Draft Iowa Nutrient Reduction Strategy

November 19, 2012

Response to Comments

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Introduction & Changes Summary

This is a summary of the comments received on the November 19, 2012 Draft Iowa Nutrient Reduction Strategy and responses to those comments. Comments were received over a two month comment period from November 19, 2012 to January 18, 2013.

Four public meetings were held — Denison on December 17, 2012; Ames on December 19, 2012; a webinar on December 21, 2012; and Monticello on January 18, 2012. Notice of the meetings was sent to interest groups and statewide news network organizations.

Approximately 1,700 persons or groups provided written comments on the Draft Iowa Nutrient Reduction Strategy (All the public comments can be found at http://www.nutrientstrategy.iastate.edu/public).

This document provides a discussion of issues raised by the comments and identifies areas of the strategy that were modified. It addresses all of the substantive comments received, although each individual comment is not specifically listed and many of the comments have been summarized to reduce the length of this document.

The questions and comments are grouped by topic. The response appears immediately after each comment.

Several changes and improvements to the Iowa Nutrient Reduction Strategy were incorporated based on comments received during the public comment period. Many changes were made to make the document easier to understand, reduce ambiguity and to clarify certain aspects of the strategy. The major substantive changes are listed below, organized by strategy section.

Executive Summary and Section 1: Policy Considerations and Strategy

- A subsection was added to the Executive Summary titled "Point Source & Nonpoint Source Collaboration" to emphasize that a concerted, cooperative, and sustained effort by both point and nonpoint sources will be needed to achieve the goals of the strategy.

- Section 1.2 - Background - Modifications to the "Numeric Nutrient Criteria Limitations" subsection were made to better reflect EPA's current positions on numeric criteria development and implementation.

- Section 1.3 - Regulatory and Administrative Framework – Modifications were made to the "Roles and Responsibilities of the Iowa Water Resources Coordinating Council" subsection to more accurately describe the responsibilities of the WRCC as defined by the Iowa Code. The specific roles and responsibilities of the WRCC as they pertain to the strategy were clarified throughout Section 1.

- Section 1.3 - Regulatory and Administrative Framework – New paragraphs were added to the "Iowa Conservation Progress" subsection providing perspective on how the strategy will build upon the progress to date.

- Section 1.4 - Nutrient Reduction Strategy

    - #3 Ensure Effectiveness of Point Source Permits, Animal Feeding Operations – Clarifications were made based on public comments.

    - #5 Storm Water, Septic Systems, Minor POTWs; Storm Water – Revisions were made that describe additional efforts that will be made to increase education and outreach pertaining to urban storm water including urban lawn care practices and golf course management.

    - #8 Numeric Criteria Development – Clarifications were made based on EPA and public comments

Section 2: Nonpoint Source Nutrient Reduction Science Assessment

- A table explaining the Nutrient Reduction Load Calculations for 45% TN and TP Reduction was added to the introduction of Section 2.1.

- Due to a lack of data from peer-reviewed literature within the Midwest for nonpoint sources, references to P retention within ponds has been removed. The importance of proper design of buffers and sedimentation basins in achieving P reduction has been emphasized within the text of the Executive Summary.

- Additional explanation, clarification, and references were made to explain the assumptions and calculations used in developing the Science Assessment. See the "Responses to Comments on the Science Assessment" section in this document for details.

Section 3: Point Source Nutrient Reduction Technology Assessment

- Replaced references to biological nutrient removal (BNR) with the general term "treatment" to make clear that other options for nutrient removal are available.

- Added revisions to appropriately reflect how best professional judgment limits are calculated consistent with federal regulations.

- Added a category to address expectations for facilities without biological treatment processes that were not accounted for in the draft strategy.

- Modified language to state that permits will specify annual average TN and TP mass limits. The methodology for how limits are calculated from plant performance data will be documented in the rationale as limits are proposed to be included in a permit.

- Specified that requirements to evaluate the feasibility and reasonableness of nutrient reduction technologies will be specified in a permit only when it is issued or reissued, not by amendment.

- Modified 10-year moratorium language to be consistent with TMDL section of the strategy to address EPA concerns.

- Clarified language regarding construction schedules to address EPA concerns.

- Added six-month process optimization period prior to a 12-month performance evaluation period to address concerns regarding start-up issues when implementing new treatment technologies.

- Updated and reformatted the list of affected facilities in Section 3.3.

Strategy Development Process

Comments: -Instead of canvassing the state and having discussions with various constituencies about the best way to solve Iowa's nutrient problem, the Committee instead barely allowed for any voices in the creation of this strategy, except for the present comment period. Such a method is surely not the best way for the state to go about crafting important policy proposals, especially when the proposal seeks to promote education and outreach as a core component of its strategy. The state can surely do better.

Response: There are typically a range of opinions on how best to develop solutions to complex, sometimes polarizing problems. In this case we thought it was important to have a sufficiently developed proposal that people could react to and that would allow for meaningful public comment. The process was designed with that in mind. The draft strategy was publicized in the media, open meetings and presentations were held across the state to encourage public participation, and more than 1,700 individuals and organizations submitted comments on the draft strategy. This document responds to comments received and changes have been made to improve the final strategy based on those comments.

The state worked with many different stakeholders throughout this process including qualified government and non-governmental technical experts and with Iowa State University. That input was critical and improved the draft strategy prior to public release when all Iowans' comments were solicited to gain their input. The work of incorporating input from stakeholders continues now as the strategy is finalized.

Comment: I sincerely hope that the developers of the Iowa Nutrient Reduction Strategy take the necessary time to carefully review all of the public comments, consult additional resources, and revise the strategy accordingly.

Response: Each of the approximately 1,900 pages of comments submitted on the draft nutrient reduction strategy was reviewed. As this Responsiveness Summary shows, careful consideration was given to all comments and revisions to the strategy have been made as a result of those comments. We have maintained close contact with stakeholders who are affected by the strategy throughout its development and will continue to do so as the strategy is implemented.

Comment: I'm concerned the plan contradicts IDNR's mission to "conserve and enhance Iowa's natural resources and to ensure a legacy for future generations."

Response: The DNR's mission is:

"**The DNR's mission:** *To conserve and enhance our natural resources in cooperation with individuals and organizations to improve the quality of life for Iowans and ensure a legacy for future generations."*

The department believes the strategy exemplifies the DNR's mission. Working to reduce nutrient pollution will improve water quality in Iowa and downstream, thus enhancing our natural resources, improving quality of life, and ensuring a clean water legacy for future generations. The strategy was developed in partnership with the Iowa Department of

Agriculture and Land Stewardship and Iowa State University and in cooperation with several different individuals and organizations throughout the state, consistent with the DNR's mission to cooperate with individuals and organizations.

Comments: -In general, I have seen a troubling lack of acknowledgement that Iowa even has a water quality problem state government is interested in solving.

-If the nutrient strategy does not educate the public about the full scope and consequences of Iowa's nutrient pollution problem, it cannot effectively motivate Iowans to act. A serious strategy must talk about how nutrient pollution is an Iowa problem with consequences for every Iowan.

Response: The impact that nutrients have on water quality in Iowa is acknowledged throughout the strategy. For example:

The executive summary states the following on page 1, second paragraph: "The strategy will also intensify efforts to address nutrient-related water quality problems in Iowa's waters that negatively impact beneficial water uses enjoyed and required by all Iowans."

The executive summary states the following on page 4, last paragraph: "The path forward to reducing nutrient impacts will not be easy, but this strategy is a key step towards improving Iowa's water quality…"

The Introduction (Section 1.1) states the following on Page 5, second paragraph: "Progress measured at the Gulf of Mexico towards these larger reduction targets, however, has been challenging, and many complex nutrient-related impacts in Iowa's lakes, reservoirs and streams remain to be addressed."

The background (Section 1.2) states the following on page 6, fourth paragraph: "Reducing excess nutrients in Iowa's surface waters can: a) improve water clarity and minimize objectionable algal growths affecting water-based recreation; b) reduce dissolved oxygen deficiencies which can lead to fish kills and reduce aquatic biological diversity; and c) minimize occurrence of taste and odor chemical compounds that impact potable drinking water supplies. Reducing nitrogen in ground water aquifers and surface water withdrawals also protects private and public drinking water sources."

We agree that the strategy could devote more space to describing all of the water quality issues that nutrients can cause. The purpose of the strategy, however, is to present a reasonable and cost-effective path forward to reducing the amount of nutrients entering lakes, rivers, streams and ultimately, the Gulf of Mexico.

Comments: -We urge the state to work with stakeholders and the USEPA to confirm a nutrient reduction strategy that is acceptable to EPA before any facility undertakes such an exceptional capital investment.

-Our concern is that the revised strategy is developed in a manner that EPA will approve and that will allow DNR to retain primacy over the NPDES program. Is losing primacy a risk?

Response: Stakeholder groups including the Iowa League of Cities, the Iowa Water Environment Association and the Iowa Association of Business and Industry were instrumental in the development of this strategy and will continue to be valuable partners as we move into the implementation phase.

The strategy does not require formal EPA approval; however, we have considered their comments and suggestions, and we have made several changes that address their specific comments and concerns and we believe the strategy is acceptable to the EPA. We base our belief on statements contained in a letter dated January 9, 2013 in which Karl Brooks, Administrator for EPA Region 7, said, "The EPA commends the Iowa Department of Agriculture and Land Stewardship and the Iowa Department of Natural Resources for reaching this important milestone as Iowa moves forward to fulfill its Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (Hypoxia Task Force) commitment to develop a nutrient reduction strategy. This agency notes appreciatively that the draft strategy, developed jointly by your agencies, embraces a specific, ambitious nutrient reduction target." EPA further expressed its appreciation of Iowa's effort to develop the strategy and has said it looks forward to working collaboratively with IDALS and IDNR on its implementation. There is no risk that the DNR will lose primacy of the NPDES program as a result of implementing this strategy.

General Comments & Questions

Comment: My personal preference is to see the strategy presented as 45% overall reduction through:

a) 67% N and 75% P reduction from point sources contributing an estimated 8% of N load and 20% of P load

b) 41% N and 29% P reduction from nonpoint sources contributing an estimated 92% of N load and 80% of estimated P load.

> **Response:** A table explaining the Nutrient Reduction Load Calculations for 45% TN and TP Reduction has been added to the introduction of Section 2.1.

Comment: Doesn't it make more sense to work on the nonpoint source of the problem first?

> **Response:** While it is true that the largest percentage of nitrogen and phosphorus entering Iowa waters is from nonpoint sources, and one might conclude that it makes sense to address these sources before requiring reductions by point sources, this assumes that point source contributions are insignificant, which they are not. In fact, point sources can be the primary source of nutrient contributions during times when stream flows are low and/or when a point source comprises the majority of flow to a stream. A concerted, cooperative and sustained effort by both point and nonpoint sources will be required to meet the ambitious goals defined in this strategy, because reductions by both are necessary to meet the goals. Neither source can meet the goals on its own. Given the magnitude of the problem and the cost to achieve the reduction targets, it will likely take decades before these goals are achieved. Thus, we cannot afford to put off indefinitely having point sources install treatment that is determined to be feasible, reasonable and affordable today.

Comment: Since agriculture is the main contributor, why is it not subject to regulation?

> **Response:** The Clean Water Act and Iowa law require point source dischargers to obtain permits to discharge pollutants to rivers and streams. These National Pollutant Discharge Elimination System (NPDES) permits establish limits on the types and amounts of pollutants that a point source can discharge. There are no similar federal or state laws, rules or regulations applicable to nonpoint sources of pollution.

Comments: -The explosion of resident Giant Canadian geese is equally amazing and potentially very damaging to the efforts of the Nutrient Strategy of lowering P and N.

-I also was disappointed to see the lack of any impact on N and P levels related to wildlife, in particular geese. Iowa has more than 250,000 acres (The World Almanac of the USA, 1996) of water, much of which is inhabited by waterfowl year-round now. Their direct discharge into these surface waters should not be ignored.

> **Response:** The contribution of phosphorus and nitrogen from waterfowl was analyzed as a part of the 2003 nutrient budget, and more studies are in progress analyzing their impact today. The

older studies and initial previews of the newer analysis indicate that waterfowl can be a source of nutrients in local surface water but they are a very small portion to the overall nutrient load. Since the analysis and supporting information demonstrated that waterfowl contributed a very small portion of the nutrient load, it was not included in the strategy at this time. Please contact the DNR if there is interest to review the detailed analysis on this issue (http://www.iowadnr.gov/ContactIowaDNR.aspx).

Comment: What are some examples of biological nutrient removal (BNR) treatment systems?

Response: There are a number of proven approaches to biological treatment of nutrients and new approaches continue to be developed. Most approaches are based on an extension of the activated sludge process where anaerobic, anoxic and aerobic zones or stages are created within the treatment process. In some cases the biological process may be coupled with chemical treatment for phosphorus removal. Some of the processes that have been developed for simultaneous phosphorus and nitrogen reduction include the modified Bardenpho process, the A^2O process, The University of Cape Town process and the PhoStripII process. Interested persons are encouraged to consult wastewater treatment plant design manuals such as the following for detailed descriptions of physical, biological, and chemical nutrient reduction processes:

Wastewater Treatment Plant Design. 2003. Water Environment Federation. Alexandria, VA. P. Aarne Vesilind ed.

Wastewater Engineering Treatment and Reuse Fourth Edition. 2003. McGraw Hill. New York, NY. 1819 pp.

Comment: How does this strategy align with, or comply with, the Clean Water Act?

Response: Congress declared that the objective of the Federal Water Pollution Control Act of 1948 as amended in 1972—when it became known as the Clean Water Act—is, "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." It further identifies seven goals with the two most pertinent to this question being: (1) wherever attainable, achieve an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and which provides for recreation in and on the water; and (2) that programs for the control of nonpoint sources of pollution be developed…so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution.

Through the implementation of this strategy, the State of Iowa hopes to achieve significant reductions in the amounts of nitrogen and phosphorus entering surface water from both point and nonpoint sources in a scientific, reasonable and cost effective manner. Because excessive amounts of these nutrients can negatively affect the chemical, physical and biological characteristics of surface waters in Iowa and downstream, a strategy that seeks to reduce the amounts of these substances is consistent with the objective and goals of the Clean Water Act.

The strategy also provides a framework for implementing practices and technologies that are designed to reduce hypoxia in the Gulf of Mexico, and follows an approach embraced by EPA in

its 2011 "Recommended Elements of a State Framework for Managing Nitrogen and Phosphorus Pollution" (Stoner, 2011). The strategy goal is to obtain reductions of at least 45% in the amounts of nitrogen and phosphorus entering Iowa waters from both point and nonpoint sources that can contribute to localized water quality problems and to the Gulf of Mexico hypoxia problem. Therefore, we believe the strategy aligns very well with the Clean Water Act.

Comment: The strategy presumes it is appropriate to set technology-based requirements for a pollutant not regulated under an applicable federal effluent guideline (in this case secondary treatment which is applicable to POTWs). It is not apparent that this is correct or that EPA will not object to permits issued with technology-based nutrient limits.

Response: Iowa rules allow permits to specify technology-based limits for a pollutant not regulated by a federal effluent guideline on a case-by-case basis when such limit is based on the effect of the pollutant in water and when it is determined that treatment to meet the limit is both feasible and reasonable. Except in a few cases (e.g., meat processing guidelines that regulate total nitrogen) neither total nitrogen nor total phosphorus is regulated by a federal effluent guideline. We have had a number of discussions with EPA Region 7 staff on this issue, and they are supportive of the approach outlined in the strategy.

Comment: The strategy should acknowledge that some facilities may achieve nutrient reduction by means other than BNR.

Response: The Implementation Plan section of the strategy has been revised by replacing references to biological nutrient removal (BNR) with the general term "treatment." The strategy is based on a determination that nutrient reductions are feasible and reasonable for most major municipal and industrial facilities and minor industrial facilities with existing biological treatment systems and that these systems can be modified or upgraded for BNR. However, we recognize there are physical and chemical technologies available that can also significantly reduce nutrient discharges when used alone or in conjunction with biological treatment. For example, at some industries, chemical substitution may be able to reduce or eliminate nutrient discharges altogether. In other cases, a facility may rely on biological removal of nitrogen combined with chemical removal of phosphorus. Nothing in this strategy is intended to preclude the use of any process or combination of processes that will substantially reduce the amounts of nutrients discharged.

Comment: What guarantee does a facility have that nonpoint sources will follow these voluntary rules and that the DNR will maintain the promised level of flexibility when implementing the point source strategy?

Response: The strategy is not a new rule. For point sources, the strategy relies on an existing rule that provides the department the authority to specify effluent limits in NPDES permits on a case-by-case basis in certain circumstances. This strategy represents a serious commitment to achieving significant reductions in the amounts of nitrogen and phosphorus entering Iowa's rivers and streams. Reductions by both point and nonpoint sources will be necessary in order for the strategy to be successful. This is the first time both point and nonpoint sources have acknowledged everyone must work together if water quality is to improve – a goal shared by all.

On the other hand, if this strategy is not successful, EPA may require adoption of stringent numeric water quality criteria, and point sources will be required to bear an even greater responsibility than called for in this strategy to achieve compliance with those criteria. In fact, we believe point sources could be required to install much more costly technology with no assurance it will be capable of achieving the required reductions.

This strategy is structured to be flexible as it relates to the degree of nutrient reductions required by a facility, and the time required to achieve those reductions, within the constraints of state and federal regulations. The DNR intends to maintain that flexibility as the strategy is implemented.

Comment: What constitutes a "significant amendment" to an NPDES permit that would trigger nutrient requirements to be added to a permit?

Response: The term "significant amendment" is not defined in either federal regulations or state rules. EPA regulations describe what constitutes a minor permit modification and any modification that is not minor is therefore major or significant. NPDES permits will not be amended to require a facility to evaluate the feasibility and reasonableness of nutrient reductions or to submit a schedule for implementing nutrient technologies. These requirements will be specified only when a permit is issued or reissued. Defining the term "significant amendment" is therefore not necessary.

Comments: -The strategy would appear to require point sources to provide a disproportionate percentage of the nutrient reduction goals and it should more fully recognize the burden that will be borne by municipal and industrial point sources.

-Page 7 of the strategy states that point source wastewater treatment dischargers would be the primary target of nutrient criteria rather than nonpoint sources, but the strategy does not explain why this has to be so, especially when nonpoint sources account for 92% of the total nitrogen and 80% of the total phosphorus entering Iowa streams annually compared to point source discharges, especially sewage treatment plants that account for approximately 8% of the total nitrogen and 20% of the total phosphorus entering Iowa's streams and rivers annually.

Response: This strategy represents a serious commitment to achieving significant reductions in the amounts of nitrogen and phosphorus entering Iowa's rivers and streams and reductions by both point and nonpoint sources will be necessary in order for the strategy to be successful. Furthermore, we disagree that the strategy puts a disproportionate share of the burden for these reductions on point sources. Our analysis determined that, in general, there are feasible treatment technologies that can reasonably be installed by Iowa's largest cities and industries to achieve significant reductions in nutrients. These technologies can generally reduce the amounts of TN and TP discharged by a point source by 66% and 75% respectively and, if all point sources covered by this strategy achieve these reductions, it will result in about a 4% decrease in the amount of nitrogen and a 16% decrease in the amount of phosphorus discharged by both point and nonpoint sources in Iowa. We do not agree that this is a disproportionate share since to achieve the 45% reduction goals established by this strategy will require that nonpoint sources achieve reductions of 41% and 29% in TN and TP respectively.

Comment: If a city has already constructed nutrient removal facilities, will it be afforded the benefits described in the strategy?

Response: Yes. The benefits described in the strategy will apply equally to a discharger that has already installed and is operating facilities to reduce the amounts of TN and TP discharged as it will to a discharger that installs and operates nutrient reduction technology in the future.

Comments: -The strategy lacks vision. It is a reflection of where we are today with nothing new or innovative.

-This is a retread of every other similar effort over the years.

Response: We disagree. The Iowa Nutrient Reduction Strategy is a new beginning in the state's efforts to assess and reduce nutrient loading to Iowa waters. Iowa leaders representing nonpoint sources (agriculture) and point sources (municipalities and industries) are working together to develop and implement an integrated strategy to enhance Iowa's and downstream waters, including the Gulf of Mexico. The collaboration between point source and nonpoint source leaders works to replace the finger-pointing of the past with the understanding that a concerted, cooperative and sustained effort by both point and nonpoint sources will be needed to meet the ambitious goals outlined in the strategy, since neither source can meet the goals on its own.

Other aspects of the Iowa Nutrient Reduction Strategy that are new include:

-An Iowa Science Assessment of Nonpoint Source Practices to Reduce Nitrogen and Phosphorus Transport to the Mississippi River Basin was completed, to inform the implementation of conservation practices to improve Iowa's waters. This assessment illustrates that achieving the nonpoint source goals of the strategy is possible.

-An Iowa Point Source Nutrient Reduction Technology Assessment was completed, to guide the implementation of wastewater treatment technologies to reduce nutrient discharges to Iowa waters. Iowa's major municipalities and industries will evaluate and implement process changes and install nutrient removal treatment processes to reduce nutrient discharge to Iowa's and downstream waters.

-The strategy works to harness the collective initiative and capacity of Iowa agricultural organizations, agricultural businesses and farmers towards implementation of nonpoint source management practices to improve Iowa water and soil quality.

-Coordination, oversight and implementation of this strategy is underway and will continue through the Water Resources Coordinating Council, which consists of 19 state and federal agencies, in consultation with the nongovernmental organizational membership of the Watershed Planning Advisory Council.

-There is unprecedented, wide-ranging, and high level support for the strategy and its implementation within state government, the EPA and by Iowa leaders representing both nonpoint sources (agriculture) and point sources (municipalities and industries).

Comments: -The strategy lacks urgency, no timelines or goals have been articulated.

-The strategy does not identify measurable outcomes – how is success or failure defined and measured.

-Provides a lot of suggestions, but no specific action plans.

-The draft strategy references operational plans. Are these operational plans for action items listed in the strategy? The strategy should include specific action steps, milestones and timelines for implementation of actions included in the strategy.

> **Response**: The goal of the strategy is to reduce Iowa's riverine total nitrogen load and total phosphorus load each by 45%. Achieving this ambitious goal will take time and will require extensive coordination with multiple governmental and nongovernment organizations and individuals. We have consistently stated that this strategy is the beginning point for working to achieve this goal and outlines the path forward. From this initial version of the strategy, operational plans will be coordinated through the Water Resources Coordinating Council and others to cover the wide variety of action items presented in the strategy. This work is already underway (e.g., watershed prioritization completed by the WRCC) and will continue in a coordinated manner with stakeholders as the strategy is implemented.
>
> Given the range of technical, logistical, and socio-economic factors that must be considered for each of the operational plans, it is not appropriate to suggest a timeline for the process and outcomes of the plans in this initial version of the strategy. The strategy is intended to be a dynamic document (see Element #7, Part d. of the strategy) and as the work from the teams creating the operational plans progresses, this may change and timelines for implementing and identifying the goals of individual plans may later be established.
>
> There are certain operational plans that will be more critical upfront as we begin implementation, such as setting priorities, establishing baselines and documenting progress on achieving the goals of the strategy. The outcomes of these plans may be used to establish additional, measurable goals to be incorporated in future versions of the strategy.

Water Quality Standards

Comments: -A number of commenters suggested that the strategy take an approach whereby the state would adopt numeric water quality criteria for nutrients, or a narrative criterion translator, and then issue permits with limits derived from these criteria in order to assure that EPA will not object to permits at a later date.

-Through data analysis the state can set numeric standards statewide or by HUC 8 and/or 12 watersheds. Numeric standards will force point and nonpoint sources to work together toward an identified goal, prioritize watershed needs most critical to reach the goal, opens up the opportunity to work in partnership for nutrient trading within the watershed, and is a prudent use of taxpayer money.

Response: The traditional approach of first adopting numeric criteria or a narrative translator, calculating a wasteload allocation, determining water quality-based permit limits and issuing a permit with a schedule that would require compliance within a specified time was considered and rejected in favor of the proposed approach for several reasons, including the following:

- A significant amount of time would likely be needed to develop and adopt scientifically defensible numeric nutrient criteria. EPA has acknowledged that there are a number of approaches to developing and implementing nutrient criteria, and time is needed to evaluate options, get buy-in from EPA and all affected stakeholders, propose rules, respond to comments, adopt rules, and issue permits to point sources. Given the experience in states such as Florida and uncertainty surrounding any rulemaking effort, there is no assurance that numeric criteria could be adopted in Iowa in the near future.
- The strategy is designed to make meaningful reductions in nutrient loadings while the need for and approaches to numeric criteria are being evaluated. This approach is entirely consistent with that of the EPA as outlined in the Stoner memo.
- We believe that establishing nutrient criteria today would create an even greater disparity between point sources and nonpoint sources because it could result in most or all point sources having to install very costly technology with no assurance such technology will be capable of meeting permit limits derived from those criteria.
- Using the water quality criteria approach would result in many small POTWs and industries having to install nutrient treatment technology to meet water quality standards that would result in only a small statewide load reduction, while many of the largest point sources that contribute the greatest amounts of nutrients may be required to do nothing. The technology-based approach allows the strategy to target the largest point sources that contribute the greatest amounts of nutrients, and which can best afford additional treatment.

Comment: Why does the strategy use a technology-based approach to establishing permit limits instead of one that would base limits on existing narrative water quality standards?

Response: The primary reason is that the technology-based approach can be implemented today without having to develop new rules, which could significantly delay moving forward. Existing rules allow technology-based effluent limits for pollutants not already regulated by federal standards to be included in a permit on a case-by-case basis when such limits are found to be feasible and reasonable. Basing limits on the narrative water quality standard would

require the development of a "narrative translator" which is a means of converting the narrative standard to a numeric effluent limit. This is a process we believe would require rulemaking and that would be subject to the uncertainties rulemaking involves.

Once a numeric water quality standard or a narrative translator is established, every NPDES permit would have to require compliance with the resulting standard. It is likely that limits established in this manner would result in many smaller facilities having to construct facilities they cannot afford, and that still may not allow them to comply with limits derived from the narrative standard.

Comment: The technology-based approach for point sources put forward in the strategy does not satisfy the federal requirements of 40 CFR §122.44(d) applicable to issuance of NPDES permits. The strategy must conform to EPA's permitting approach by adopting numeric nutrient criteria and developing water quality-based permit limits based on those criteria, otherwise point sources will not be afforded protection from further regulation.

Response: 40 CFR §122.44(d) requires that NPDES permits specify requirements necessary to achieve compliance with water quality standards, including state narrative criteria for water quality, when technology-based effluent limits alone are not sufficient to achieve compliance. This strategy relies on an interim technology-based approach to reduce the amounts of nutrients from major point sources that discharge to numerous water bodies throughout Iowa while numeric criteria are being developed. The primary purpose of the strategy is to address the effects that nutrients have on Gulf hypoxia regardless of whether or not a particular discharge is causing or contributing to an exceedence of an Iowa narrative or numeric water quality standard. However, any reduction in the discharge of nutrients will have a positive impact on local water quality as well.

When a stream is determined to be impaired by nutrients, a Total Maximum Daily Load (TMDL) is developed to address the impairment. A number of nutrient related TMDLs have already been developed in Iowa. Under the strategy—and consistent with federal regulations—when a permit is issued to a point source that contributes to a water quality impairment, regardless of whether the permit is for a major or minor source, the permit will specify effluent limits consistent with the approved TMDL. The limits developed through the TMDL are WQ-based effluent limits which conform to the requirements of 40 CFR §122.44(d) and have been determined to be necessary to achieve compliance with applicable water quality standards, including narrative criteria.

It is important to note, however, that TMDLs address only a single pollutant discharged by sources identified as contributing to a specific impairment in a specific watershed or waterbody (e.g. nitrate in the Raccoon River). Likewise, the federal regulations at 40 CFR §122.44(d) only require that permits contain requirements to ensure compliance *with state water quality standards* and thus do not address the Gulf hypoxia issue that was the impetus for this strategy.

Comment: Because total phosphorus is the limiting nutrient in nearly all streams in Iowa throughout most of the year, a 4% reduction in total phosphorus by point sources will have no measurable benefit to water quality despite the $1.5 billion expenditure. Iowa should focus on total phosphorus reductions and defer control of nitrogen for at least 10 years to reduce the economic impact, while getting the greatest benefit from the expenditure.

Response: First, the strategy states that "If successful, this strategy will reduce by at least 11,000 tons per year the amount of nitrogen and 2,170 tons per year the amount of phosphorus discharged annually by municipalities alone. These figures represent a 4% reduction in nitrogen and a *16% reduction in phosphorus* (emphasis added) in the estimated statewide amounts of nitrogen and phosphorus discharged to Iowa water from both point and nonpoint sources" (Executive Summary, page 2). Although these figures constitute a relatively small percentage of the amounts of nitrogen and phosphorus entering Iowa waters, they are not insignificant and, when combined with significant reductions by nonpoint sources, can have a demonstrable effect on water quality both locally in Iowa and downstream.

The strategy was prepared in large part in response to the 2008 Gulf Hypoxia Action Plan, which calls for significant reductions in the discharge of both nitrogen and phosphorus to the Gulf of Mexico. Scientific research has demonstrated that both nutrients can impact the size of the hypoxic zone. In Iowa, there is not a scientific consensus on which nutrient (N or P) is more limiting to Iowa stream productivity. Most people who consider themselves to be knowledgeable on the subject are likely to say that neither N or P are limiting most of the time; however, phosphorus is more likely to be limiting at certain times, or under certain conditions, than nitrogen. Given that we expect most point sources will utilize biological treatment to achieve the targeted reductions, removal of both nutrients will occur simultaneously.

Comment: The state should identify the "impairment" thresholds that will be used to implement narrative water quality criteria (e.g. chlorophyll "a" concentration).

Response: Iowa uses a narrative water quality standard translator to develop specific requirements in TMDLs for lakes and streams that have been determined to be impaired due to nuisance algae blooms and impacts to aquatic life. Additional research is underway at Iowa State University that focuses on developing biological assemblage indicators for lakes that can provide a basis for determining if water quality goals for aquatic life are met. At the same time, a technical advisory committee has been assisting with evaluating different approaches to nutrient criteria for rivers and streams.

As explained in Section 1.2 of the strategy, there is still considerable debate on what nutrient criteria should be, and a "one size fits all" approach to numeric criteria may not be the best approach. This strategy seeks to achieve significant reductions in the amounts of nutrients entering Iowa's waters through an interim technology-based approach while the need for, and approaches to, the development of numeric criteria are being evaluated.

Comment: Point sources need to be more strictly regulated due to the toxic impact of high levels of chloride, ammonia and nitrogen on aquatic life downstream.

Response: NPDES permits issued to point sources already contain limits for a number of pollutants. The need for limits for chloride, sulfate, ammonia, bacteria, toxics and other pollutants to protect aquatic life and public health is assessed each time a permit is issued or reissued. Limits are specified whenever any pollutant is determined to have a reasonable potential to cause or contribute to an exceedence of a water quality standard. Since other pollutants are already being addressed through NPDES permits, this strategy addresses only total nitrogen and total phosphorus, two pollutants that are not currently regulated.

Comments: -The State of Iowa should set nutrient standards for nitrogen and phosphorus at levels that will protect aquatic life and the health of Iowans who use our rivers for drinking water.

-The State of Iowa should establish numeric standards for nutrients.

-Numeric standards are needed to set the restoration targets and, once water quality is restored, to prevent new impairments.

Response: One goal of the strategy is to evaluate different approaches for nutrient standards for Iowa. Nutrient standards would establish the maximum acceptable concentrations of nitrogen and phosphorus that would allow a water body to support beneficial uses such as drinking water supply, fishing (aquatic life), and swimming (water-based recreation).

There has been and continues to be much debate on how best to establish the appropriate nutrient criteria for protecting the beneficial uses of surface waters. Unlike most pollutants for which criteria have been established, no single nutrient criterion value appears to be appropriate for every water body. Numerous factors could lead to site-specific nutrient criteria for each waterbody. Developing site-specific criteria could take several years. In the meantime, nutrient enrichment would continue to negatively impact Iowa's water quality. Understanding these challenges, EPA outlined an approach in a March 16, 2011 memorandum entitled, *"Recommended Elements of a State Framework for Managing Nitrogen and Phosphorus Pollution"* (Stoner 2011). This framework identifies eight strategy elements that emphasize implementation of existing nutrient reduction practices and technologies for point and nonpoint nutrient sources while states continue working to establish nutrient standards.

Consistent with EPA's framework, Iowa's Nutrient Reduction Strategy proposes a pragmatic approach for reducing nutrient loads discharged from Iowa's largest wastewater treatment plants to be accompanied by targeted practices designed to reduce nutrients from nonpoint sources. By working to reduce nutrient loads, Iowa can help to protect valuable drinking water supplies, aquatic life, and recreational resources now, while continuing to assess suitable nutrient criteria.

Comments: -The nutrient strategy should be revised to include a work plan for developing and implementing numeric nutrient criteria – failure to do so delays Iowa's compliance with the Clean Water Act, forces Iowans to unnecessarily continue to suffer the consequences of nutrient pollution, and risks EPA action.

-The strategy should outline the work required to complete numeric WQS standards, and a proposed approach for prioritizing and completing the needed work on the state's various waterways within a reasonable timeframe

-No fiscal analysis or timetable for interim goals or an overall plan is discussed (for WQS).

Response: The strategy emphasizes implementation of technology-based nutrient reductions in the near-term, and acknowledges the need for continued assessment of suitable nutrient criteria. Approaches to the development of nutrient criteria continue to evolve as many states explore alternatives for establishing suitable nutrient standards. For the reasons described in Section 1.2 of the strategy, DNR is currently evaluating methods other than the statistical data

distribution method initially presented by EPA. These include analysis of stream nutrient stressor-response relationships for the determination of site-specific nutrient criteria. This approach would involve the application of nutrient response indicator criteria (e.g., dissolved oxygen, chlorophyll a) as a means to establish appropriate site-specific nutrient targets, which together would form the basis for identifying nutrient-related impairments of beneficial water uses. The site-specific nutrient criteria approach is one of several alternatives that will be further evaluated as part of the DNR's triennial water quality standards review process.

When developing a water quality standard, factors in addition to the standard itself must be considered such as changes to designated stream uses, antidegradation policy implications, developing implementation procedures for water quality assessments and NPDES permitting, and evaluating fiscal impacts. Given the range of technical and socio-economic factors that must be evaluated, it is not appropriate to suggest a timeline for developing nutrient standards in this initial version of the strategy. Element #8 in the strategy has been revised to clarify this point. The strategy is intended to be a dynamic document (see Element #7, Part d. of the strategy) and as more information regarding nutrient criteria development becomes known this may change, and a timeline for developing nutrient standards may be established in a future version of the strategy.

The DNR plans to update the Water Resources Coordinating Council (WRCC) regarding the assessment of the different approaches to developing nutrient criteria and supporting standards, as new information becomes available.

Comment: While the draft strategy does address all framework elements the EPA has identified to maximize progress in reducing nutrient pollution, the section *"Numeric Nutrient Criteria Limitations"* does not reflect the EPA's current thinking about numeric criteria development and implementation. The EPA views numeric criteria as important tools for effective water quality management of nutrient pollution. Many of the concerns with numeric nutrient criteria described in the strategy focus on the EPA ecoregional criteria published in 2000, which were intended to be a starting point for states and others to develop more refined criteria that fully reflect localized conditions and protect specific designated uses. We have made a lot of progress working with states and authorized tribes since the 2000 document was issued to identify a range of options available to them in developing and implementing numeric criteria. This agency is available to work with you on the scientific underpinnings of numeric criteria that would be appropriate for water bodies in Iowa and that represent best available science. Such approaches may include: derivation of numeric nutrient criteria using stressor-response approaches, use of mechanistic models currently used in TMDL development, and approaches that better link biological responses to numeric nutrient criteria assessment procedures.

The draft Iowa strategy highlights the costs to dischargers of complying with nutrient standards but does not recognize the wide range of water quality standards and permitting implementation flexibilities the EPA has been exploring with states that have protective numeric criteria in place. These tools include site-specific criteria, revisions to designated uses, permit compliance schedules, water quality standards variances, and trading. Which regulatory tool is appropriate depends upon the circumstances.

Response: Section 1.2 - Numeric Nutrient Criteria Limitations of the strategy has been revised to address these concerns.

Affected Facilities

Comment: How many NPDES permit holders are there in the State?

Response: As of March, 2013, there were a total of 1,620 NPDES permits issued in Iowa including 817 municipal, 338 industrial and 465 others, which include permits issued to semi-public facilities, animal feeding operations and potable water treatment plants.

Comment: Can you please review again the NPDES permittee numbers? How did you arrive at these numbers? Do you have a list of wastewater treatment plants that will be affected by the strategy?

Response: The final numbers are 102 major publicly-owned treatment works (POTWs), 29 major industrial facilities and 17 minor industrial facilities for a total of 148 facilities that would be affected by this strategy. A list of the point sources that will be addressed by this strategy was included in Section 3.3 of the draft Strategy.

A POTW is defined by federal regulations as a treatment works which is owned by a state or municipality. A "major" POTW is defined as a facility having an average wet weather design flow of 1 million gallons per day or greater. For industries, a major facility is one designated as such by EPA based on a point rating system. The 17 minor industries are those known by the department to already be operating a biological treatment plant for treating process wastewater. The department believes it may be feasible and reasonable for major POTWs and the 17 minor industries to add biological nutrient removal (BNR) or other nutrient reduction technologies to their existing treatment process.

The list of POTWs remains essentially unchanged in the final strategy. The list of major industries in the draft included only those with existing biological treatment systems while all 29 major industries are listed in the final strategy. The lists of major and minor industries have been revised to reflect changes in classifications since the draft strategy was prepared.

Comment: The City of Garner is on the list of affected facilities (Section 3.3.) subject to the Nutrient Reduction Strategy but the City constructed a new treatment plant that has an average wet weather design flow of only 0.873 MGD and is therefore no longer a major facility and should be removed from the list.

Response: The City of Garner has been removed from the list of affected facilities in Section 3.3 of the strategy.

Comments: -The City of Britt wastewater treatment plant is designed to treat an average wet weather flow of 1.16 MGD but the actual average 30-day flow is between 0.45 and 0.775 MGD and the City plans to have the facility's design AWW flow changed to 0.9 MGD.

-The City of Harlan has been proactive in addressing their wastewater needs and should not be penalized for those efforts by being considered a major facility since actual wastewater flows may never reach 1.0 MGD.

Response: The strategy applies to all major POTWs and major industries. A major POTW is defined as having an average wet weather design flow of 1.0 MGD or greater. Iowa has a long history of using design flow rather than actual flow when determining applicable permit requirements, because design flow provides a consistent and technically-based value that is not influenced by changes in population, industrial contributions or weather conditions. Although actual flows today at Harlan and at Britt may be less than their respective treatment plant design capacities, both plants are designed for and are capable of treating 1.0 MGD or more. Either facility could treat 1.0 MGD or more on short notice if a new industry were to locate in either community and discharge to the city sewer system. Thus, both cities will remain on the list in Section 3.3 and will be subject to the strategy unless a change in design flow is approved by the department.

Comment: The size threshold for applicability of the Nutrient Reduction Strategy to industrial facilities should be a minimum of 1 MGD.

Response: Unlike POTWs, the amounts of nutrients and other pollutants discharged by an industry are more often related to the type of industry, the processes conducted and production levels than to the volume of water discharged. This is why EPA does not define industries as "major" based solely on flow or the size of a treatment plant as it does with POTWs. The department believes it is fair and equitable that all major industries determine the concentrations of nitrogen and phosphorus they currently discharge and evaluate the feasibility and reasonableness of nutrient reductions, just as all major POTWs will be required to do.

Comment: Why is the point source strategy focusing on major industries without significant nutrient loads?

Response: We disagree with the characterization that the strategy is focusing on industries that do not discharge significant amounts of nutrients. There are several reasons why all major industries are included in the strategy:

- There is little if any data available on the amounts of nutrients discharged today by major industries in Iowa and therefore no way to identify which ones may or may not contribute significant amounts of nitrogen or phosphorus. By including all major industries in the strategy, an accurate assessment of the contribution each of these industries has on nutrient loads can be made.
- Since all major POTWs will be required to evaluate reducing the amounts of nitrogen and phosphorus in their discharges, it is fair and equitable to expect all major industries to do likewise.
- Major industries discharge the majority (by volume) of all process wastewater that is generated and discharged by industries in Iowa and thus likely offer the greatest opportunities for significantly reducing nutrient loadings to Iowa waters.
- We believe it may be feasible and reasonable for some industries to significantly reduce nutrient discharges by means other than biological treatment (e.g., process changes, chemical treatment or chemical substitution) and thus contribute to meeting the goals of this strategy.

Comment: The report appears to partially ignore point source pollution. Why does it affect only the 130 largest point source polluters?

Response: As explained in the strategy, the 102 largest municipal wastewater facilities serve the treatment needs of 55-60% of Iowa's population and treat more than 80% of all the sewage produced by the 817 city-owned and operated wastewater treatment plants. The 29 major industries discharge the majority of all process wastewater generated and discharged by the 340 permitted industries in Iowa. These 131 major point sources, together with 17 minor industries with existing biological treatment systems, provide the greatest opportunity for significantly reducing nutrient loadings to Iowa waters from point sources. Many of these facilities have existing treatment facilities that can be retrofitted to remove nitrogen and phosphorus. On the other hand, most smaller municipal and industrial facilities cannot be easily modified to remove more nutrients and would need to be replaced by new, more complex treatment facilities. The cost to these smaller cities and industries to build and operate new treatment systems is, in most cases, not affordable and furthermore would result in only a small percentage reduction in the amounts of nutrients discharged to Iowa's rivers and streams.

Comment: My understanding is that the number of small cities/towns with little or no sewage treatment is quite significant. I find it hard to believe that raw sewage from hundreds of small point sources would not be making a significant impact on the water.

Response: All cities and towns in Iowa are required to provide treatment for their wastewater. However, there are a number of small unincorporated communities generally consisting of only a few dozen homes that do not have centralized sewer systems and treatment plants but instead have small private treatment systems, generally individual septic tanks and leach fields for each residence. While these systems do not discharge raw sewage, they admittedly may not provide the same high degree of treatment as in cities and towns with more advanced treatment facilities. During the past decade, the department has worked with a number of these unsewered communities to install sewers and provide better treatment facilities, but much work remains. Even with the government grants and loans that are available, these communities face significant financial challenges to install and operate facilities to provide adequate sewage treatment. Thus, they cannot afford the advanced systems needed to remove significant amounts of nitrogen and phosphorus. Furthermore, the total amounts of nitrogen and phosphorus discharged by these unincorporated and unsewered communities are extremely small when viewed in relationship to the amounts discharged by even one large city.

Comment: Regarding so-called minor pollution sources, the proposed strategy notes that Iowa has more than 300,000 private sewage disposal systems. Beyond a summary of existing state and local regulation and funding, no goals, timetables or funding estimates are provided with regard to minor POTWs.

Response: Minor facilities are not included in the strategy with the exception of 17 minor industrial facilities and therefore the strategy does not discuss goals, timelines or funding estimates for these facilities. As explained elsewhere in these responses, we concluded it is not feasible or reasonable for most minor facilities to construct or upgrade existing wastewater treatment facilities to remove TN or TP. A minor facility that proposes to expand its treatment capacity or replace its treatment facility altogether is required by existing antidegradation rules to evaluate whether there are practicable, cost-effective and affordable means of minimizing any proposed increase in nutrient discharges that would result from plant upgrade or replacement. Since it is not possible to know if, when, or how many minor facilities might be upgraded or replaced, they are not addressed by the strategy.

Comment: Why should cities have to pay for treating the nutrients to a cleaner level than what came in upstream? It seems they are a very easy target.

Response: The purpose of the Clean Water Act is to reduce the disposal of pollutants into our rivers and streams. In order to achieve that purpose, we cannot use existing in-stream pollution levels as an excuse to justify the discharge of additional pollutants. The law looks at the uses that could be attained for that stream and standards are set to protect those attainable uses, rather than just the uses that are being achieved today. The intent of the strategy is to reduce discharges of TN and TP to improve water quality in Iowa and downstream.

Comment: Will the Nutrient Strategy impact industry (i.e. required sampling, impacts on NPDES Permit Requirements, treatment technology costs, etc.)?

Response: Yes. The strategy will have an impact on major industries and minor industries that have existing biological treatment systems for their process wastewater. These industries will be required by their next NPDES permit to sample for total nitrogen and total phosphorus to establish a baseline for the amounts of these nutrients that are being discharged. The permit will also specify requirements to evaluate the feasibility and reasonableness of reducing nutrients to target concentrations of at least 10 mg/L TN and 1 mg/L TP. Where treatment or process modifications are determined to be feasible and reasonable, they will be required to be implemented and there is likely to be a cost associated with this implementation.

Comment: Industry contributes to aquatic pollution. Fertilizer plants, food processing and even food-based production of products like ethanol could be contributing a large percentage of the P and N not to mention other toxics to Iowa's rivers and streams. Why aren't these addressed in the plan?

Response: Industries are addressed. The strategy requires Iowa's largest industries that include fertilizer and pesticide manufacturers, food processors, power plants and others, to collect information on the amounts of nitrogen and phosphorus they discharge and to evaluate the feasibility and reasonableness of significantly reducing these levels. Where reductions are determined to be feasible and reasonable, the industry will be required to achieve these reductions. We don't believe that minor industries not addressed in the strategy generally discharge significant amounts of TN or TP and, because they do not have biological treatment systems, would experience costs for treatment that would be wholly disproportionate to the nutrient reductions that would be achieved.

Comment: The strategy should clarify that a facility that discharges less than 10 mg/L total nitrogen and 1 mg/L total phosphorus today will not be required to achieve further reductions.

Response: Based on information available to IDNR today it is anticipated that permits will not specify limits more stringent than 10 mg/L TN and 1 mg/L TP where biological treatment is the primary means of achieving the nutrient reduction goals. These concentrations are consistent with the minimum levels considered achievable using biological nutrient removal at a wastewater treatment facility that treats primarily domestic sewage. Effluent limits for nutrients must be based on a case-by-case evaluation and where data on actual plant performance shows

that lower levels are consistently achieved, it is possible a permit could specify limits more stringent than 10 mg/L TN and 1 mg/L TP.

More stringent limits also are possible when a facility discharges to an impaired waterbody and there is an approved TMDL that establishes limits more stringent than 10 mg/L TN or 1.0 mg/L TP, in which case the permit must contain limits based on the TMDL. Second, if numeric water quality criteria are adopted in the future, permits must contain limits necessary to ensure that water quality standards are met and in some cases this could result in limits more stringent than the technology-based limits.

Comment: It is unclear how the strategy will be implemented for point sources without biological treatment and whether there are mechanisms by which a facility can demonstrate that it should not be subject to the strategy.

Response: Section 3.1 of the strategy has been revised as follows to include a discussion of expectations for facilities without biological treatment.

A facility with one or more nutrient discharges that exceed 10 mg/L TN or 1 mg/L TP but where the characteristics of the wastewater make treatment impracticable will be required by its next permit to submit a report within two years of reissuance of the permit with the results of a study that evaluates operational changes and costs for achieving nutrient reductions. The report will also include a proposed schedule for implementing the option or options determined to be feasible and reasonable. The permit will either be amended or an administrative consent order will be issued to include the schedule. Following implementation of operational changes determined to be feasible and reasonable, a six-month optimization period, and a 12-month performance evaluation period, the permit will be amended to include effluent limits determined from the performance evaluation. The NPDES permit will require effluent monitoring for both TN and TP.

Comment: The Louisa Generating Station was listed as using an activated sludge treatment system for treating domestic sewage from employees. The activated sludge system was replaced with a non-discharging system.

Response: We have revised the strategy to show the Louisa Generating Station does not provide biological treatment for wastewater that may be subject to this strategy.

Comment: What will be required of point sources not specifically listed in the strategy? Will they be required to collect data, evaluate nutrient reduction opportunities, and implement those reductions determined to be feasible and reasonable?

Response: It depends. Rules currently require that all facilities that treat wastewater in amounts equivalent to that of a city of 3,000 people or greater, and which discharge on a continuous basis, must monitor their discharge for TN and TP. These requirements are being specified in permits today as they are issued or reissued regardless of whether or not the facility is specifically identified in the strategy.

Facilities not listed in the strategy are required by Iowa's antidegradation policy to evaluate alternatives when changes are made to process or treatment systems that would result in the discharge of a new or increased amount of any pollutant including nitrogen and phosphorus. A facility is required to implement the least degrading alternative that is determined to be practical, cost effective and affordable. So, there may be facilities not listed in the strategy that will be required to evaluate nitrogen and phosphorus reductions in conjunction with plant changes. These reductions, however, would be implemented only when they are determined to be practical, cost effective and affordable.

Comment: The strategy outlined for point sources is for the most part clearly articulated, with specific goals and mechanisms to achieve them, both in terms of structures and expected financial support. However, the details provided primarily target municipality-based nutrient reduction, with relatively little attention to that which is industry-based. In addition, timelines for point source nutrient reduction are lacking.

Response: We assume that the details being referred to in the comment are the descriptions of biological nutrient options in the strategy. These descriptions apply equally to POTWs and industries that have existing biological treatment plants. We are unable to provide detail with regard to industrial facilities without biological treatment. For these facilities we don't have information to know (1) if nutrient reductions are feasible, (2) what practices might be employed, and (3) what reductions these practices might obtain. These details will be provided by each facility in the initial evaluation called for in the strategy.

As discussed elsewhere in these responses, the amount of time that individual point sources will require to install nutrient removal facilities will vary considerably depending on a variety of factors, including the type and age of existing wastewater treatment facilities, the feasibility and cost of modifying existing treatment facilities, a discharger's financial status and current debt, and (for POTWs) the existing user charges. Therefore, this strategy purposely does not establish a single time frame for achieving the targeted reductions.

Comment: Some small and large communities have made conscientious decisions to provide facilities above and beyond their current needs and regulatory requirements. Their past efforts and investment would not be acknowledged while those communities that have made conscious decisions to avoid progressive steps toward contributing to water quality improvements would continue to be ignored.

Response: We disagree. A facility that has already installed and is operating biological nutrient removal or another nutrient reduction technology will not be required under this strategy to invest in additional nutrient treatment and thus those previous efforts are certainly acknowledged. Facilities addressed by this strategy that have not installed nutrient reduction technology will be required under this strategy to do so when it is found to be feasible and reasonable and thus are clearly not ignored.

Permit Requirements – Studies

Comment: Will permits specify different requirements for a municipality that already has treatment installed?

> **Response:** Yes. If treatment for nutrient reduction is installed and operating, the first permit issued to a facility under this strategy will specify effluent limits for TN and TP if data is available with which to establish limits; the permit will also require monitoring for TN and TP (See Nutrient Reduction Strategy, November 2012, Section 3.1, Implementation Plan Details, Category 1.a., page 6). If treatment is installed but is not operating, the permit will require it to be operated and will specify only monitoring. However, the permit will subsequently be amended or reissued to specify effluent limits after an 18-month process optimization/performance evaluation period (See previous citation Category 1.b. of the Strategy).

Comment: Will the permit for a municipality with high nutrient loadings from industry acknowledge an alternative to the 10 mg/L TN and 1.0 mg/L TP limits?

> **Response:** Yes. Municipal and industrial facilities with raw waste TN or TP loadings higher than typical domestic sewage will be expected to provide percentage reductions similar to those for municipal facilities with typical domestic sewage concentrations (i.e., 66% reduction in TN and 75% reduction in TP).

Comment: Should the feasibility report that follows the initial two-year evaluation period contain information that assesses "affordability" similar to what is required for an antidegradation alternatives analysis?

> **Response:** Yes. For each technology evaluated, the report must evaluate both feasibility and reasonableness. A project is not considered to be feasible or reasonable if it is not affordable. Therefore, reports must provide estimates of capital and annual operating costs with POTWs also reporting the impact on user rates used to assess affordability.

Comment: What requirements may stem from the feasibility study? Even if the study concludes that nutrient reduction is feasible, it would seem to be economically unreasonable to install treatment facilities at each plant location.

> **Response:** The required evaluation is expected to lead to a conclusion as to whether or not nutrient reduction at a particular facility is feasible and reasonable and to what extent. Facilities will be required to proceed with projects to reduce nutrients when it is feasible and reasonable to do so. The department has already determined that technology is available and generally affordable for most major POTWs to construct or modify treatment systems to include biological nutrient removal. The same technologies are available to major and minor industries with existing biological treatment systems, and we assume nutrient reduction by these facilities is also feasible and reasonable. We are uncertain about the feasibility and reasonableness of nutrient reductions by industries that do not have biological treatment. This uncertainty is due to lack of information on the amounts of TN and TP in discharges from these facilities as well as lack of cost estimates for options available for reducing nutrients at these facilities. If any facility

demonstrates that nutrient reduction is not technologically feasible or is not reasonable due to cost or other factors, it will not be required to implement nutrient reduction practices. The strategy deliberately does not specify timeframes for facilities to achieve nutrient reduction goals. This will allow those facilities that may not be able to afford to make treatment improvements in the short-term to propose longer schedules that account for local situations.

Comment: There is no mention of who conducts the study, when the study does or does not need to be conducted, how the study differs from antidegradation and if there are mandatory requirements resulting from the feasibility study.

Response: We expect that most facilities, especially those with biological treatment systems, will have feasibility studies prepared by an engineer or other professional trained to gather and assess technical data and evaluate treatment technologies and costs. Industries without biological treatment may be more likely to evaluate operational changes using their own resources. In either case, permits will not require that a third party perform the evaluation. If nutrient reduction is determined to be feasible and reasonable, and if construction or modification to a treatment system is proposed, a construction permit will be required; this process typically requires the services of a licensed engineer.

Each of the 148 facilities listed in the strategy will be required to collect data and evaluate the feasibility and reasonableness of reducing nutrients either through treatment, process or operational changes.

The study requirement is similar to an alternatives analysis required by Iowa's antidegradation policy. This policy, however, applies only when a facility proposes to discharge a new pollutant or to increase the amount of a pollutant already discharged. The nutrient strategy is different in that it will require facilities to evaluate the feasibility and reasonableness of reducing existing levels of nutrients in a discharge. The report that results from this evaluation may contain similar information to that found in an alternatives analysis.

Where the evaluation concludes that nutrient reduction is feasible and reasonable, a facility will submit a schedule for constructing treatment or implementing process or operational changes designed to reduce nutrients in its discharge. Upon completion of construction, and following an 18-month period of process optimization and performance testing, effluent limits will be established in the facility's NPDES permit.

Permit Requirements – Limits

Comment: A plant could be in compliance with a 1 mg/L phosphorus limit 99% of the time but one significant excursion could result in noncompliance with an annual average limit for the better part of a year or result in a facility having to treat to levels less than 1 mg/L to ensure it complies at all times. Is there an alternative to an annual average limit?

Response: Effluent limits in NPDES permits are typically expressed as 30-day or monthly average limits, 7-day or weekly averages, or daily minimum or maximum. However, there are several reasons we believe it is more appropriate to specify nutrient limits as annual averages instead of 30-day or 7-day average limits:

- EPA found that annual permit limits for nutrients designed to protect Chesapeake Bay were appropriate. Unlike toxics and most other pollutant parameters that can have a direct and immediate impact on water quality, nutrients usually do not have a direct or immediate impact. Nutrient assimilation and processing in the environment takes time and delays and buffers the time between discharge and effect on water quality. Impacts such as algae blooms and the Gulf hypoxia problem generally occur far downstream from the point at which the nutrient was discharged.
- Short term fluctuations in nutrient concentrations in a discharge are equalized as the discharge moves downstream where it mixes with discharges from other point and nonpoint sources and as the nutrients undergo physical and biological changes.
- The degree of biological nutrient removal is expected to change seasonally with changes in water temperature.
- Annual average limits lessen rather than increase the chance that a single high value will result in noncompliance. The more sample results that are used to calculate an average, the less impact a single high value has on the average.

In response to the concern that a violation of an annual average limit would be viewed as multiple violations, the department is proposing to specify in permits that a violation of an annual average limit will be considered a single violation and not multiple violations.

Comment: How will the strategy impact a facility that withdraws water from a river or stream that contains nitrogen and phosphorus, uses the water for cooling, and returns the water to the river? Will limits be based on "net addition"; that is, will they account for the amounts of nitrogen or phosphorus in the intake water?

Response: Discharges of once-through, non-contact cooling water will not be subject to the strategy, and facilities will not be required to evaluate nutrient reductions for these discharges. If an industry provides treatment for the sewage from its employees separate from treatment of other wastewater, the discharge from the sewage treatment system will also not be subject to the strategy as such discharges would be comparable to those from minor POTWs which are not addressed by the strategy. For other outfalls, the department will determine on a case-by-case basis whether to specify nutrient requirements in permits and will work with the facility during development of the permit to address issues such as "net addition." Facilities are encouraged to begin collecting data on total nitrogen and total phosphorus concentrations in discharges other than once-through cooling water and domestic sewage; this information will help facilitate discussions on whether nutrient reduction requirements are needed in permits. We recommend, however, that facilities consult with the department prior to starting a monitoring program to ensure that samples are collected at appropriate locations.

Comments: -Unless impracticable within the meaning of 40 CFR 122.45(d), monthly and short-term permit limits, based on annual limits, would be required in NPDES permits.

-We are concerned that permit limits will be expressed as an annual average in permits. This method of measurement would allow effluent limits to exceed permit limits by a significant amount for stretches of the year and/or for significant periods of the year.

Response: The strategy calls for specifying only annual average nutrient limits in NPDES permits because we think that doing so best reflects the goal of the strategy — to achieve a 45% reduction in the annual nutrient loads to Iowa waters and the Gulf of Mexico. The strategy also ensures parity with nonpoint sources that will be striving to achieve annual, not monthly, weekly, or daily reductions in nutrient loadings. We are aware that annual average nutrient limits without corresponding short-term limits have been specified in permits issued in other states. Further, we are aware that EPA found in connection with the Chesapeake Bay restoration that expressing limits for nitrogen and phosphorus on a daily, weekly, or monthly basis was impracticable while limits based on annual loadings were found to be appropriate. We will continue to work with EPA Region 7 as the strategy is implemented to resolve any issues about how averaging periods for nutrient limits are specified in permits.

Comment: To the extent that numeric effluent limits are placed in NPDES permits they should be load limits only and should be based on the target concentration and average wet weather flow.

Response: The rule upon which this strategy hinges requires that permit limits must be determined on a case-by-case basis considering the effect of the pollutant in water and the feasibility and reasonableness of treating the pollutant. This case-by-case determination cannot preemptively preclude limits either higher or lower than the target concentrations of 10 mg/L TN and 1.0 mg/L TP described in the strategy. Based on information available to IDNR today it is anticipated that permits will not specify limits more stringent than 10 mg/L TN and 1 mg/L TP where biological treatment is the primary means of achieving the nutrient reduction goals.

We have modified Section 3 of the strategy as follows:

Effluent limits for TN and TP will be expressed as annual average mass limits. The department will document how the mass limits are calculated in the permit rationale prepared at the time the permit is amended or reissued to include TN and TP limits.

Comment: How do TMDLs, for example one for nitrate, affect the strategy in terms of final nutrient limits that end up in a permit?

Response: It depends. Where there is an approved TMDL, permits must contain limits that are consistent with the TMDL. An existing TMDL may specify a limit for one or more facilities that is more stringent than a technology-based limit established in accordance with this strategy. In this case the TMDL limits would be specified in the permit. It should be pointed out that of the approximately 100 Iowa TMDLs approved to date, only the Cedar River TMDL specifies limits for total nitrogen for point sources, and only the TMDLs for Milford Creek (Dickinson County), Camp Creek (Polk County), Yeader Creek (Polk County), Middle Fork S. Beaver Creek (Grundy County), North Fork Maquoketa River (Dubuque and Delaware Counties), Trumbull Lake and Black Hawk Lake (Sac County), specify limits for phosphorus.

For future TMDLs, the technology-based limits discussed in the strategy will be used as the basis for setting the WLA for point sources. The IDNR will not impose effluent limitations for total nitrogen or total phosphorus in permits more stringent than those described in the strategy unless it is determined that lower limits are necessary to allow the stream or lake to meet Iowa water quality standards.

Comment: Under existing Iowa law, NPDES permits should have limits on discharges of phosphorus where the discharge might contribute to violations of the dissolved oxygen standards.

Response: Iowa's water quality standards specify minimum dissolved oxygen levels for all designated lakes, rivers and streams. When it is determined in connection with the issuance or reissuance of an NPDES permit that a point source discharge has a reasonable potential to cause or contribute to a violation of the dissolved oxygen standard, or any water quality standard, the permit must specify a limit for that pollutant. Many NPDES permits specify limits for dissolved oxygen, but there is no regulation that specifically requires limits on the discharge of phosphorus to prevent violations of the dissolved oxygen standard.

Comment: The strategy should not arbitrarily limit the results of the proposed economic and technological evaluation by stating that the technology-based limits will not be more stringent than 10 mg/l TN and 1 mg/l TP. If the evaluation determines that more stringent effluent limits are economically and technically feasible, those limits should be used as the technologically-based limits.

Response: Section 3.1 of the strategy has been revised to clarify that technology-based effluent limits will be determined on a case-by-case basis using actual plant performance data. Facilities are expected to be designed to achieve target levels of 10 mg/L TN and 1.0 mg/L TP but we acknowledge that limits either more or less stringent than these targets are possible in certain circumstances.

Permit Requirements – Monitoring

Comment: EPA has not approved a test method in 40 CFR Part 136 for determining total nitrogen in wastewater. Analyses for total nitrogen must rely on separate measurements of total Kjeldahl nitrogen, nitrate nitrogen and nitrite nitrogen and these results must be added together and reported as total nitrogen. The uncertainty within each individual method makes determining a regulatory maximum discharge limit with a set detection limit very problematic.

Response: It is correct that EPA has not approved a single method for determining total nitrogen in wastewater, but we don't see this as an obstacle to implementing this strategy. EPA regulations require that NPDES permits must specify that pollutant analyses be conducted according to procedures approved under 40 CFR Part 136 except that when there is no approved method, monitoring must be conducted according to a test procedure specified in the permit {see 40 CFR §122.44(h)(iv)}.

The department has previously defined total nitrogen in permits as the sum of TKN plus nitrate plus nitrite and plans to do the same in permits that will implement this strategy. EPA has approved methods for the analyses of TKN, nitrate and nitrite, and we believe these methods are sufficiently sensitive to allow for accurate determinations of total nitrogen at the levels expected in raw wastewater and final effluent at wastewater treatment facilities.

Page 4 of the strategy states that "IDNR will identify the appropriate total nitrogen and total phosphorus lab testing methods for wastewater and ambient stream water quality to ensure consistent data and allow for accurate accounting of removal of nutrients from wastewater treatment plants. These lab methods may be specified in NPDES permits with total nitrogen and total phosphorus testing requirements."

Comment: Is it the intention of DNR that the listed facilities will be required to perform various testing/sampling to provide a baseline?

Response: Yes. Without first establishing a baseline of amounts of nutrients entering and leaving a treatment plant, neither a facility nor the department will be able to evaluate whether nutrient reductions are feasible and reasonable. The baseline will also be needed to document nutrient reductions. State rules already require that most major facilities sample for TN and TP; thus, even without this strategy, testing for TN and TP will be specified in permits. Because the concentrations of nutrients in wastewater can vary significantly throughout the year, we are suggesting that samples be analyzed once per week for 12 months to establish current levels to be used as a baseline.

Comment: Are the listed facilities required to perform the testing immediately upon the plan becoming effective, not when their permits are up for renewal?

Response: No. The strategy is only a plan and does not establish specific legal requirements. Requirements from the strategy, including testing requirements, will be established in the NPDES permit when it is issued or reissued. However, that doesn't mean that a facility must wait to begin collecting information on the concentrations of TN and TP in its wastewater. We recommend that a facility consult with the department prior to starting a sampling program to

ensure that the proper sampling points are identified and the correct sampling and laboratory procedures are used.

Comment: Will all NPDES permit holders be required to monitor for TN and TP and to prepare feasibility studies or only those facilities specifically listed in the strategy?

Response: Only major POTWs, major industries and the few minor industries listed in Section 3.3 of the strategy will be required to complete feasibility studies.

As for monitoring, any wastewater treatment plant designed to treat the wastewater from the equivalent of 3,000 people or more and which discharges continuously is already required by rule to monitor the final effluent for total nitrogen and total phosphorus. Implementation of this strategy will result in the facilities listed in Section 3.3 having to sample more frequently than the minimum specified by rule and also will require sampling of the raw waste for at least one year to obtain data with which to develop the feasibility study. Permits issued to facilities not listed in the strategy will contain monitoring requirements consistent with IAC 567-Chapter 63.

Comment: Will facilities be required to retest following an initial discovery that a discharge contains nutrients above the goals of 10 mg/L TN and 1 mg/L TP? A point source should have a reasonable period of time after initial sampling to adjust processes to meet the goals, especially when the concentrations are only marginally higher than the goals, before having to retest.

Response: The strategy calls for an initial evaluation period which includes monitoring of the discharge for TN and TP for at least one-year to establish a baseline from which reductions can be measured. Monitoring will be required on a frequent-enough basis during this evaluation period (e.g. 1 time per week) that we do not expect to find discharges with annual average concentrations that are only marginally higher than the targets. Should this occur, the strategy provides a facility time to adjust processes or construct additional treatment before effluent limits are established in the permit.

Permit Requirements – Schedules

Comment: If a new wastewater treatment plant has been built in the last year, how long will a city have to convert to a BNR system? What would be the timeline for a treatment plant that changed to BNR within the last two years?

Response: These questions are addressed in the Strategy in Section 3 – Point Source Nutrient Reduction Technology Assessment and Implementation Plan and in Section 3.1 – Implementation Plan Details of the strategy.

The NPDES permit for a facility that has installed and has operated facilities for reducing the discharge of TN and TP for at least two years will be amended or reissued to specify effluent limitations for TN and TP developed using actual plant performance data.

If treatment is installed but has not operated or has operated for less than two full years, the next NPDES permit that is issued will require that the nutrient reduction treatment facilities be operated. Following a six-month optimization period and an additional 12 months of operation, the permit will be modified to specify effluent limits using actual plant performance data.

Comment: The strategy should be clear that permits will not contain schedules of compliance for meeting technology-based effluent limits.

Response: NPDES regulations allow permits to include schedules of compliance to provide facilities additional time to achieve compliance with Clean Water Act regulations. Such schedules must require compliance as soon as possible but may not extend a final compliance date specified in the Clean Water Act. Because all Clean Water Act deadlines for meeting technology-based effluent limits have passed, permits cannot include a schedule of compliance for meeting the new technology-based limits for TN or TP that will be established in accordance with this strategy.

To comply with federal regulations while providing facilities time to modify operations or treatment systems to reduce nutrient discharges, permits will establish construction schedules for installing or modifying facilities to remove nutrients. Nutrient limits will not be specified in permits until after facilities have been constructed, optimized and sampled to establish performance capabilities. In other words, limits will not be specified until a facility has already demonstrated that it complies with the final limits for TN and TP, thus making compliance schedules unnecessary.

Comment: Is it correct that schedules of compliance will not be used to enforce the point source strategy? Instead, construction schedules will be worked on by cities with DNR and enforceable at the state level by DNR correct?

Response: Yes. As explained in the previous response, permits cannot contain compliance schedules for meeting technology-based effluent limits for TN or TP. Permits will instead contain schedules that require construction of facilities in advance of establishing permit limits. These construction schedules will be developed by cities and industries, which will be enforceable once they are incorporated in the NPDES permit.

Comment: Twenty-four months is insufficient time for submitting a report that evaluates the feasibility and reasonableness of reducing TN and TP discharges. It is recommended that the time for submission of the report be extended to 60 months.

Response: We believe that two years will provide ample time to collect and analyze information on the feasibility and reasonableness of nutrient reduction and ample time to develop a schedule for implementing changes determined to be both feasible and reasonable. If necessary, a facility can provide time early in the construction schedule it submits as a part of the strategy to collect additional data prior to design of additional treatment facilities.

Comment: NPDES permit expiration should be the only trigger for inclusion of TN and TP limits.

Response: Requirements to evaluate the feasibility and reasonableness of nutrient reduction technologies will be specified in a permit only when it is issued or reissued. A construction schedule will likely be added by amendment because it will be agreed upon during the term of a permit. Nutrient limits may be added either by amendment or at the time of permit issuance depending on when in a permit cycle the optimization and performance testing needed to establish limits is completed.

Comment: The amount of time given each community to achieve point source reduction must take into consideration the community's ability to pay and the amount of money currently spent on improvement of water quality.

Response: We agree and have designed the strategy to allow point sources to account for a variety of factors that may impact a community's current ability to pay for improvements to reduce nutrients. It is the facility and not the department that will develop a schedule for implementing operational changes or constructing additional treatment facilities. The schedule can and should account for the age and type of the current treatment facility, the additional treatment needed to reduce nutrients, the cost of treatment plant upgrades, current debt load, user charges and other community-financed water quality projects.

Comments: -What is the expected time frame for point sources to collect data, complete feasibility studies and either make operational changes or complete construction of additional treatment facilities to reduce nutrient discharges?

-There is no discussion whatsoever of how or when the goals for point sources would be achieved.

Response: The time frame for collecting data and completing a feasibility study is two years from the date the NPDES permit is reissued to require the study. The time frame to construct additional treatment facilities or make operational changes will vary depending on a particular facility's situation. The strategy requires that at the end of the two-year period, a facility must submit an evaluation and a schedule for construction of facilities to achieve significant nutrient reductions that are determined to be feasible and reasonable. One facility may be able to make fairly simple changes in operations in a short period of time while another may need to make major modifications to its treatment plant. One facility may have financial resources available today to begin making modifications while another may need a number of years before it can proceed. Therefore, while the strategy establishes a time frame to collect data and evaluate

options it does not specify a time frame for making operational changes or constructing additional treatment facilities. The feasibility report should provide justification for the requested schedule, especially when the proposed schedule extends beyond one permit cycle (five years).

Comment: Why are permittees given two options for limits and schedules in permits?

Response: While two options are provided, we expect most facilities to select the option that follows a process of monitoring, evaluation, construction, optimization and monitoring followed by the establishment of effluent limits in a permit. The second option establishes effluent limits and a construction schedule immediately upon permit issuance. We believe there may be facilities that will use the second option because it follows the traditional permitting approach with which they are more familiar, and because of the certainty of knowing precisely what permit limits they must meet.

Solids

Comment: Since solids will increase with the use of alum or ferric polymers, the operational costs will also increase for solids handling. Will the DNR/IDALS change the land application regulations and rates to keep nutrient loading down so that we need to expand the area to be able to land apply solids?

Response: Biological nutrient removal will result in only minor increases in the amounts of solids produced. Chemical addition for phosphorus removal, on the other hand, will increase solids generation, and the operational cost estimates presented in the strategy include the costs associated with disposal of these additional solids. Federal biosolids regulations and Iowa rules limit the amount of nitrogen that can be applied to the agronomic rate of the crop grown on the application field, but there should be little to no increase in the amount of nitrogen in biosolids resulting from biological nutrient removal. Current regulations do not limit the amount of phosphorus that can be land applied. We do not anticipate that regulation changes will be needed as a result of implementing this strategy and there are no plans at this time to do so.

Pretreatment

Comment: If an NPDES permit is issued to a POTW that is required to implement a local pretreatment program (those with AWW design flow >5 MGD) and the permit specifies limits for TN and TP, the POTW will be required to develop local limits for TN and TP under its pretreatment program, and specify limits in permits it issues to industrial users. This will be difficult because: (1) there are no set levels for the concentrations of TN or TP in domestic sewage, (2) the IDNR does not have the resources to perform headworks studies for POTWs with AWW design flow of <5 MGD; and, (3) the political backlash will be enormous.

Response: EPA's general pretreatment regulations (40 CFR Part 403) prohibit any user of a POTW from introducing any pollutant into the POTW that would cause pass through or interference. Interference results whenever a discharge is introduced to a POTW from a non-domestic source which inhibits or disrupts the treatment process or operations or the sludge process, use or disposal and causes the POTW to violate any requirement of its NPDES permit. Pass-through results when a discharge exits the POTW in quantities or concentrations that cause a violation of the POTW's NPDES permit. A POTW that is required to develop and implement a pretreatment program must develop and enforce specific limits to prevent interference and pass-through.

When a treatment plant is modified to provide nutrient removal, we expect that during the design phase, design influent loadings for TN and TP will be established in much the same way that design capacities are established for $CBOD_5$, TSS or TKN. The design capacity can then be used by the POTW to establish Maximum Allowable Headworks Loadings (MAHLs) and a determination of the need for local limits can be made. EPA's *Local Limits Development Guidance* (EPA 2004) describes procedures for developing MAHLs and local limits for conventional and non-conventional pollutants. We see no more difficulty for POTWs to develop requirements for nitrogen and phosphorus than for other nonconventional pollutants.

Comment: Will there be instances where a major POTW will impose limits on the amount of phosphorus an industrial user can discharge or increase user rates on industrial users to pay for nutrient reduction facilities?

Response: Possibly. The strategy is based on the premise that biological nutrient removal is feasible and reasonable for most major industries and POTWs, but the strategy does not prevent a facility from using other means to achieve the same results. There could be instances where a POTW determines that the most feasible and reasonable way to reduce phosphorus in its discharge is through chemical substitution by an industrial user. Another facility may determine that chemical treatment of phosphorus by industry combined with biological nutrient removal at the POTW may be the best option. We encourage industrial users that discharge to a major POTW that is affected by this strategy to collect data on the amounts of nitrogen and phosphorus it discharges, because this data may prove helpful as the city moves forward to evaluate, design and construct nutrient removal facilities.

User charges are typically adopted in local ordinances by a city council after opportunity for public input. The costs of capital construction projects and daily operation and maintenance costs are usually shared by all users of the POTW including industrial users. The department has no input into the rates a POTW charges its customers.

Moratorium

Comments: -There may be exceptions to the 10-year moratorium on meeting water quality-based limits for nutrients if a TMDL is developed that establishes a wasteload allocation for nutrients or numeric nutrient criteria are adopted.

-How will DNR respond to EPA's comment on the 10-year moratorium? What changes to the strategy might be made?

Response: Section 3 (Implementation Plan) of the strategy has been revised by adding the following language which was already in the Total Maximum Daily Loads section of the strategy:

"TN and TP discharge limits will not be made more restrictive for a period of at least 10 years after the completion of the nutrient reduction process construction unless it is determined that more restrictive limits are necessary to ensure the stream or lake will meet Iowa water quality standards."

Comments: -Have you considered extending the regulatory certainty period (10 years) for point sources to 20 years which is the timeline used to assess costs? Will EPA accept the 10-year moratorium on more stringent limits?

-Would DNR consider extending the timeline for additional facility upgrades after nutrient controls are installed?

Response: The 10-year period is the minimum specified in Iowa law meaning a longer period is possible where it is justified. EPA permits staff acknowledge the existence of this Iowa law and are supportive of the approach presented in the strategy.

The moratorium precludes a facility from having to meet more stringent effluent limits for a period of at least 10 years from the completion of construction of treatment facilities designed to meet all applicable technology and water quality standards in effect at that time. If construction of additional facilities becomes necessary to address new standards adopted during or following the moratorium period, schedules would be developed case-by-case at the time of permit development that would lead to compliance as soon as possible.

Comment: What circumstances could result in a city not falling under the 10-year moratorium?

Response: In all circumstances a publicly owned treatment works whose discharge meets the final effluent limitations which were contained in its discharge permit on the date construction of the publically owned treatment works was approved by the department, shall not be required to meet more stringent effluent limitations for a period of 10 years from the date the construction was completed and accepted, but not longer than 12 years from the date that construction was approved by the department. In all circumstances, a POTW with an NPDES permit shall achieve compliance as soon as possible as required by federal law.

Costs

Comment: There must be an acknowledgment that point sources are quickly approaching the point where additional improvements to wastewater treatment systems will not be justified under any economic or environmental formula.

Response: We believe state regulations and this strategy acknowledge this. For technology-based effluent limits developed on a case-by-case basis such as those proposed for total nitrogen and total phosphorus, there must be a finding made that the limits are both feasible and reasonable. For limits to be feasible and reasonable, there must be technology available to meet the limits, and a facility must be able to afford to install and operate the technology. If there comes a point where additional reductions are needed to meet federal requirements and the technology to do so is no longer feasible or reasonable, other solutions will need to be explored.

Comment: What are estimated/potential costs for cities outside of the 102 major municipals affected by the nutrient reduction strategy through the implementation of Iowa's antidegradation policy?

Response: Potential costs to facilities not specifically addressed in the strategy (e.g. minor POTWs and most minor industries) were not assessed because these facilities are not being asked to install treatment to reduce nutrient discharges. These facilities are not included in the strategy because in general it is not feasible or reasonable for these facilities to install biological nutrient removal. Many of these small facilities utilize lagoons for wastewater treatment and, while these facilities likely remove some nitrogen and phosphorus, they are not specifically designed to do so and cannot be easily upgraded to remove more nutrients. In addition, these communities have fewer users among whom to spread the cost of treatment, resulting in higher costs per user than in larger cities.

Comment: IDNR talked about treating to the ability to pay if a city can't afford the 10/1 standard. I do not see that in the plan.

Response: As stated in earlier responses, the rule that this strategy relies upon requires a finding that proposed effluent limits for TN and TP for a facility be both feasible and reasonable. If a city cannot afford to install and operate nutrient removal facilities, then it is unreasonable to expect it to do so. However, we expect most, if not all, major POTWs to be able to afford biological nutrient removal, especially considering the flexibility provided in the strategy for developing construction schedules that take into account a city's financial condition.

Comment: How will affordability be evaluated? Would DNR provide examples?

Response: Section 3.1, page 1 of the draft strategy states the following:

> "Screening criteria are available to indicate the likelihood that a project will be affordable with minimal information. EPA economic guidance (U.S. EPA 1995) and proposed (now final) rules to implement Iowa's disadvantaged communities law (455B.199B) suggest that if the ratio of projected total wastewater costs to a community's median household income (MHI) is less than 1%, then a project is affordable barring very weak community economic indicators. If the ratio is greater than 2%, then a project is not affordable unless economic indicators are strong. Projects resulting in a ratio between one and two percent may or may not be considered affordable dependent upon the strength of secondary economic indicators such as comparison of county MHI to statewide MHI, bond rating, etc."

Comment: Funding is a big issue for the smaller major municipal point sources. It's commendable that the strategy is intended to achieve the most "bang for the buck." Cedar Falls is completing a major construction project ($19 million), and adding a BNR system to the fixed film trickling filter plant would cost the city an additional $18 million at a minimum, by current engineering estimates and essentially double our debt load. Can there be a top down approach to removing the necessary nutrient loadings? Can the desired total mass reductions be accomplished by focusing on the biggest five or 10 POTWs as opposed to trying to squeeze drastically smaller amounts of nutrients from all 102 of the major municipals?

Response: The strategy focuses on a process for establishing technology-based TP and TN limits in an effort to reduce nutrient loadings from point sources. During development of the strategy it became clear that the cost to install nutrient removal technology is likely to be cost-prohibitive for most small communities and other small facilities. Our data show that major facilities, on the other hand, generally can afford to install and operate treatment systems capable of achieving the nutrient reduction targets. The strategy allows case-specific circumstances to be considered since each community and industry will have to deal with different situations.

Comment: It is unclear how this point source strategy can be implemented without adequate funding from the state and federal level. If this is a federal goal, the state should aggressively seek federal funding to help implement the strategy. The only option that exists for cities for financing upgrades is the state revolving loan fund. The state has not allocated any additional grants or

funding sources to help lower the cost of this strategy to communities, nor are there any identified federal resources. The full cost for achieving the strategy goals will ultimately fall on ratepayers in these cities. More specifics on obtaining additional funding or funding sources for planning and technological upgrades should be an integral part of the strategy particularly because municipal ratepayers may be commercial or industrial partners that could be adversely impacted by significant rate increases associated with nutrient controls and choose to locate operations outside the State of Iowa.

Will DNR and other nutrient strategy partners support a system of grants or other public funding options to supplement ratepayer contributions to implement the point source strategy?

> **Response:** There are no known plans to develop new state or federal funding sources to assist facilities with installing additional treatment for nutrient removal; however, we would support efforts by others to do so. The strategy determined that the affected facilities generally can afford to install and operate such treatment facilities without considering new funding sources.

Priorities

Comment: How will permit renewals be prioritized? Expiration date? Critical watershed? Size?

The 10-year moratorium makes it difficult if not impossible to respond to watershed prioritization that is to be reevaluated every five years according to the strategy. IDNR should use a five-year time table to reevaluate the appropriateness of effluent limits in NPDES permits as the Clean Water Act requires.

Response: A number of factors determine if and when a permit can be reissued. These include but are not limited to whether the facility is in compliance with its current permit, the status of the receiving stream designation, staffing, availability of all necessary information, size and location of the facility and when the current permit expires. Where other factors are not at issue, permits will be issued first to major facilities in priority watersheds and to the larger facilities, before smaller ones.

NPDES permits by law are issued for a period of five years although they may be administratively extended and remain in effect for a longer period if circumstances preclude reissuance prior to expiration of a permit. Permit requirements including effluent limits are reevaluated each time a permit is reissued.

Trading

Comments: *Several commenters encourage investigating the feasibility of developing a nutrient trading program while others disagree that a trading program should be pursued.*

-In order to meet nutrient pollution reduction targets at minimal risk and cost, the State should:

- Encourage and promote nonpoint source to point source, and point source to point source emissions trading and offset agreements, without creating centralized banks or trading bureaus.
- Allow emissions trading and offsets, under existing laws, utilizing modern verification techniques and avoiding trading ratios, or similar measures that encourage farmland condemnation.
- Immediately allow all NPDES permit holders to reopen and revise their permits in order to establish nonpoint source and point source to point source mitigations.
- Create a commercially based Industrial Advisory Panel to provide the State with ongoing information and expertise on least-cost environmental compliance solutions.
- Undertake multiple and diverse pilot projects, codifying environmental mitigation offsets in NPDES permits.
- Manage and arrest future need to regulate point sources.
- Avoid best practice mandates on agricultural producers. No minimum level of nutrients management practices should be regulated.

-We encourage IDNR to investigate the feasibility for a nutrient credit trading program whereby one nutrient discharge source can purchase credits from another source that implements nutrient reduction practices in lieu of constructing expensive treatment plant modifications for achieving extremely stringent nutrient discharge limits.

-While nutrient trading has the potential to improve water quality at a lower cost compared to point source measures, the development of such a program will be challenging; property rights will be involved, contracts will need to be uniquely structured, proper baselines established, monitoring for performance developed, verification of reductions conducted, and other issues not foreseen. This does not mean that such a program should not be considered, it's merely meant to point out the very real challenges of such a system.

-In Iowa there may not be enough regulated point sources in a watershed to make credit trading and other market solutions viable.

-The strategy should abandon any consideration of water quality trading and focus instead on effective regulation of the sources of water pollution.

-A comprehensive framework for a TN and TP credit trading program must be developed prior to implementing the Nutrient Reduction Strategy.

Response: The strategy calls for IDNR, IDALS, WRCC and point and nonpoint source stakeholders to work to develop an environmental credit trading program if there is found to be a need and resources are made available. Based on experience in other states, we believe it could take a number of years to pass laws and adopt rules and procedures that would be a prerequisite to implementing a nutrient trading program. Given the likely complexity of such a program, we expect that few point sources would opt for trading over installing treatment to achieve levels of 10 mg/L TN and 1.0 mg/L TP in their discharges. For this reason we disagree that a trading program must be developed prior to starting to implement a nutrient reduction strategy. Trading may become more attractive and may become the only means by which point sources will be able to comply with more stringent permit requirements, should stringent nutrient water quality criteria be adopted.

The following are a few of the topics that would need to be addressed to develop a credible trading program:

- A system to verify measureable reductions in nutrients would be needed.
- A system to track nutrient reductions would be needed.
- Accountability measures would need to be established.
- The program would need to be based on sound science with standards established for certifying credits.
- An enforcement mechanism would be needed.

Storm Water

Comment: Municipal storm water discharges should be considered *de minimus* sources of nutrient loadings. A more cost effective approach for municipal stormwater would be to legislatively grant cities local authority to regulate the application of fertilizer within their corporate limits.

Response: As the commenter indicated, local control of fertilizer use is prohibited by statute, specifically Code of Iowa 200.22. Should the Iowa Legislature remove or modify this restriction, the Department would consider placing such a requirement in a Municipal Separate Storm Sewer Permits (MS4) permit, if a city were to request such a restriction.

Comments: -I have concerns that a significant amount of nitrogen and phosphorus applied in urban areas is not being utilized by turf and landscape plants. In addition, the amount of fertilizer that is deposited on sidewalks and streets can be staggering at times. This results in a direct entry point for N and P into stormwater which is ultimately discharged into Iowa's rivers and streams.

-Runoff from urban lawns and golf courses should also be included.

Response: Iowa's major cities are required to evaluate and implement best management practices within their corporate limits to reduce pollution discharges from their storm sewer systems. Best management practices include fertilizer management programs that require evaluating the usage of fertilizers on city property and reducing the amount used when appropriate. Cities are encouraged to work to educate homeowners and businesses about the effects of fertilizer runoff on water quality and provide information about proper fertilizer application practices.

Several cities focus on education and outreach to educate homeowners that fertilizer that ends up on sidewalks or streets needs to be swept up to protect rivers and streams. While many of Iowa's major cities are required to reduce pollution from their storm sewer systems, many smaller communities in Iowa are not. The state is looking into opportunities to increase awareness and education of these urban storm water issues.

The DNR has plans to learn more about how fertilizer is managed at golf courses and is looking for opportunities to partner with experts in golf course management to seek ways to possibly reduce nutrient runoff. The strategy has been modified to include a sentence describing these efforts.

Progress on these efforts will be reported to the WRCC at their regularly scheduled meetings.

Comment: All cities in Iowa should have a basic stormwater ordinance that requires the infiltration of at least one inch of rain, as well as erosion and sediment control guidelines for construction sites. All cities, not just NPDES permitted cities.

Response: Cities generally have the authority to adopt ordinances to address specific issues in the community. State efforts, as described in the strategy, will continue to focus on infiltration of the water quantity or the runoff from up to 1.25 inches of rainfall. Reductions of 80 to 85% in

the annual runoff volume are possible. By reducing the volume of runoff, corresponding reductions in the amounts of pollutants, including nutrients, can thus be achieved.

Comment: The Department of Natural Resources should walk the walk. DNR owned land should actually incorporate water quality practices – either new projects or retrofits - that capture and infiltrate stormwater runoff. Any state park we visit is an example of what not to do - as the parking lots / roadways drain right into the body of water. Pleasant Creek in Palo is a great example of that as is Palisades near Mt. Vernon to name two.

Response: We agree and are working to address this. The DNR is incorporating infiltration basins and bio-retention basins, permeable paving strips, and/or rain gardens in all new construction. Recently the DNR installed rain gardens and bio-retention swales at Big Creek Lake to capture runoff from the boat ramp area. A rain garden is being installed at Lake Keomah State Park adjacent to the new office/shop building, which will serve the entire front parking lot area.

The DNR also recently modified the construction review process for projects on DNR lands to include a review and consideration of storm water management options for each project. This ensures the best options are now evaluated prior to construction. While budgetary constraints limit widespread retrofitting of infiltration practices for existing facilities in state parks, opportunities may exist to work with individual parks to make improvements to existing infrastructure. The work of Friends groups and/or Scout projects also could be enlisted in this area.

Comments: -Stormwater loading is extremely minor in comparison to agricultural sources and nitrogen control in particular is difficult and very expensive to obtain in stormwater.

-Would DNR clarify that stormwater limits will not be set for nutrients, and describe more clearly how MS4 permits factor in to the strategy?

Response: The Department does not plan to specify limits for nutrients in NPDES MS4 permits at this time. MS4 permits contain provisions requiring cities to implement a pesticide and fertilizer management program that includes evaluating the usage of fertilizers on city property and reducing the amount used when appropriate.

Private Sewage Disposal Systems

Comment: In the plan I saw only one reference to the potential impacts of failing or non-existing rural septic systems. Some county sanitarians have estimated that 50% or more of rural septic systems are not up to code and have an impact on local water quality. While not truly a nonpoint source problem, it usually gets thrown into NPS planning and should be addressed.

Response: We believe that the discussion in the draft strategy adequately addresses septic systems and the concern expressed by this comment. Section 1.2, page 20 of the draft strategy reads:

> "Much of Iowa's efforts with private sewage disposal systems consist of upgrading of failing systems through routine inspections by counties and through Iowa's "time of transfer" septic system inspection law that took effect in 2009. This law requires that every home/building served by a septic system have the system inspected prior to sale or deed transfer. The law is intended to eliminate sub-standard or polluting septic systems. Since taking effect, there have been approximately 18,000 time of transfer inspections and 6,000 new septic systems installed as a result of the inspections."

Current efforts, especially since 2009, are demonstrating major progress on upgrading or replacing failing septic systems.

Animal Feeding Operations

Comment: I am really embarrassed when my family members from out of state come and visit me and they tell me how horrible it smells here in Iowa. Can't there be something done about that also? I used to live in Oklahoma, Texas and Minnesota and they don't use that pig poop on their fields. Can someone please stop the farmers from doing that? I know that can't be a good thing to the drinking water in this state.

Response: Animal manure has nutritional value for crops and decades of agricultural research have shown that it improves the soil quality, structure and the crop yield. It is a commodity that is used by farmers on their own lands or sold to others to grow a better crop and achieve higher yields. Because it is widely used on farms in the state, the Iowa DNR has been mandated to enforce requirements regarding the land application of manure (see rules summary in italics below).

(567 Iowa Administrative Code (IAC) 65.2(1 through 11) and 567 IAC 65.3 (1 through 6) deal with manure from animal feeding operations that use confinement buildings. Issues such as minimum manure control and reporting of manure releases are required in 567 IAC 65.2. Requirements and recommended practices for land application of manure, including application rates, separation distances, surface application of liquid manure on frozen or snow - covered ground, etc. are provided in 567 IAC 65.3. In addition, manure generated by animal feeding operations managed as open feedlots is regulated by 567 IAC 65.101(1 through 9). These requirements may be accessed at http://www.iowadnr.gov/Environment/LandStewardship.aspx)

While odor and air quality issues are beyond the scope of the nutrient reduction strategy, requirements pertaining to separation distances to residences and other places where humans gather, and prompt soil incorporation of manure, are examples of practices used to minimize odor problems.

Comments: -I noted that the nutrient strategy document does not recommend a review of the DNR's manure management plan (MMP) program. The problem with the current MMP program is that it is outdated and results in over-application of nitrogen. The MMP program currently uses the outdated yield goal method for determining nitrogen application rates; this method is not supported by ISU and results in application rates significantly higher than what is recommended by ISU. I believe that the nutrient strategy should include plans to make the DNR MMP regulations consistent with ISU nitrogen application recommendations.

-The proposed strategy summarizes existing state regulation of animal feedlots but contains no account of the numerous breaches of animal waste treatment facilities or resulting pollution of Iowa waters, contains no analysis of the efficacy of existing regulations, nor any process or timetable for evaluating or modifying these regulations.

Response: The commenter is correct that the MMP requirements use the yield goal method for determining nitrogen application rate and this method is currently supported by ISU for fields that are using manure only.

The newer MRTN method is used when only synthetic fertilizers are used by farmers. The maximum return to nitrogen (MRTN) method utilizes established prices for nitrogen and corn to

calculate the optimum economical application rate for nitrogen. The MRTN calculator includes synthetic nitrogen sources of anhydrous ammonia, 28% UAN, 32% UAN, urea and ammonium sulfate. There is no listing of nitrogen or a cost associated for manure with MRTN. Since the nitrogen content of manure is extremely variable and since the value of the nitrogen also varies due to nutrient concentration, hauling distance and other factors, using the MRTN method to determine nitrogen application rate is not practical at this time.

State law prohibits release of manure to water sources. The vast majority of breaches that occur are accidental, not planned, and are fairly rare. While there are manure storage structures that were not constructed properly or were poorly maintained, most operations in the state properly retain manure to protect water quality. The poorly constructed or maintained structures are dealt with as they are identified in order to properly protect water quality. DNR regulations are reviewed at least every five years for accuracy, relevance and efficacy.

Comment: Beyond a mere reference to confinements in the summary, the current and future negative impact on water quality from animal livestock confinements (CAFOs) is not even addressed or considered. This is a serious oversight, given that confinements produce millions of gallons of manure and are a significant nonpoint source of water pollution. In particular, there is no mention of how to address the negative impact on water quality due to the unchecked growth of the number of confinements, the increased chance of over-application of manure due to overlapping manure plans, or the probability of significant water quality impairment when confinement construction is not limited in watersheds already defined as high priorities for the reduction of nitrates.

The nutrient reduction strategy needs to account for the unchecked growth of hog confinements - a significant nonpoint source of water pollution - or it will ultimately fail in making any significant progress in reducing nitrates in our water.

Response: There is no evidence that nutrients in manure from livestock confinements cause any more water pollution than the commercial fertilizer that would be applied to the crop production fields if it were used instead of manure. The nutrients in manure are a valuable resource many farmers utilize instead of purchasing and applying commercial fertilizer. Confinement operations with a manure management plan are restricted to applying no more nutrients than the crop can utilize. There is no similar restriction on how much commercial fertilizer can be used.

When the nutrients in manure are properly accounted for in a MMP, it is less likely that excess nutrients will be applied to a crop than in cases where there is no MMP required. There is no evidence that overlapping of fields for manure application in separate MMPs increases the likelihood of over-application. MMPs identify which fields are eligible for manure application, not which fields manure is actually applied on. Records of actual manure application must be maintained at or near the operation and review of these records has not revealed that manure is being over-applied. Section 1.4 of the strategy has been revised to address this point.

Comment: The State of Iowa requires nothing of the hog producers to mitigate the negative effects of hog waste other than to cover it up with a couple inches of dirt. Why is this same method not sufficient for human waste? What is the difference? If unprocessed human waste is not good for the environment then how is hog waste any better?

Response: There are several significant differences between human and animal waste which explain why human waste is treated and discharged to rivers and streams while animal waste is used as fertilizer for the benefits of crops and soil improvement. One difference is the volume produced. The average human produces approximately 2 lbs of waste per day while livestock produces many times this amount. For example, pigs produce approximately 12 lbs of waste per day and cattle produce approximately 92 lbs per day.

Manure from livestock can be used as fertilizer because these animals are plant eaters and their feed consists of plant material; thus, their manure is high in nutrients and organic matter which can help stimulate the growth of crops and improve the soil structure. For example, cows excrete 75% to 90% of the plant materials they eat. Human waste is 75% water and the remaining 25% is composed of indigestible fiber, dead bacteria and living pathogens. Thus, there is a risk that use of untreated human waste could be harmful to human health or the environment because it could contain parasites and/or harmful organisms.

Comment: The nutrient strategy should include steps that IDNR will take to ensure that the Animal Feeding Operation program meets the Clean Water Act requirements.

The authors somehow left out the fact that EPA is threatening to take over the NPDES permit program from Iowa because of DNR's inadequate job of regulating animal agriculture in the state. Your authors may not agree with EPA's contentions, but they should not be given the luxury of avoiding this important point. While one might be able to make a case that reducing the number of inspectors from 23 in 2004 to 8.75 in 2010 was justified and did not affect water quality, the EPA perspective and potential action must be acknowledged. One must ask if this omission is meant to cover up the controversy.

Response: The strategy emphasizes preventative water quality efforts by virtue of Iowa laws that are independent of the Clean Water Act. The NPDES permit program applies to large animal feeding operations and only after ongoing or repeated discharges to water of the United States are documented. State law, however, regulates large and many medium-sized operations in ways that reduce the likelihood of discharges in the first place (e.g. construction permits, MMPs and certification of manure applicators). The IDNR has successfully addressed 26 of the 31 deficiencies in the NPDES permit program identified by EPA, and is working with EPA to resolve the remaining issues.

Water Quality Monitoring

Comments: -Although I understand the desire to allow farms and farmers to experiment with their own reduction policies, we should at least institute a monitoring program on creek and stream connections with our wider river system. In this way we could discern which areas produce the most egregious discharges and begin to work back up the systems to those who, knowingly or not, are producing the greatest discharge.

-The Iowa DNR should figure out how much nitrogen and phosphorous is leaving the state.

-Monitoring should be put in place to measure actual progress in the reduction of nutrients in watersheds where best management practices have been implemented.

-It is critical that a good scientifically based nutrient load monitoring program be developed by IDNR in 2013 and that adequate resources are allocated to in-stream water quality monitoring and documentation of agricultural land management practices. It is essential that we start with good baseline nutrient load data and that we accurately monitor our progress with nutrient load reduction as we implement the strategy.

Response: The State of Iowa utilizes an ambient water quality monitoring network to assess surface water quality throughout the state. This network effectively covers 82% of the state and has been in-place in its current form since about 2001. This network consists of 78 monitoring stations on major rivers and streams and another 12 stations downstream from major cities. Data from this network was used to determine the total phosphorus and total nitrogen exports leaving the state to assist with the development of the strategy and nutrient reduction targets. Data from the ambient monitoring network, along with data from other sources, is also being used to help determine which watersheds in Iowa are discharging the most phosphorus and nitrogen so that priority watersheds can be designated and areas of greatest concern can be addressed first.

The strategy calls for the IDNR to convene a technical work group beginning in 2013 to define the process for providing a regular nutrient load estimate (i.e., nutrient budget) based on the ambient water quality data network. This process will include specifying the most appropriate mathematical model, the acceptability of the data, and a process for making future adjustments based on new information and advancements in science and technology. Once priority watersheds are designated, we anticipate that additional monitoring will be conducted to document nutrient reductions and water quality improvements.

Responses to Comments on the Science Assessment

N Comments

Comment: Par 4, sentence 7, "The price of corn was assumed…" A sensitivity analysis of how the cost of related practices varies with varying corn and N fertilizer prices would be very helpful.

Response: The price of corn and nitrogen would certainly be a factor in the overall costs of many practices but conducting a sensitivity analysis with just these factors could create confusion since many practice costs are computed using cash rent. The variability in the MRTN with a range in corn and nitrogen price is shown below.

Corn Price ($/bu)	Fertilizer Price ($/lb)	Price Ratio	MRTN for Corn following Soybean (lb-N/acre)	Profitable Range (lb-N/acre)
5.00	0.5	0.10	133	123-147
6.00	0.5	0.08	141	130-152
7.00	0.5	0.07	145	135-157
7.00	0.6	0.09	140	130-151

Comment: Everything is based on nitrate-N rather than all N sources. We understand the rationale, since quantifying all N components and sources would be impossible. Locally, ammonia/ammonium can be important. For Gulf hypoxia issues, organic N could potentially be important/significant. May want to better defend rationale for excluding organic-N from the analysis.

Response: Organic N (and NH4) was excluded from the analysis for several reasons. While it is true that at the scale of the Mississippi River basin, total N is approximately 1/3 Kjeldahl N (TKN) and 2/3 nitrate-N, much of this TKN is formed within the riverine system from biological processes, part of what is commonly termed the N spiral. In upper basin watersheds heavily dominated by agriculture, nitrate-N is typically six times the concentration of all reduced N species (Crumpton et al, 2006). At the scale of tile drain outlets, nitrate-N typically comprises 95% of the total N load (Crumpton et al 2012; Hernandez-Ramirez et al., 2011). Nitrate is by far the dominant N species in tile flow – the major, nonpoint source pathway of N entering surface waters in Iowa.

In addition, the bioavailability and importance of nitrate as a driver of hypoxia is widely recognized. Seventy percent of the total N load to the Gulf of Mexico is nitrate, which is immediately available to support algal growth, only 2% of TKN is NH3, 98% of the TKN is organic nitrogen which at least over the short term is less bioavailable than nitrate. Nitrate load is recognized as the best predictor of Gulf hypoxia and is used by the major research groups in Louisiana (Turner) and Michigan (Scavia) producing hypoxia forecasts.

Finally, the preponderance of water quality studies only measure nitrate, thus there is little information available to make any assessments about the impact of various practices on non-nitrate forms of N. Certainly, additional studies on this topic would be of value, but we are confident that by considering nitrate, we are accounting for the majority of N leaving Iowa fields.

Comment: "The research indicated a small reduction (4%) in nitrate-N concentration when comparing liquid swine manure to fertilizer nitrogen…" Small reductions shown were for a short-term study, but what about long-term reductions due to improved soil structure and increased soil organic matter, which tends to hold nutrients?

Response: The specific reduction noted was related to liquid swine manure. Any soil structure or organic matter benefits are likely to be much less from liquid swine manure than other manure sources (e.g. beef or poultry manure). From literature reviewed, there were no documented increased water quality benefits from long-term manure applications.

Comment: "Wetlands restored specifically for habitat benefit are not being considered in this effort as they may or may not receive nitrate-N, and as a result, the primary water quality benefit is from land being taken out of production." More explanation as to why these wetlands may not receive nitrate-N would be helpful. It seems likely that potholes and depressions in the middle of cornfields would receive nitrate in runoff and in shallow subsurface flow. What about the benefits of these types of wetlands obtained by capturing and treating non-nitrate forms of N? Could these systems capture and "treat" TKN, for example?

Response: The potential for wetlands to reduce watershed scale nitrate loads is largely determined by the fraction of the watershed's total nitrate load the wetlands intercept and by the wetland's size. If not sized appropriately and sited so as to intercept a significant fraction of the watershed load, wetlands have very little effect on either nitrate concentrations or exported nitrate loads. Although virtually all wetlands have the potential to remove nitrate, wetlands must be positioned to intercept significant nitrate loads if they are to achieve significant load reductions. Isolated potholes and depressions in the middle of cornfields rarely intercept tile drains, and intercept very little nitrate in runoff or shallow subsurface flow.

Comment: The explanation of how mean values were calculated is not easily understood. There is a concern about averaging nitrate concentrations between years, because the flows in each year could be dramatically different. If concentrations are used instead of loads, then flow-weighted averages would be more appropriate. And reducing loads is the goal.

Response: Since loads are quite variable for a given study and across studies, the science team felt annual flow-weighted nitrate-N concentrations were a more representative measure for comparing performance of practices. Concentrations and percent reductions were then used with water flow information to compute loads and percent load reductions.

Comment: "Practice/scenario costs…calculated by Major Land Resource Area (MLRA) and then accumulated for a statewide cost and reduction amount." It would be very beneficial to calculate and report these costs (and nutrient reductions) by MLRA. This would illustrate whether the costs to each MLRA are "equitable" on a per-pound of nutrient removed and an aggregate basis. MLRAs that

have a relatively small contribution should not be faced with high implementation costs (and vice versa).

Response: The cost per pound varies little by MLRA but the load reduction that could be achieved due to applicability of the practices in different regions or overall load does vary by MLRA, so that should be taken into account when targeting practices across the state. Adding additional tables for each MLRA would increase the length of the report, but the science team will prepare summary tables that provide information by MLRA.

Comment: Page 22, last par and Eq 11: A more detailed explanation could be included for this regression analysis. Regression plots would be helpful, if applicable.

Response: The report has been revised to provide additional explanation.

Comment: "Based on this analysis,…" It is not clear, given the information in this paragraph and the preceding one (including Figure 3 on page 24), that attributing 83% of nitrate to subsurface flow and 17% to runoff is a valid assumption. Further explanation would be useful.

Response: The report has been revised to provide additional explanation.

Comment: The document argues that reducing nitrogen application rates will mine soil nitrogen and reduce soil quality. This point is not agreed upon by soil scientists, but is stated in the document as factual.

Response: A recent study conducted by Dr. Michael Castellano at Iowa State University concluded that soil carbon and nitrogen stocks in Iowa corn-soybean rotations are at significant risk of long-term decline. We have added this reference to this section of the report.

Comment: Pg 34, "Costs/benefits" par.. :"farmer management time…" Was this included in the cost calculation? If so, how much time does it take for farmer to adjust gates every year, and what is the hourly rate? It seems likely that this is more of an inconvenience, rather than a cost.

Response: The farmer management time for raising and lowering gates was included. The cost included approximately 12 hours of time to open and close the gates an average of 3 times per year (labor rate of $14/hr).

Comment: "Controlled drainage is limited to areas with land slopes less than 1%." Some explanation/illustration to this physical constraint would be helpful to many readers.

Response: A reference was added to point the reader to a fact sheet with more discussion of this. The management zone should have an elevation rise of 1-2 ft so that if the slope was greater than 1% the number of control structures needed to uniformly manage the water table could be substantial.

Comment: Pg 38, "Practice limitations" par: Consider adding "Increased agricultural/economic diversity" to the list of bullets.

Response: Added.

Comment: Pg 39, "Other services" par: Consider adding "Increased soil health" to the list of bullets.

Response: Added.

Comment: Pg 40, par 3, "Scenario NCS2, sentence 1: "…in all MLRAs except 103 and 104,…" It would be helpful to the reader if a rationale for excluding MLRAs 103 and 104 from cover crop implementation was provided.

Response: Since these MLRAs have fairly low adoption of no-till, which would be most conducive to cover crops, these areas may be more difficult to get adoption so we did not assume cover crop adoption in this example scenario. This reasoning was added to the report.

Comment: What about enhanced efficiency fertilizers or foliar application of nutrients or nitrogen fixing azotobacter?

Response: Nitrogen fertilizer additives or other soil additives were considered where there was water quality research data available. Foliar nitrogen application is not a suggested agronomic practice, and the amount that could be effectively taken up by the plant through foliar application is small, and would therefore have little impact on nitrogen application rate requirement.

Comment: The data in the assessment indicating very little water quality advantage from moving N application from the fall to the spring contradicts conventional wisdom. Given what we know about the risk of nitrate loss, especially in the late winter and early spring, we are concerned about the validity of this conclusion and ask that it be re-examined.

Response: The available water quality data for the region was examined as part of this assessment. It is expected that areas with more winter drainage such as the eastern Corn Belt may see greater benefit from timing of nitrogen application than documented in Iowa and closely surrounding states. The studies reviewed were from Iowa, Minnesota, and Illinois.

Comment: Some key and promising practices such as denitrifying bioreactors and constructed wetlands are new and their N trapping capacity is based on limited data. Actual effectiveness, long-term viability, maintenance issues, and potential of unintended consequences are not adequately known. While we support the implementation of these conservation practices, we suggest continued work to design optimal systems and develop maintenance criteria and infrastructure. Secondary impacts also need to be examined and mitigation needs for those impacts need to be accounted.

Response: We agree there is a need to continue to examine all positive and negative impacts of practices and have added a statement in the nitrogen document highlighting the need for evaluating potential unintended consequences of practices.

Comment: Why do the numbers provided in Table 14 of the Nitrogen Science Assessment differ from practice performance data presented at the September Hypoxia Task Force Meeting?

Response: They do not differ. To clarify there is a practice performance table (Table 1) which summarizes water quality data from research comparisons. This information was then used along with flow information to estimate nitrate-N load and load reduction from various practice implementation. These load reductions are summarized in Table 14. So, Table 14 estimates potential load reductions for various levels of practice implementation.

P Comments

Comment: Executive Summary. Page 2, Paragraph 7, last sentence. Edge-of-field practices through buffers or sedimentation basins/ponds whose potential for dramatic reductions in phosphorus load, 58% and 85%, respectively." It is felt that a comprehensive literature review would show that P reduction in ponds is highly variable, and assuming an 85% reduction is optimistic. At a minimum, the importance of proper design (depth, length:width ratio, drainage area ratio, etc.) in achieving an 85% reduction in P should be emphasized.

Response: Due to a lack of data from peer-reviewed literature within the Midwest for nonpoint sources, references to P retention within ponds has been removed. The importance of proper design of buffers and sedimentation basins in achieving P reduction has been emphasized within the text of the Executive Summary.

Comment: "In the long term, however, manure compared with inorganic P forms can reduce runoff by increasing soil organic carbon and improving soil structure." The same could be said in Section 2.2 on nitrogen reduction, but this point was not emphasized there. Little difference/reduction was attributed to the N source (manures vs. chemical) and this important benefit was not pointed out as clearly in Section 2.2.

Response: See note above related to the liquid swine manure where it is expected there would be less impact on improving soil organic carbon or soil structure since there is little organic matter in this manure source. The only manure source examined for statewide nitrogen reduction was liquid swine manure.

Comment: Brackets, "[]" are confusing. Are data in brackets means or standard deviations? If means, which values are utilized in calculation of P reductions (those in brackets, or those above the brackets?

Response: The brackets represent unpublished data or outliers. These data are not used in the calculations but do reflect the ranges of possibilities. We have footnoted the values below the tables.

Comment: "A trend line…" Consider including the regression plot, trend line, regression equation, R2 value, etc.

Response: This sentence has been changed to "The relationship between P application rate and P loss under these conditions was derived from these data using the Iowa P Index." The original data can be found in the referenced publications, and including a figure for each of the relationships used would add unwarranted detail.

Comment: "…of 65 kg P2O5/ha and 90 kg P2O5/ha,…" Text indicates these rates are from Sawyer et al., 2002, but this reference is not included in the list and description of references in Appendix A – Literature Reviewed. Please add so the reader can understand the rationale for these rates. Also confirm these rates are higher than P removal rates for each crop in order to more quickly reach the recommended STP levels.

Response: This section explains the methodology for site-specific P management. As explained in the text, the effect of site-specific P management on P loss was difficult to assess because of STP variation within a field, plus the levels at which this variation occurs differ greatly across fields. As such, the estimates do not represent a review of published studies and no section is included in *Appendix A – Literature Reviewed.* The estimates in Table 1 are of the maximum long-term benefit of site-specific P management using unpublished mean values from a recent study of 14 fields (Mallarino, 2012). Sawyer et al. (2002) is an extension publication that is referenced for the nutrient removal and recommended amounts of P2O5 at a specific soil test P level. The reference is included in the Literature Cited.

Comment: What about benefits of alternative surface inlets?

Response: This practice was not included due to lack of peer-reviewed data from Iowa or surrounding states. It has been noted in the "Future Research Needs" section.

Comment: The EPA recommends that the final version of the strategy address the contribution of phosphorus pollution from streambank erosion. When and how will data on streambank erosion phosphorus contributions be developed? Is there an opportunity to review and utilize/adapt information from other sources, such as Minnesota presented at the Davenport workshop, to determine phosphorus contributions from streambank erosion?

Response: The current assessment provides estimates from Iowa studies on the potential contribution from streambanks. Accurately accounting for streambank sources of P is extremely difficult and methods have not been developed to quantify streambank sediment contributions beyond a local scale. Therefore, evaluating strategies to reduce P losses from eroding streambanks (i.e., runoff volume reduction or bank stabilization) are beyond the scope of the science assessment. The Minnesota data presented at the Davenport workshop represent a promising approach at a larger scale than the Iowa data, and should be included in future analyses. This issue has been highlighted in the "Future Research Needs" section.

Comment: The report accounts for stream bank and channel erosion and legacy sediments as phosphorus sources (perhaps as much as 50% of the P load). However, the report fails to discuss the technologies, costs, and benefits of stabilizing these systems. This needs to be addressed.

Response: This analysis is outside the scope of this effort, but should be a future priority.

Others Economic Considerations Section

Comment: The strategy is proposing changes implemented over many years so it seems clear these costs/consequences will be moderated significantly. This section seems to focus on what will happen if large-scale changes occur quickly, which is unrealistic. This fact should be accounted for in this section.

Response: The following statement was included in the Other Consideration section with the discussion about the economics. "*The cost estimates are based on current dollars and current technologies. As new technologies emerge and farmers find more efficient ways to implement practices, the adoption costs can be expected to decline.*"

It is not possible to quantify how costs may change as the strategy is implemented.

Comment: The EPA recommends providing more detailed information to support the BMP effectiveness estimates, particularly where confidence intervals are broad.

Response: Available water quality data was reviewed in developing the estimates and the standard deviation of the estimate is reported in the report. Studies used in developing the estimates are noted within the reports so readers can find information on studies used if they are interested in reviewing specific information.

Comment: The strategy mentions that Iowa has restored 250,000 acres of wetlands, but does not mention the Natural Resources Conservation Service Wetlands Restoration Program. Monitoring of WRP sites has shown nitrogen reduction benefits that meet or exceed benefits from current Conservation Reserve Enhancement Program designed wetlands. The WRP sites also have habitat benefits. The strategy should more clearly explain how WRP wetlands fit into the overall nutrient reduction strategy plans in Iowa.

Response: The major determinants of N removal by wetlands receiving elevated NPS nitrate loads was estalished based on monitoring results from WRP, CREP and USFWS wetlands over the past decade. These results formed the basis of the wetland N loss estimates used in the alternative scenarios. For clarification, all of these wetlands have habitat benefits.

WRP sites do not show nitrogen reduction benefits that meet or exceed those of CREP designed wetlands and to the contrary typically remove a much smaller mass load of N per area of wetland. However, when wetlands are sited to intercept sufficient nitrate load and are appropriately sized, the performance is comparable for WRP, CREP, USFWS, etc. wetlands.

Comment: The EPA recommends that Iowa describe how data from the Major Land Resources Area level assessment—such as nitrogen and phosphorus loads—will be translated to the watershed scale and ultimately field scale to determine BMP placement and effectiveness.

Response: The analysis conducted for this assessment can provide general guidance on MLRAs within the state that are providing the greatest loading of nutrients to downstream waters. However, due to the lack of available baseline data, it is difficult to target high load areas within

the MLRA. Future work needs to collect finer spatial scale baseline/input data to allow for enhanced targeting of efforts. This is an area for future work.

Comment: The draft strategy points out the significant potential of cover crops to reduce both nitrogen and phosphorus while also pointing out the estimated corn yield loss with rye cover crops. The strategy is silent on the additional benefits, including economic benefits, to be gained by using cover crops. These benefits include increased water infiltration, minerals held in the soil, additional organic matter accumulation, and supressed weed growth.

Response: Some of these benefits are still in need of research documentation in Iowa despite anecdotal evidence. The report has indicated a reduction in erosion and loss of surface runoff contaminants along with benefits to soil health and soil organic matter.

Comment: The science report is based on published, peer-reviewed data for Iowa and adjacent states, a justifiable approach. However, since there may be a long-term research bias for corn and soybean production in Iowa and conservation practices tied to these two crops, the report reflects that bias by having limited information on potentially viable alternative cropping systems and conservation practices. For instance there may be viable alternative crops and rotations, which require less added nitrogen or can more efficiently trap nutrients throughout the soil profile or for more months of the year. Part of the strategy should reflect non-traditional opportunities for agricultural production, which inherently have less water pollution potential. The strategy should chart a path to investigate both their potential to significantly reduce nonpoint pollution and their economic viability.

Response: The practices considered include a range from nutrient management to extended rotations to perennial land uses in addition to edge-of-field practices. The Science Assessment was intended to summarize available water quality information. The overall strategy is intended to be a dynamic document and may be modified in the future to include a more specific path forward for non-traditional opportunities for agricultural production.

Comment: Additionally, limiting the analysis to data from just Iowa and adjacent states may have been unduly restrictive for some conservation practices. Data from Indiana, Ohio, and Michigan for cover crops, drainage water management, no-tillage, etc., may have provided additional, quality information that is appropriate when local data is limited.

Response: These other states have different climatic conditions that impact the timing and amount of nutrient loss. The science team focused on conditions most similar to Iowa. For example, the eastern Corn Belt has substantially more winter drainage than does Iowa, which impacts the timing of nutrient loss.

Comment: For some conservation practices, which are management intensive (e.g. cover crops, no-tillage, and drainage water management), the data did not distinguish among the nutrient management, crop production, and economic impacts when the systems were poorly managed versus well managed. Cover crops are one clear example. If not properly managed, the cover crop may not function as effectively to scavenge nutrients or may end up competing with the cash crop for water and nutrients.

Response: Unfortunately the data are not available to differentiate the performance of practices by level of management. This should continue to be evaluated.

Comment: Thus while the report highlights the potential for cover crops to achieve nutrient reductions in water, it indicates that the cost is very high due, in part, to the potential reduction in corn production. As evidenced during the recent "Cover Crops: Practical Strategies for Your Farm" conference hosted by the Soil and Water Conservation Society, producers with many years of experience in cover crops have learned to manage risks to production. We encourage you to re-examine the cover crop data to determine, if possible, which management strategies work best for environmental, production, and economic performance. Given the small number of studies, we recognize this may not be possible. But ask that you consider selecting cover crop viability as a research priority.

Response: The "Future Research Needs" addressed the need to examine cover crop performance specific to cash crop yields. We agree this is a needed research priority to acquire more data than is currently available.

Comment: We believe there are tremendous opportunities for innovative ideas to improve cover crop performance including new cover crop species, improved cultivars, multiple species mixes, planting method and equipment, seed cost, timing of planting and termination, and termination methods.

Response: The "Future Research Needs" addressed the need to examine cover crop performance specific to cash crop yields. We agree this is a needed research priority to acquire more data than is currently available.

Comment: The data used to analyze no-till production appears to have used predominantly short-term or rotational no-till research. Short-term and long-term, continuous no-till systems are very different both in terms of the impacts on nutrient management and on crop production. Only in long-term no-till can we expect to see changes in soil quality that are beneficial for crop production. We would also expect to see even more improved environmental performance in a continuous no-till system. Short-term and long-term no-till should be evaluated separately. In general, we believe you should consider the long-term, aggregate impacts of conservation practices such as erosion control, cover crops, high-residue crops in rotation, and reduced tillage or no-till on both our soil's crop production potential and their capacity to hold and cycle nutrients. The studies used do not appear to account for improvements in soil performance due to increased organic matter, microbial activity, and soil structure when the conservation practices are maintained over the long-term. Alternatively, they do not account for the environmental and economic impact of agricultural systems, which degrade the soil over time. Changes in soil quality and the subsequent long-term impact on production and water quality should be considered when evaluating conservation systems.

Response: Types of tillage are a continuous variable – we used the literature that was available that included water quality responses. While there will undoubtedly be long-term impacts, it would be speculative to include them in the assessment of current research.

Comment: The report does not distinguish the relative value of in-field versus edge-of-field practices. The report confirms that nutrient management, cover crops, extended rotations, perennial crops, and pastures are effective nutrient reduction practices. In-field technologies, such as these, address water quality issues systemically and robustly. For nitrates, in-field conservation technologies protect both tile line water and groundwater. Edge-of-field technologies such as filter strips, nutrient-treatment wetlands, and bioreactors, while effective at treating tile line and other surface/near surface water, have limited impact on groundwater. We believe that in-field conservation practices should be a priority.

> **Response**: The analysis does consider the potential pathway for treatment and estimates maximum level of treatment that might be achieved with both in-field and edge-of-field practices.

Comment: The strategy could be more explicit about how additional data can be incorporated into the load reduction tools.

> **Response**: The practice performance tables will be updated as new water quality performance data become available and this information would be incorporated in future assessments. This will also include adding new practices as their performance is documented.

Comment: With regards to the valuation of land that is taken out of production for buffer strips and wetlands, it is being undervalued by the report and is lowering the cost of implementation. The report uses ISU average cash rental rates as the cost to take land out of production. However, farmers and landlords will tell you that the ISU rental rates are low and do not reflect the going rate for farmland rental. Plus on top of this low rental rate being used, the report fails to account for the lost profit potential on those acres taken out of production.

> **Response**: The ISU rental rates are consistent with the National Agricultural Statistics Service rental rate estimates. The Iowa State survey is a mixture of both tenants and landlords to avoid being too heavily weighted to one group. Rental rates are used in lieu of trying to estimate profits because individual farmers will have individual profit structures. Using cash rental rates reflects the opportunity costs of taking the land out of production. In other words, if it weren't being farmed, how much money would be given up? You could look at an individual but that isn't practical given the number of farmers in Iowa. So, we use a proxy for the costs, the average rental rate.