paper Manufacturing
2754	Commercial Printing (except Screen and Books)
2800	Chemicals and allied Products
2812	Other Basic Inorganic Chemical Manufacturing
2816	Other Basic Inorganic Chemical Manufacturing
2819	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2821	Plastics Material and Resin Manufacturing
2823	Artificial and Synthetic Fibers and Filaments Manufacturing
2824	Artificial and Synthetic Fibers and Filaments Manufacturing
2833	Medicinal and Botanical Manufacturing
2834	Pharmaceutical Preparation Manufacturing
2841	Soap and Other Detergent Manufacturing
2842	Polish and Other Sanitation Good Manufacturing
2843	Surface Active Agent Manufacturing
2851	Paint and Coating Manufacturing
2861	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
2865	Petrochemical Manufacturing
2869	All Other Miscellaneous Chemical Product and Preparation Manufacturing

SIC	Name
2879	Pesticide and Other Agricultural Chemical Manufacturing
2891	Adhesive Manufacturing
2899	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2911	Petroleum Refineries
2992	Petroleum Lubricating Oil and Grease Manufacturing
3079	Miscellaneous Plastics Products
3081	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
3086	Urethane and Other Foam Product (except Polystyrene) Manufacturing
3089	All Other Plastics Product Manufacturing
3241	Cement Manufacturing
3291	All Other Miscellaneous Fabricated Metal Product Manufacturing
3321	Iron Foundries
3351	Copper Rolling, Drawing, Extruding, and Alloying
3354	Other Aluminum Rolling, Drawing, and Extruding
3444	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3498	Fabricated Pipe and Pipe Fitting Manufacturing
3499	All Other Miscellaneous Fabricated Metal Product Manufacturing
3511	Turbine and Turbine Generator Set Units Manufacturing
3519	Other Motor Vehicle Parts Manufacturing
3523	Saw Blade and Handtool Manufacturing
3534	Elevator and Moving Stairway Manufacturing
3537	All Other Miscellaneous Fabricated Metal Product Manufacturing
3555	All Other Industrial Machinery Manufacturing
3569	All Other Miscellaneous Textile Product Mills
3585	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3661	Telephone Apparatus Manufacturing
3669	Other Communications Equipment Manufacturing
3679	Other Electronic Component Manufacturing
3695	Manufacturing and Reproducing Magnetic and Optical Media
3711	Heavy Duty Truck Manufacturing
3714	Other Motor Vehicle Parts Manufacturing
3724	Research and Development in Nanotechnology
3751	Motorcycle, Bicycle, and Parts Manufacturing

SIC	Name
3764	Research and Development in Nanotechnology
3861	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
3999	All Other Miscellaneous Chemical Product and Preparation Manufacturing
4953	Solid Waste Landfill
5161	Wholesalers machine tools
5172	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
7389	All Other Miscellaneous Chemical Product and Preparation Manufacturing
9511	Administration of Air and Water Resource and Solid Waste Management Programs

(B) NAICS codes:

NAICS	Industry Title
211130	Natural Gas Extraction
311942	Spice and Extract Manufacturing
312230	Tobacco Manufacturing
313210	Broadwoven Fabric Mills
313230	Nonwoven Fabric Mills
313310	Textile and Fabric Finishing Mills
314999	All Other Miscellaneous Textile Product Mills
316110	Leather and Hide Tanning and Finishing
321999	All Other Miscellaneous Wood Product Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
323111	Commercial Printing (except Screen and Books)
324110	Petroleum Refineries
324191	Petroleum Lubricating Oil and Grease Manufacturing
325110	Petrochemical Manufacturing
325120	Industrial Gas Manufacturing
325130	Synthetic Dye and Pigment Manufacturing
325180	Other Basic Inorganic Chemical Manufacturing
325193	Ethyl Alcohol Manufacturing
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing

NAICS	Industry Title
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325992	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326199	All Other Plastics Product Manufacturing
327310	Cement Manufacturing
327910	Abrasive Product Manufacturing
331313	Alumina Refining and Primary Aluminum Production
331318	Other Aluminum Rolling, Drawing, and Extruding
331420	Copper Rolling, Drawing, Extruding, and Alloying
331511	Iron Foundries
332117	Powder Metallurgy Part Manufacturing
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers

NAICS	Industry Title
332919	Other Metal Valve and Pipe Fitting Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333248	All Other Industrial Machinery Manufacturing
333310	Commercial and Service Industry Machinery Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333618	Other Engine Equipment Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333998	All Other Miscellaneous General Purpose Machinery Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334610	Manufacturing and Reproducing Magnetic and Optical Media
335131	Residential Electric Lighting Fixture Manufacturing
335210	Small Electrical Appliance Manufacturing
336110	Automobile and Light Duty Motor Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing

NAICS	Industry Title
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336390	Other Motor Vehicle Parts Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
337127	Institutional Furniture Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339930	Doll, Toy, and Game Manufacturing
339999	All Other Miscellaneous Manufacturing
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
425120	Wholesale Trade Agents and Brokers
541420	Industrial Design Services
541713	Research and Development in Nanotechnology
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators
562219	Other Nonhazardous Waste Treatment and Disposal
562920	Materials Recovery Facilities
812320	Drycleaning and Laundry Services (except Coin-Operated)
924110	Administration of Air and Water Resource and Solid Waste Management Programs

(4) "Intake water" means the water entering the industrial establishment from surface water, groundwater, commercial, or other sources prior to any activities of the industrial establishment.

(5) "Minimization plan for 1,4-dioxane" means a strategy to reduce or eliminate pollutants at the source before they are discharged into the environment. A minimization plan for 1,4-dioxane includes:

(A) Best management practices, such as: identifying and eliminating 1,4-dioxane in raw materials, predicting process or operation generation of 1,4-dioxane as byproducts, improving operational efficiency to minimize the quantity of waste generation, product

substitution to eliminate the introduction or generation for 1,4-dioxane, spill prevention, and installing treatment technologies;

(B) A timeline for implementation;

(C) Estimated annual reductions from implementation; and

(D) Reduction goals, such as a target concentration or % reduction.

(6) "POTW" means Publicly Owned Treatment Works as defined in Rule .0403 of this Subchapter.

(7) "POTW-LPP" means a POTW with a local pretreatment program approved in accordance with Section .0900 of Subchapter 02H that has at least one SIU with an activity classified under one or more SIC or NAICS codes listed in Paragraph (k) of 15A NCAC 02H .0924.

(b) All 1,4-dioxane monitoring outlined in this Rule shall be conducted as follows:

(1) 1,4-dioxane monitoring shall be conducted in accordance with the requirements in Rule .0505 of this Section;

(2) 1,4-dioxane monitoring shall comply with the requirement in 40 CFR 136 to be certified;

(3) 1,4-dioxane monitoring shall require field blanks to be analyzed; and

(4) 1,4-dioxane monitoring shall be a representative grab sample, unless the Director approves use of either a grab-composite as specified in 40 CFR 403.12(g)(3), or 24-hour to 72-hour composites collected by an automatic sampler cleaned and prepared to prevent 1,4-dioxane contamination.

(c) All 1,4-dioxane monitoring outlined in this Rule shall be submitted to the Director as follows:

(1) 1,4-dioxane monitoring results reporting shall comply with the requirements in Rule .0506 of this Section, except as noted in Paragraph (b) of this Rule.

(2) The lowest reporting concentration shall be reported.

(d) 1,4-dioxane baseline characterization monitoring shall be required as follows:

(1) Within 60 days of the effective date of this Rule, the Director shall notify all IDDs-IP and all POTWs-LPP that either:

(A) 1,4-dioxane baseline characterization monitoring shall be required as described in Subparagraph (d)(2) of this Rule, or

(B) Statistically representative historical 1,4-dioxane sampling as described in Subparagraph (d)(3) of this Rule shall be used to satisfy the requirement for 1,4-dioxane baseline characterization monitoring outlined in Subparagraph (d)(2) of this Rule.

The Director shall also notify any new applicants for an individual NPDES Industrial Direct Discharger permit or a POTW seeking approval of new pretreatment program under Section .0900 of Subchapter 02H that 1,4-dioxane baseline characterization monitoring shall be required as described in Subparagraph (d)(2) of this Rule.

(2) Each IDD-IP and POTW-LPP notified under Part (d)(1)(A) of this Rule shall characterize the 1,4-dioxane concentrations in their influent or water intake and their effluent by conducting 1,4-dioxane baseline characterization monitoring as follows:

(A) For each POTW-LPP, 1,4-dioxane samples shall be collected quarterly at each influent station and effluent station for one calendar year from the Director's notification starting within three months from the Director's notification;

(B) For each IDD-IP, 1,4-dioxane samples shall be collected quarterly at each water intake station and effluent station for one calendar year from the Director's notification starting within three months from the Director's notification;

(C) 1,4-dioxane samples shall be collected in accordance with the requirements in Rule .0505 of this Section;

(D) 1,4-dioxane samples shall be collected in accordance with the requirements in Paragraph (b) of this Rule; and

(E) 1,4-dioxane monitoring data shall be submitted to the Director in accordance with the requirements in Paragraph (c) of this Rule.

(3) Statistically representative historical 1,4-dioxane sampling may be used to satisfy the requirement for 1,4-dioxane baseline characterization monitoring outlined in Subparagraph (d)(2) of this Rule if all of the following criteria are met:

(A) The 1,4-dioxane sampling follows the requirements in Paragraph (b) of this Rule;

(B) The 1,4-dioxane sampling follows the requirements in Subparagraph (d)(2) of this Rule; and

(C) The samples were collected within the four and one-half years prior to the Director's notification date under Subparagraph (d)(1) of this Rule.

(4) 1,4-dioxane monitoring required in a NPDES permit issued prior to the effective date of this Rule may be used to satisfy the requirement for 1,4-dioxane baseline characterization monitoring outlined in Subparagraph (d)(2) of this Rule if all of the following criteria are met:

(A) The 1,4-dioxane sampling follows the requirements in Paragraph (b) of this Rule; and

(B) The 1,4-dioxane sampling follows the requirements in Subparagraph (d)(2) of this Rule.

(e) 1,4-dioxane ongoing monitoring shall be required as follows:

(1) The Director shall require 1,4-dioxane ongoing monitoring as described in Subparagraph (e)(2) of this Rule for any IDD-IP or POTW-LPP that reports a concentration above the lowest reporting concentration (i.e., not a non-detect) for 1,4-dioxane in any of the quarterly effluent station samples collected under Paragraph (d) of this Rule.

(A) For each IDD-IP and POTW-LPP notified under Part (d)(1)(A) of this Rule, within 120 calendar days of receiving all of the 1,4-dioxane baseline characterization monitoring data as required in Paragraph (d) of this Rule, the Director shall notify each IDD-IP and each POTW-LPP whether 1,4-dioxane ongoing monitoring will be required or not.

(B) For each IDD-IP and POTW-LPP notified under Part (d)(1)(B) of this Rule, when the Director notifies each IDD-IP and each POTW-LPP in accordance with Part (d)(1)(B) of

this Rule, the Director shall also notify each IDD-IP and each POTW-LPP whether 1,4-dioxane ongoing monitoring will be required or not.

(2) Each IDD-IP and POTW-LPP notified under Subparagraph (e)(1) of this Rule shall conduct ongoing 1,4-dioxane monitoring of their effluent as follows:

(A) For each POTW-LPP, 1,4-dioxane samples shall be collected quarterly at each influent station and effluent station starting within three months from the Director's notification. Sampling shall continue each calendar year until all of the requirements in Subparagraph (e)(3) of this Rule are met;

(B) For each IDD-IP, 1,4-dioxane samples shall be collected quarterly at each water intake station and effluent station starting within three months from the Director's notification. Sampling shall continue each calendar year until all of the requirements in Subparagraph (e)(3) of this Rule are met

(C) 1,4-dioxane samples shall be collected in accordance with the requirements in Rule .0505 of this Section;

(D) 1,4-dioxane samples shall be collected in accordance with the requirements in Paragraph (b) of this Rule; and

(E) 1,4-dioxane monitoring data shall be submitted to the Director in accordance with the requirements in Paragraph (c) of this Rule.

(3) Ongoing 1,4-dioxane monitoring required in Subparagraphs (e)(1) and (e)(2) of this Rule shall continue until at each effluent station until the concentration for 1,4-dioxane is below the lowest reporting concentration (i.e., reported as non-detects) in four consecutive quarterly effluent samples for that effluent station. If more than one sample is collected per quarter at an effluent station, then the highest concentration of 1,4-dioxane for that quarter shall be used to determine whether ongoing 1,4-dioxane monitoring shall be performed at that effluent station.

(f) A minimization plan for 1,4-dioxane shall be required for IDDs-IP as follows:

(1) When the Director notifies each IDD-IP in accordance with Subparagraph (e)(1) of this Rule, the Director shall also notify each IDD-IP that meets the criteria in Subparagraph (e)(1) that a minimization plan for 1,4-dioxane that will reduce or eliminate 1,4-dioxane loading to surface waters is required.

(2) Within 365 days of receiving notification from the Director that a minimization plan for 1,4-dioxane is required, a minimization plan for 1,4-dioxane must be submitted by the IDD-IP to the Director for review and approval.

(3) Within 120 calendar days of receipt of the minimization plan for 1,4-dioxane from the IDD-IP, the Director shall approve the plan or notify the IDD-IP of any deficiencies identified in the plan that must be addressed before approval. The IDD-IP shall correct all deficiencies and resubmit a complete and updated minimization plan for 1,4-dioxane to the Director within 60 calendar days.

(4) Within 120 calendar days of the Director's approval of the minimization plan for 1,4-dioxane, the IDD-IP shall commence implementation of the minimization plan for 1,4-dioxane. Upon approval by the Director, the IDD-IP is required to comply with their approved minimization plan for 1,4-dioxane. The Director shall incorporate the ongoing monitoring and approved minimization plan for 1,4-dioxane into the IDD-IP permit upon permit renewal.

(5) The Director shall require annual reporting on the minimization plan for 1,4-dioxane that include at a minimum:

(A) A summary of the status of implementation of the minimization plan for 1,4-dioxane; and

(B) Any observed increases or decreases in 1,4-dioxane concentrations in the samples collected before and after implementation of the minimization plan for 1,4-dioxane.

(6) The minimization plan for 1,4-dioxane shall be reviewed every two years after the Director's approval in accordance with Subparagraph (f)(4) of this Rule. If the IDD-IP's reduction goals in their approved minimization plan for 1,4-dioxane are not met, then the IDD-IP shall provide an updated minimization plan for 1,4-dioxane to seek additional reductions to the Director for review and approval in accordance with Subparagraphs (f)(2) and (3) of this Rule.

(7) Once the criteria in Subparagraph (e)(3) of this Rule are met for all effluent stations at the IDD-IP, the requirements in Subparagraphs (f)(5) and (6) of this Rule shall no longer be required from the IDD-IP.

(g) An IDD-IP may request an exemption from the requirements in Paragraphs (e) and (f) of this Rule from the Director if all of the following criteria are met:

(1) The 1,4-dioxane concentration in all of the quarterly effluent station samples is equal to or less than the 1,4-dioxane concentration in all of the intake water station samples;

(2) There is no increase in 1,4-dioxane due to activities of the IDD-IP.

(h) Nothing in this Rule limits the Control Authority's authority to impose additional monitoring, reduction requirements, control or treatment requirements, or any other requirements as authorized in Section .0900 of Subchapter 02H.

(i) Nothing in this Rule limits the Commission's or Division's authority to impose additional monitoring, reduction requirements, control or treatment requirements, or any other requirements as authorized under the Clean Water Act, under the North Carolina General Statutes, or under other Rules within the North Carolina Administrative Code.

History Note: *Authority G.S. 143-215(a); 143-215.1(a); 143-215.1(b); 143-215.1(c); 143-215.3(a)(1); 143-215.3(a)(2); 143-215.6A; 143-215.6B; 143-215.6C; 143-215.65; 143-215.66; 143-215.67; 143-215.69*
Eff. DATE;

15A NCAC 02H .0924 1,4-DIOXANE MONITORING AND MINIMIZATION PROGRAM

(a) For purposes of this Rule, the following definitions shall apply:

(1) "1,4-Dioxane" means any of the following substances: 1,4-dioxane, *p*-dioxane, diethylene dioxide, diethylene ether, diethylene oxide, 1,4-dioxacyclohexane, 1,4-diethylene dioxide, dioxyethylene ether, 1,4-dioxin, tetrahydro-, dioxane, *p*-dioxan, dioxan, 1,4-dioxan, NE 220, and NSC 8728. Chemical Abstracts Service (CAS) Registry Number 123-91-1.

(2) "Intake water" means the water entering the SIU from surface water, groundwater, commercial, or other sources prior to any activities of the SIU.

(3) "Minimization plan for 1,4-dioxane" means a strategy to reduce or eliminate pollutants at the source before they are discharged into the environment. A minimization plan for 1,4-dioxane includes:

(A) Best management practices, such as: identifying and eliminating 1,4-dioxane in raw materials, predicting process or operation generation of 1,4-dioxane as byproducts, improving operational efficiency to minimize the quantity of waste generation, product substitution to eliminate the introduction or generation for 1,4-dioxane, spill prevention, and installing treatment technologies;

(C) A timeline for implementation;

(D) Estimated annual reductions from implementation; and

(E) Reduction goals, such as a target concentration or % reduction.

(4) "NAICS" means North American Industry Classification System as defined in 15A NAC 02B .0503(18);

(5) "Quarterly" means the term as defined in 15A NCAC 02B .0503(20);

(6) "SIC" means Standard Industrial Classification as defined in 15A NCAC 02B .0503(23).

(b) All 1,4-dioxane monitoring outlined in this Rule shall be conducted as follows:

(1) 1,4-dioxane monitoring and reporting shall be conducted in accordance with the guidelines in 40 CFR Part 136;

(2) 1,4-dioxane monitoring and reporting shall comply with the requirement in 40 CFR 403.12 to be certified;

(3) 1,4-dioxane monitoring and reporting shall require field blanks to be analyzed; and

(4) 1,4-dioxane monitoring and reporting shall be a representative grab sample, unless the Control Authority approves use of either a grab-composite as specified in 40 CFR 403.12(g)(3), or 24-hour to 72-hour composites collected by an automatic sampler cleaned and prepared to prevent 1,4-dioxane contamination.

(c) All 1,4-dioxane monitoring outlined in this Rule shall be submitted to the Control Authority as follows:

(1) 1,4-dioxane monitoring data submitted shall at a minimum include the following:

(A) Facility name;

(B) Facility number or other identification if assigned by the Control Authority;

(C) For each reported sample: sample date, sample time (on a 2400 hour clock basis), sample location, and sample collection type; and

(D) The lowest reporting concentration shall be reported.

(2) 1,4-dioxane monitoring data shall be submitted to the Control Authority in accordance with the schedule outlined in the pretreatment discharge permit issued to the SIU by the Control Authority in accordance with Rule .0916 of this Subchapter.

(d) 1,4-dioxane baseline characterization monitoring shall be required as follows:

(1) Within 60 days of the effective date of this Rule, the Control Authority shall notify all SIUs with one or more SIC or NAICS codes listed under Paragraph (k) of this Rule that either:

(A) 1,4-dioxane baseline characterization monitoring shall be required as described in Subparagraph (d)(2) of this Rule, or

(B) Representative historical 1,4-dioxane sampling as described in Subparagraph (d)(3) of this Rule shall be used to satisfy the requirement for 1,4-dioxane baseline characterization monitoring outlined in Subparagraph (d)(2) of this Rule.

The Control Authority shall specify in the notification whether the Control Authority or SIU will be responsible for completing the monitoring. The Control Authority shall also notify any new SIU pretreatment permit applicant with one or more SIC or NAICS codes listed under Paragraph (k) of this Rule that 1,4-dioxane baseline characterization monitoring shall be required as described in Subparagraph (d)(2) of this Rule.

(2) SIUs notified under Part (d)(1)(A) of this Rule, or the Control Authority on behalf of the SIU, shall characterize the 1,4-dioxane concentrations in their effluent by conducting 1,4-dioxane baseline characterization monitoring as follows:

(A) 1,4-dioxane samples shall be collected quarterly at each effluent station for one calendar year from the Control Authority's notification starting within three months from the Control Authority's notification;

(B) 1,4-dioxane sample location and timing shall be representative of the effluent for each effluent;

(C) 1,4-dioxane samples shall be collected in accordance with the requirements in Paragraph (b) of this Rule; and

(D) 1,4-dioxane monitoring data shall be submitted to the Control Authority in accordance with the requirements in Paragraph (c) of this Rule.

(3) Representative historical 1,4-dioxane sampling may be used to satisfy the requirement for 1,4-dioxane baseline characterization monitoring outlined in Subparagraph (d)(2) of this Rule if all of the following criteria are met:

(A) The 1,4-dioxane sampling follows the requirements in Paragraph (b) of this Rule;

(B) The 1,4-dioxane sampling follows the requirements in Subparagraph (d)(2) of this Rule; and

(C) The samples were collected within the four and one-half years prior to the date the SIU is notified by the Control Authority as outlined in Subparagraph (d)(1) of this Rule.

(4) 1,4-dioxane monitoring required in a NPDES permit may be used to satisfy the requirement for 1,4-dioxane baseline characterization monitoring outlined in Subparagraph (d)(2) of this Rule if all of the following criteria are met:

(A) The 1,4-dioxane sampling follows the requirements in Paragraph (b) of this Rule; and

(B) The 1,4-dioxane sampling follows the requirements in Subparagraph (d)(2) of this Rule.

(e) 1,4-dioxane ongoing monitoring shall be required as follows:

(1) The Control Authority shall require 1,4-dioxane ongoing monitoring as described in Subparagraph (e)(2) of this Rule for any SIU with an activity classified under one or more SIC or NAICS codes listed under Paragraph (k) of this Rule that reports a concentration above the lowest reporting concentration (i.e., not a non-detect) for 1,4-dioxane in any of the quarterly effluent station samples collected under Paragraph (d) of this Rule.

(A) For each SIU notified under Part (d)(1)(A) of this Rule, within 120 calendar days of receiving all of the 1,4-dioxane baseline characterization monitoring data as required in Paragraph (d) of this Rule, the Control Authority shall notify each SIU whether 1,4-dioxane ongoing monitoring will be required or not. The Control Authority shall specify in the notification whether the Control Authority or SIU will be responsible for completing the ongoing monitoring of 1,4-dioxane.

(B) For each SIU notified under Part (d)(1)(B) of this Rule, when the Control Authority notifies each SIU in accordance with Part (d)(1)(B) of this Rule, the Control Authority shall also notify each SIU whether 1,4-dioxane ongoing monitoring will be required or not.

(2) SIUs notified under Subparagraph (e)(1) of this Rule, or the Control Authority on behalf of the SIU, shall conduct ongoing 1,4-dioxane monitoring of their effluent as follows:

(A) 1,4-dioxane samples shall be collected semiannually at each effluent station starting within three months from the Control Authority's notification date per Subparagraph (e)(1) of this Rule. Sampling shall continue each calendar year until the requirements in Subparagraph (e)(3) of this Rule are met;

(B) 1,4-dioxane sample location and timing shall be representative of the effluent for each effluent;

(C) 1,4-dioxane samples shall be collected in accordance with the requirements in Paragraph (b) of this Rule; and

(D) 1,4-dioxane monitoring data shall be submitted to the Control Authority in accordance with the requirements in Paragraph (c) of this Rule.

(3) Ongoing 1,4-dioxane monitoring required in Subparagraphs (e)(1) and (2) of this Rule shall continue until at each effluent station until the concentration for 1,4-dioxane is below the lowest reporting concentration (i.e., reported as non-detect) in four consecutive quarterly effluent samples for that

effluent station. If more than one sample is collected per quarter at an effluent station, then the highest concentration of 1,4-dioxane for that quarter shall be used to determine whether ongoing 1,4-dioxane monitoring shall be performed at that effluent station.

(f) A minimization plan for 1,4-dioxane shall be required as follows:

(1) When the Control Authority notifies each SIU with an activity classified under one or more SIC or NAICS codes listed under Paragraph (k) of this Rule in accordance with Subparagraph (e)(1) of this Rule, they shall also notify each SIU that meets the criteria in Subparagraph (e)(1) that a minimization plan for 1,4-dioxane that will reduce or eliminate 1,4-dioxane loading to the POTW is required.

(2) Within 365 days of receiving notification from the Control Authority that a minimization plan for 1,4-dioxane is required, a minimization plan for 1,4-dioxane must be submitted by the SIU to the Control Authority for review and approval.

(3) Within 120 calendar days of receipt of the minimization plan for 1,4-dioxane from the SIU, the Control Authority shall approve the minimization plan for 1,4-dioxane or notify the SIU of any deficiencies identified in the minimization plan for 1,4-dioxane that must be addressed before approval. The SIU shall correct all deficiencies and resubmit a complete and updated minimization plan for 1,4-dioxane to the Control Authority within 60 calendar days.

(4) Within 120 calendar days of the Control Authority's approval of the minimization plan for 1,4-dioxane, the SIU shall commence implementation of the minimization plan for 1,4-dioxane. The Control Authority shall modify the SIU permit in accordance with Rule .0916 of this Subchapter to incorporate the ongoing monitoring and the approved minimization plan for 1,4-dioxane into the SIU permit within 120 calendar days of the Control Authority's approval of the minimization plan for 1,4-dioxane.

(5) The Control Authority shall require annual reporting on the minimization plan for 1,4-dioxane in the SIU permits that include at a minimum:

(A) A summary of the status of implementation of the minimization plan for 1,4-dioxane; and

(B) Any observed increases or decreases in the 1,4-dioxane concentrations in the samples collected before and after implementation of the minimization plan for 1,4-dioxane.

(6) The minimization plan for 1,4-dioxane shall be reviewed every two years after the SIU permit is modified in accordance with Subparagraph (f)(4) of this Rule. If the SIU's reduction goals in their approved minimization plan for 1,4-dioxane are not met, then the SIU shall provide an updated minimization plan for 1,4-dioxane to seek additional reductions to the Control Authority for review and approval in accordance with Subparagraphs (f)(2) and (3) of this Rule.

(7) Once the criteria in Subparagraph (e)(3) are met for all effluent stations at the SIU, the requirements in Subparagraphs (f)(5) and (6) of this Rule shall no longer be required from the SIU.

(g) A SIU may request an exemption from the requirements in Paragraphs (e) and (f) of this Rule from the Control Authority if all of the following are met:

(1) Concurrent with the 1,4-dioxane baseline characterization monitoring conducted in accordance with Paragraph (d) of this Rule, the SIU must also characterize the 1,4-dioxane concentrations in their intake water by conducting 1,4-dioxane baseline characterization monitoring as follows:

(A) 1,4-dioxane samples shall be collected quarterly at each intake water station for one calendar year from the date the SIU is notified by the Control Authority in Subparagraph (d)(1) of this Rule;

(B) 1,4-dioxane sample location and timing shall be representative of the intake water for each intake water station;

(C) 1,4-dioxane samples shall be collected in accordance with the requirements in Paragraph (b) of this Rule; and

(D) 1,4-dioxane monitoring data shall be submitted to the Control Authority in accordance with the requirements in Paragraph (c) of this Rule.

(2) The 1,4-dioxane concentrations meet all of the following criteria:

(A) The 1,4-dioxane concentration in all of the quarterly effluent station samples is equal to or less than the 1,4-dioxane concentration in all of the intake water station samples;

(B) There is no increase in 1,4-dioxane due to activities of the SIU.

(h) In the Pretreatment Annual Report submitted to the Division as required in Rule .0908 of this Subchapter, the Control Authority shall submit a 1,4-dioxane Addendum that includes:

(1) A summary of the 1,4-dioxane monitoring data received by the Control Authority from all SIUs as required in Paragraphs (d) and (e) of this Rule;

(2) Copies of lab reporting sheets of excel spreadsheets received by the Control Authority from all SIUs as required in Paragraphs (c) and (d) of this Rule.

(3) A list of SIUs with approved minimization plans for 1,4-dioxane, including their total volume discharged and their estimated mass of 1,4-dioxane discharged during the reporting year;

(4) A summary of the implementation status for all approved minimization plans for 1,4-dioxane;

(5) A summary of the estimated annual reductions of 1,4-dioxane reaching the POTW from implementation of the approved minimization plans for 1,4-dioxane;

(6) A list of any enforcement actions taken for failing to conduct ongoing 1,4-dioxane monitoring, failing to provide a minimization plan for 1,4-dioxane or for failing to implement an approved minimization plan for 1,4-dioxane; and

(7) A summary of status and outcomes for any enforcement actions taken.

(i) Nothing in this Rule limits the Control Authority's authority to impose additional monitoring, reduction requirements, control or treatment requirements, or any other requirements as authorized in Section .0900 of this Subchapter.

(j) Nothing in this Rule limits the Commission's or Division's authority to impose additional monitoring, reduction requirements, control or treatment requirements, or any other requirements as authorized under the Clean Water Act, under the North Carolina General Statutes, or under other Rules within the North Carolina Administrative Code.

(k) Index of SIC and NAICS codes:

(1) SIC codes:

SIC	Name
2111	Tobacco Manufacturing
2221	Broadwoven Fabric Mills
2297	Nonwoven Fabric Mills
2671	Paper Bag and Coated and Treated Paper Manufacturing
2672	Paper Bag and Coated and Treated Paper Manufacturing
2673	Paper Bag and Coated and Treated Paper Manufacturing
2754	Commercial Printing (except Screen and Books)
2800	Chemicals and allied Products
2812	Other Basic Inorganic Chemical Manufacturing
2816	Other Basic Inorganic Chemical Manufacturing
2819	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2821	Plastics Material and Resin Manufacturing
2823	Artificial and Synthetic Fibers and Filaments Manufacturing
2824	Artificial and Synthetic Fibers and Filaments Manufacturing
2833	Medicinal and Botanical Manufacturing
2834	Pharmaceutical Preparation Manufacturing
2841	Soap and Other Detergent Manufacturing
2842	Polish and Other Sanitation Good Manufacturing
2843	Surface Active Agent Manufacturing
2851	Paint and Coating Manufacturing
2861	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
2865	Petrochemical Manufacturing
2869	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2879	Pesticide and Other Agricultural Chemical Manufacturing
2891	Adhesive Manufacturing
2899	All Other Miscellaneous Chemical Product and Preparation Manufacturing
2911	Petroleum Refineries
2992	Petroleum Lubricating Oil and Grease Manufacturing
3079	Miscellaneous Plastics Products
3081	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
3086	Urethane and Other Foam Product (except Polystyrene) Manufacturing
3089	All Other Plastics Product Manufacturing
3241	Cement Manufacturing

SIC	Name
3291	All Other Miscellaneous Fabricated Metal Product Manufacturing
3321	Iron Foundries
3351	Copper Rolling, Drawing, Extruding, and Alloying
3354	Other Aluminum Rolling, Drawing, and Extruding
3444	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3498	Fabricated Pipe and Pipe Fitting Manufacturing
3499	All Other Miscellaneous Fabricated Metal Product Manufacturing
3511	Turbine and Turbine Generator Set Units Manufacturing
3519	Other Motor Vehicle Parts Manufacturing
3523	Saw Blade and Handtool Manufacturing
3534	Elevator and Moving Stairway Manufacturing
3537	All Other Miscellaneous Fabricated Metal Product Manufacturing
3555	All Other Industrial Machinery Manufacturing
3569	All Other Miscellaneous Textile Product Mills
3585	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3661	Telephone Apparatus Manufacturing
3669	Other Communications Equipment Manufacturing
3679	Other Electronic Component Manufacturing
3695	Manufacturing and Reproducing Magnetic and Optical Media
3711	Heavy Duty Truck Manufacturing
3714	Other Motor Vehicle Parts Manufacturing
3724	Research and Development in Nanotechnology
3751	Motorcycle, Bicycle, and Parts Manufacturing
3764	Research and Development in Nanotechnology
3861	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
3999	All Other Miscellaneous Chemical Product and Preparation Manufacturing
4953	Solid Waste Landfill
5161	Wholesalers machine tools
5172	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
7389	All Other Miscellaneous Chemical Product and Preparation Manufacturing
9511	Administration of Air and Water Resource and Solid Waste Management Programs

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1 (2) NAICS codes:

NAICS	Industry Title
211130	Natural Gas Extraction
311942	Spice and Extract Manufacturing
312230	Tobacco Manufacturing
313210	Broadwoven Fabric Mills
313230	Nonwoven Fabric Mills
313310	Textile and Fabric Finishing Mills
314999	All Other Miscellaneous Textile Product Mills
316110	Leather and Hide Tanning and Finishing
321999	All Other Miscellaneous Wood Product Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
323111	Commercial Printing (except Screen and Books)
324110	Petroleum Refineries
324191	Petroleum Lubricating Oil and Grease Manufacturing
325110	Petrochemical Manufacturing
325120	Industrial Gas Manufacturing
325130	Synthetic Dye and Pigment Manufacturing
325180	Other Basic Inorganic Chemical Manufacturing
325193	Ethyl Alcohol Manufacturing
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325211	Plastics Material and Resin Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325992	Photographic Film, Paper, Plate, Chemical, and Copy Toner Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing

NAICS	Industry Title
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326199	All Other Plastics Product Manufacturing
327310	Cement Manufacturing
327910	Abrasive Product Manufacturing
331313	Alumina Refining and Primary Aluminum Production
331318	Other Aluminum Rolling, Drawing, and Extruding
331420	Copper Rolling, Drawing, Extruding, and Alloying
331511	Iron Foundries
332117	Powder Metallurgy Part Manufacturing
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332919	Other Metal Valve and Pipe Fitting Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333248	All Other Industrial Machinery Manufacturing
333310	Commercial and Service Industry Machinery Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333618	Other Engine Equipment Manufacturing
333921	Elevator and Moving Stairway Manufacturing

NAICS	Industry Title
333922	Conveyor and Conveying Equipment Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333998	All Other Miscellaneous General Purpose Machinery Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334610	Manufacturing and Reproducing Magnetic and Optical Media
335131	Residential Electric Lighting Fixture Manufacturing
335210	Small Electrical Appliance Manufacturing
336110	Automobile and Light Duty Motor Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336390	Other Motor Vehicle Parts Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
337127	Institutional Furniture Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339930	Doll, Toy, and Game Manufacturing

NAICS	Industry Title
339999	All Other Miscellaneous Manufacturing
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
425120	Wholesale Trade Agents and Brokers
541420	Industrial Design Services
541713	Research and Development in Nanotechnology
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators
562219	Other Nonhazardous Waste Treatment and Disposal
562920	Materials Recovery Facilities
812320	Drycleaning and Laundry Services (except Coin-Operated)
924110	Administration of Air and Water Resource and Solid Waste Management Programs

History Note: *Authority G.S. 143-215(a); 143-215.1(a); 143-215.1(b); 143-215.1(c); 143-215.3(a)(1); 143-215.3(a)(2); 143-215.3(a)(14); 143-215.6A; 143-215.6B; 143-215.6C; 143-215.65; 143-215.66; 143-215.67; 143-215.69*
Eff. DATE;