DATE: July 7, 2023

TO: Great Lakes Water Quality Board of the International Joint Commission

FROM: Manure Nutrient Management Collaborative

SUBJECT: Toward the Implementation of a Manure Management Framework – Summary of Work by the Manure Nutrient Management Collaborative

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On behalf of the Manure Nutrient Management Collaborative, led by the Great Lakes Water Quality Board, we are providing a summary of the Collaborative's work, including a consultant report "Toward the Implementation of a Manure Management Framework" (April 2023).

In January 2020 the International Joint Commission's (IJC) Great Lake Water Quality Board (WQB) released a report with recommendations for strengthening manure management regulations to help reduce nutrient runoff to the Great Lakes. Following its release, the WQB further recognized that there is no entity that provides the opportunity for key players to convene and assess nutrient/manure management and water quality programs. In response, in October 2021, the WQB led the establishment of a diverse, binational group of stakeholders called the Manure Nutrient Management Collaborative (Collaborative), comprised of farmers and conservation, environmental, business, academic and government partners and leaders (**Attachment 1**). To guide the start of the Collaborative's work, a Terms of Reference was developed, (**Attachment 2**) outlining its purpose, goals, and activities. The Collaborative's goal is to work toward addressing excess nutrient runoff from manure application by identifying improved management opportunities and addressing challenges, such as implications of extreme precipitation events, to protect water quality while supporting productive livestock and crop farming operations in the Great Lakes basin. The Collaborative believes this can be accomplished by identifying needed changes in land use practices, manure management and handling, research, policy; new technology; and outreach to farmers, including funding to support farm operations. Accomplishing such goals will require long-term collaboration, discussions, and trust-building. Ultimately, the Collaborative aims to continue operating independent of the WQB.

To inform the Collaborative's work, a consultant was hired to collect, review and assess information on manure inputs, policies, and practices in two small watersheds of Lake Erie (the Auglaize River watershed in Ohio and the Medway Creek watershed in Ontario). The resulting consultant report "Toward the Implementation of a Manure Management Framework" (April 2023), was produced by Potomac-Hudson Engineering in association with LimnoTech. This report represents a detailed gathering of information by the consultant and serves as an interim report to inform future work and progress of the Collaborative. **The information presented in the report are the views and recommendations of the consultant and does not represent full endorsement by the Collaborative, its members, or their organizations.**

Based on the findings of the consultant's work, the Collaborative has broadly identified areas of general agreement and areas that are not agreed upon by the group. Gaps also exist that will require further study to fully address, through conversations, research, and outreach. The sections below identify these areas of agreement, areas not agreed to, and areas where more work is needed.

Areas of agreement

1. Agricultural nutrient runoff is a driver of nutrient loading and harmful algal blooms in the Western Basin of Lake Erie. While the goal of the Collaborative is to address excess runoff of nutrients from manure and impacts on water quality, it is recognized that manure nutrient management, commercial fertilizer nutrient management, and drainage water management need to be considered collectively to fully address the challenge of comprehensive nutrient management.
2. Harmful algal blooms are causing environmental, economic, and human health problems.
3. Over the last decade the number of animals in the Auglaize River watershed and Medway Creek watershed has increased significantly and continues to grow.[1]
4. Since 2002, commercial fertilizer use in the Auglaize Watershed has remained relatively constant, but manure use has doubled and continues to grow.[2]
5. Ontario, Ohio, and Indiana have significantly different guidelines and definitions of large animal operations. Collaboration on streamlining guidelines that impact the Lake Erie watershed is needed to develop an action plan that is consistent across the watershed.
6. In the U.S., the greatest growth in the number of animal operations has been in the unpermitted operations, sized just below the threshold requiring permitting, e.g., 2,499 hogs. They constitute over 90% of the animal operations in the Auglaize Watershed and evidence suggests they generate the majority of the manure.[3]
7. Gathering data on the locations of animal feeding operations, locations of manure application, and other farming practices is very challenging.
8. As noted under "Areas for additional work" below, there are several identified needs for data, information and outreach to inform decision-making for improved manure management to reduce excess nutrient runoff. It will take a collaborative effort from scientists, farmers, government, academia, industry representatives and other organizations to come together and solve these challenging issues as a team.

Areas not agreed upon

1. Instituting livestock-specific moratoria. Moratoria can alienate landowners and does not effectively address the issue of improving manure management, land practices, etc. to prevent runoff and protect water quality from existing operations.
2. Collection of farm level data. While it is recognized that farm-level data is needed to fill gaps and improve understanding, others believe its collection and use should not infringe on the landowners' privacy. Approaches are required to obtain the needed data, by working with the landowners, but still protecting their privacy. Identification of such approaches should include feedback, input and buy-in from the landowners.

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[1] PHE and LimnoTech, *Toward the Implementation of a Manure Management Framework* (April 2023), pg. 34-36 and pg. 38

[2] Ibid., pg. 52

[3] Ibid., pg. 30; Ibid, pg. ES-5; Environmental Working Group, *Methodology: New analysis identifies animal feeding operation 'hot spots' in Western Lake Erie Basin* (2022), www.ewg.org/wlealgaemethods

3. The need for additional regulations. The creation and implementation of regulations could drive improvements in water quality. However, others believe that this should be done in a manner that is reasonable and consistent, yet does not create backlash or alienation of landowners, who are the recipients and on-the-ground implementers of the regulations. It is imperative to build and maintain positive relationships with landowners to ensure their continued collaboration. If additional regulations are considered, a review should be conducted of regions in the country where regulations are effective in protecting and improving water quality.

Areas for additional work

There are several material data, science and information gaps that exist, including challenges in locating or accessing data and/or lack of data, as listed below. Such gaps hamper the ability to determine the impact of manure application and/or changes in practices on water quality. Additional work needs to be done to fill these gaps to make informed decisions about changes to manure management practices and policies. In moving forward, it is important to recognize that there is no "one solution". This effort will need to combine multiple approaches at both the local and regional levels to have a significant impact.

1. There is no official source of locations of non-permitted animal feeding operations in the U.S and no readily accessible location data for animal feeding operations in Ontario.
2. Lack of location-specific, publicly available soil phosphorous test data across both watersheds.
3. Lack of data on manure generated and applied to land in Ontario, and for non-permitted facilities in the U.S., including data on application locations, and application rate.
4. Lack of data on manure application methods, frequency and timing for both watersheds.
5. Technical gaps in the handling, transport, and placement of manure and strategies to concentrate and reduce its volume need to be defined and a plan developed to close those gaps. In an unconcentrated form, the low nutrient level in hog and dairy manure makes it quite expensive to transport.
6. In identifying options to reduce phosphorus loading to waters, need to explore a range of possibilities such as, regional agricultural waste treatment options (including biodigesters), taxing phosphorus that enters the watershed and using the tax revenue to construct regional treatment systems to reduce P, or consider a system of water quality trading activities.
7. Need to investigate funding opportunities to assist farmers in the implementation of best practices, including new, innovative practices; improvements to existing ones; treatment technologies; and edge-of-field phosphorus capture. It is more efficient to prevent, minimize or treat nutrient runoff at the source, but expecting producers to carry the financial burden alone may not be the most effective approach in working collaboratively toward protection of water quality. Conversely, the movement of nutrients into the environment off a farm operation cannot cause adverse impairments to public water ways or the Great Lakes. These assistance programs need to be evaluated in the same frame as programs to prevent the degradation of the adjacent waterways and the environment.

The authors of the consultant report have provided a valuable contribution to the Collaborative's understanding of the state of manure management and its impacts on the water quality in the two watersheds examined and, more broadly, implications for Lake Erie and the Great Lakes basin. It is important that the Collaborative consider the implications of all the findings and recommendations in

the consultant report; utilizing this information to continue to work on filling the identified gaps, understanding new technology, increasing outreach to both farmers and the community and to bring all groups together to work toward addressing water quality issues. The issue of manure management and nutrient runoff from agricultural lands is a complex and sensitive issue requiring long-term attention, partnerships, and cooperation among a variety of stakeholders. The Collaborative has been valuable in providing a table to bring these diverse stakeholders together and its continued operation is critical to collectively find and advance strategies for improved manure management, protected waters, and sustainable agriculture.

The Collaborative seeks to continue its work and is actively engaged in conversation with entities that can serve as a backbone organization or secretariat in pursuit of further work, conversation and collaboration. The Collaborative wholly agrees that this approach is valuable and necessary to achieving and maintaining healthy agricultural operations and a clean and healthy environment.

Attachment 1

MANURE NUTRIENT MANAGEMENT COLLABORATIVE MEMBERSHIP LIST

NAME	AFFILIATION
Jon Allan	IJC WQB Member, University of Michigan
Tracy Annett & Tatianna Lozier	Upper Thames River Conservation Authority
Nandita Basu	IJC SAB Member, University of Waterloo
Sandy Bihn *[Former Member]*	IJC WQB Member (Project Co-Lead), Lake Erie Waterkeeper
Ian Campbell *[Former Member]*	IJC SAB Member, Agriculture and Agri-Food Canada
Ron Campbell	Ontario Agri Business Association
Kari Gerwin	Toledo Metropolitan Area Council of Governments
Amy Holtshouse	The Nature Conservancy in Ohio
Peter Jeffery	Former Ontario Federation of Agriculture
Laura Johnson	Heidelberg University National Center for Water Quality Research
Bill Knapke	Cooper Farms
Greg Lake	Allen County Soil and Water Conservation District
Charles Lalonde	Thames River Phosphorus Coalition
Joe Logan	Ohio Farmers Union
Melisa Luymes	Ontario Professional Agri-Contractors Association
Merrin Macrae	University of Waterloo
Margaret May	Ontario Soil and Crop Improvement Association
Michael Murray *[Former Member]*	IJC SAB Member, University of Michigan School for Environmental and Sustainability
Joe Nester	Nester Ag, LLC
Mark Reusser	Ontario Federation of Agriculture
Jeff Reutter	Former Ohio Sea Grant, Stone Lab
Mark Smith	Ohio Natural Resources Conservation Service
Ryan Smith & Chris Adamo	Danone North America
Ron Snyder	Grain farm owner
Joe Tomandl	IJC WQB Member (Project Co-Lead), Dairy Grazing Apprenticeship
Lambert VanderMade	VanderMade Dairy Farm
Mark Wales	IJC WQB Member (Project Co-Lead), former Ontario Federation of Agriculture
Denise Watkins	USDA NRCS East National Technology Support Center
Bill Wolf	Agriculture Consultant
Gayle Wood *[Former Member]*	IJC WQB Member, Former Ontario Conservation Authorities

May 2023

INTERNATIONAL JOINT COMMISSION GREAT LAKES WATER QUALITY BOARD
TOWARD A MANURE MANAGEMENT IMPLEMENTATION FRAMEWORK
TERMS OF REFERENCE

PURPOSE

The purpose of this project is to establish a diverse group of stakeholders involved in nutrient and manure management to create an operational framework for Great Lakes manure management, using the Water Quality Board's (WQB) 2019 recommendations as a basis. Ultimately the goal is to build a collaborative group with institutional capacity to work together and provide collective recommendations to advance a manure management framework and that will continue to operate independent of the Water Quality Board and the International Joint Commission (IJC) after project completion. The critical component of this project will be to create institutional durability for the furtherance of the field-based operational benefits to water quality from less harmful animal manure applications and field management practices[1].

BACKGROUND

The IJC was created by the 1909 Boundary Waters Treaty and provides advice to help resolve disputes and prevent problems along the entire transboundary region. Under the 2012 Great Lakes Water Quality Agreement (GLWQA) the IJC is responsible for providing advice on matters related to protecting and restoring the quality of the Great Lakes. Under the GLWQA, the WQB serves as the principal advisor to the IJC, playing a critical role in researching, evaluating, and assessing and ultimately providing insight and recommendations on a range of Great Lakes water quality issues.

The WQB recognizes the issue of runoff of excess nutrients from manure application which contributes to nutrient loadings in the Great Lakes. This is contributing to the problem of harmful algal blooms and dead zones in the lakes. As a result, in October 2019 the WQB released a report that provided recommendations for strengthening the regulatory manure management framework to aid in the reduction of nutrient runoff. In this report, the WQB urges governments, agriculture and citizens to work together aggressively to get a better understanding of the magnitude of the manure problem and take action to address it. The WQB also recommends further assessment of the Ontario Nutrient Management Act (2003) as a model. The WQB further identified a crucial gap that exists for implementing the 2019 report recommendations: there is no existing entity that provides the opportunity for key players, from farmers to federal agencies, to convene and assess nutrient/manure management and water quality programs.

PROJECT SCOPE AND OUTCOMES

Through the establishment of a Manure Nutrient Management Collaborative (or Collaborative), the Collaborative will review manure/nutrient inputs, manure policies and practices and land use in two Great Lakes subwatersheds (one in the U.S., one in Canada), with the following outcomes expected:

- To build or refine relationships and promote communication among a binational group of diverse stakeholders.
- Provide recommended goals/strategies for an animal manure management implementation framework that is feasible, will be protective of water quality via animal manure management

[1] Field management practices are an important component of managing animal manure and reducing nutrient runoff. Examples of such practices include use of cover crops, crop rotation, and conservation tilling.

recommendations, and that can be scaled up at a watershed-wide and Great Lakes basin-wide level.

- Build and amplify the case for manure management funding with cost benefit accounting of reducing excess nutrients[2].

To achieve these outcomes the project includes two key phases:

A. Creation of a Manure Nutrient Management Collaborative

- Coalesce key stakeholders across various sectors in a Collaborative, to be hosted/housed within an existing organization[3].
- The Collaborative would continue operation after the completion of the project to continue advancing the implementation of a manure management framework

B. Collection and review of information on manure inputs, policies and practices

- Review and assess manure/nutrient inputs, manure permitting (including manure management plans), nutrient, soil phosphorus allowances, manure production and content amounts, watershed nutrient data and assessment, policies and practices and land use in two Great Lakes subwatersheds
- The two subwatersheds include the Auglaize River in the Maumee River watershed (Ohio) and the Medway Creek in the Upper Thames River watershed (Ontario). These subwatersheds have been selected due to the prevalence of animal feeding operations in the watersheds, manure spreading practices, availability of management practices and water quality data.
- Through the hiring of a research-focused consultant or academic partner, collect and organize available data and information on the two select subwatersheds, such as:
  - Collate data to validate animal counts for permitted and unpermitted animal feeding operation facilities.
  - Map facility locations and likely manure management practices, as well as nearby animal processing facilities/abattoirs.
  - Map animal feeding operation proximity to drainage and streams along with flow paths to the Thames and Auglaize.
  - Map locations where manure is applied from each animal feeding facility.
  - Map soil phosphorus amounts where data is available.
  - Use scientific standards to determine nutrient production by animal (i.e., attempt to construct a "nutrient management unit" for U.S. applications).
  - Estimated phosphorus loading from streams entering the subwatersheds.
  - Determine/assess estimated manure phosphorus (P), potassium (K), and nitrogen (N) land application rates for predominant crop types, tillage practices and drainage practices.
  - Assess any existing permitting rules and known voluntary practices (best management practices) and other policy instruments in use.
  - Describe the impairment status of the waterway (under U.S. and Canadian water laws) using available data, to the extent possible, and any existing watershed assessments, recognizing there may be impacting factors both upstream and downstream of the subwatersheds.

[2] It is recognized that the management of manure has human health implications, via both air and water, which is an issue of material importance, but not central to the focus of this project on nutrients. Although not within the scope of the current work, it is an area that warrants further, future study.

[3] The existing organization has not yet been identified.

- Produce a report evaluating the efficacy of existing manure management framework in the two subwatersheds.
- Include a list and/or links of current permitting rules, existing manure nutrient management research available on the watersheds and data or reports used in the development/study of this review.
- Develop communications products for use in engagement and outreach activities.

DELIVERABLES

The deliverables of this project include:

- The consultant will produce a final report to the Collaborative on the collection and assessment of data/information in two subwatersheds.
  - A deliverable of the consultant will also include communications products for outreach activities
- The consultant will provide a recorded webinar and slide deck on findings to the Collaborative and for use with the general public.
- The Collaborative will develop recommendations, based on the final consultant report, on a manure management framework that includes a timetable and goals for implementation.
- The Collaborative will identify a willing organization to host the Collaborative to operate after the completion of the project to continue advancing the implementation of a manure management framework.
- The Collaborative will identify additional organizations that could contribute technical knowledge or assistance to the Collaborative, including how they could contribute.
- The Collaborative will establish an organizational and governance structure for an ongoing Collaborative within the "existing organization" (to be determined).

STRUCTURE AND OPERATIONS

The oversight and implementation of the project will include two groups with binational membership as outlined below (Project Oversight Work Group and the Collaborative). There will also be a Technical Advisory Group (TAG) that will serve as a technical resource to the Collaborative as it works toward developing a framework for manure management. The Collaborative will meet via video and/or teleconference as needed to carry out and make decisions on the implementation of the project (~monthly). These groups will be supported by IJC staff member and WQB Secretariate, Antonette Arvai.

Project Oversight Work Group

U.S. Members	Canadian Members
Sandy Bihn (*WQB Member Project Co-Lead, Lake Erie Waterkeeper*)	Mark Wales (*WQB Member Project Co-Lead, A Former President of the Ontario Federation of Agriculture*)
Jon W. Allan (*U.S. WQB Co-Chair, Jon W. Allan Group LLC & School of Environment and Sustainability, University of Michigan*)	Gayle Wood (*Canadian WQB Co-Chair, Retired Conservation Authority Chief Administrative Officer*)

Joe Tomandl (*WQB Member, Dairy Grazing Apprenticeship*)	Ian Campbell (*SAB-RCC Member, Agriculture and Agri-Food Canada - Science Coordination)*
Michael Murray (*SAB-SPC Member, U of Michigan School for Environment and Sustainability*)	Peter Jeffery (*Former Ontario Federation of Agriculture*)
Amy Holtshouse (The *Nature Conservancy in Ohio*)	Margaret May (*Soil and Crop Improvement Association*)
Jeff Reutter (*Former Director of Ohio Sea Grant, Stone Lab and the Center for Lake Erie Area Research, Ohio State University*)	
Alaina Nicole Nunn (*Institute for Water Research, Michigan State University*)	
Bill Wolf (*Ohio Lake Erie Commission*)	
Denise Watkins (*USDA NRCS East National Technology Support Center)*	

Manure Nutrient Management Collaborative Member Organizations

The Collaborative will include, but is not limited to, the members of the Project Oversight Work Group (as above) as well as representatives from agriculture, nutrient and manure management focused organizations.

U.S. Members	Canadian Members
Government	
Ohio Natural Resources Conservation Service	
Toledo Metropolitan Area Council of Governments	
Watershed	
Allen County Soil and Water Conservation District	Upper Thames River Conservation Authority
Agriculture/Commodity Organizations	
Ohio Farmers Union	Ontario Professional Agri-Contractors Association
Ohio Dairy Farmer	
Ohio Grain Farmer	
Ohio Hog Farmer	
Trade Associations	
	Ontario Agri Business Association
Non-Government Organizations	
	Thames River Phosphorus Coalition
Academia	
Heidelberg University National Center for Water Quality Research	University of Waterloo

Other
Independent Agronomist
Danone

Technical Advisory Group

The TAG is comprised of invitees from federal, state and provincial agencies, as well as municipal governments, who have a role in the management of manure/nutrients, management of animal feeding operations and/or knowledge of nutrient and water quality data and information in the selected watersheds.

U.S. Members	Canadian Members
Federal Government	
U.S. Environmental Protection Agency	Environment and Climate Change Canada
	Agriculture and Agri-Food Canada
State and Provincial Government	
Ohio Environmental Protection Agency	Ontario Ministry of Agriculture, Food and Rural Affairs*
Ohio Department of Agriculture	
Municipal Government	
City of Defiance, OH	Association of Municipalities Ontario

**Input from Ontario Ministry of the Environment, Parks and Conservation will be provided through OMAFRA*

ROLES AND RESPONSIBILITIES

Members are expected to attend and participate in all meetings of the Collaborative to the best extent possible. While concurrence around decisions will be sought, it is recognized this may not always be possible, and therefore will work toward decisions that Collaborative members can abide with. Members are to serve in an impartial manner, in their personal and professional capacities, and for the common good of both countries and the Lake Erie/Great Lakes watersheds.

Project Oversight Work Group – Oversight, input and implementation on project activities, such as finalization of project terms of reference, identification of potential Collaborative members, and identification of a potential Chair (or Co-Chairs) for the Collaborative.

Manure Nutrient Management Collaborative - Provide guidance and advice on project process and progress, such as building relationships and promoting communication among a diverse group; scoping work for a consultant to assess manure policies and practices; and providing recommendations for implementing a manure management framework.

Manure Nutrient Management Collaborative Chair (or Co-Chairs) – Work with the Project Oversight Work Group Co-Leads to determine scheduling of meetings and meeting agenda preparation. The Chair (or Co-Chairs) will facilitate meetings of the Collaborative, use the project terms of reference and objectives to guide the work of the Collaborative and ensure involvement of all members in decision making.

Technical Advisory Group – As requested, the TAG will review and provide feedback on draft documents and materials for the Collaborative's consideration (such as a draft scope of work for a consultant to

collect and assess manure/nutrient inputs, policies and practices; a draft consultant report and draft findings of the Collaborative). To the extent possible, the TAG will also assist in identifying and/or providing data, information and research that may be of use to the Collaborative. The TAG will advise the Collaborative, via the Project Oversight Work Group, for the duration of this project (anticipated end in fall 2022).

WQB Secretariate - Provide support to the Project Oversight Work Group and Collaborative, for the duration of the project, in its operations, scheduling of meetings, meeting minutes, communications and contract administration/oversight.

Host Organization – A willing organization to which the Collaborative can transition, to continue operation after the completion of the project, for advancing the implementation of a manure management framework, building on the deliverables, outcomes and relationships established during this project.

TIMELINE

This project was initiated with the approval of the Commission in March 2021. An initial draft Terms of Reference were developed in mid-April 2021, recognizing they may require periodic review and update. The general timelines for key points in this project are outlined below:

- **Early May 2021** – Establish draft project Terms of Reference
- **Early June 2021** – Hold first meeting of the Project Oversight Work Group
- **Late June 2021** – Finalize the Terms of Reference by the Project Oversight Work Group
- **Mid July 2021** – Hire facilitator to assist with organization, start-up and operation of the Collaborative
- **Late August 2021** - Confirm Collaborative membership
- **Mid October 2021** - First meeting of the Collaborative
- **October-November 2021** – Develop a scope of work for a consultant to collect, review and assess information on manure inputs, policies and practices, as outlined in Item B under "Project Scope and Outcomes"
- **December 2021** - Hire consultant for data collection/assessment
- **December 2021 – March 2022** – Hold ~monthly calls between Collaborative and consultant
- **April 2022** - Final report of consultant submitted to the Collaborative
- **June 2022** - Recommendations from the Collaborative to advance a manure management framework
- **July-August 2022** – The host organization, with WQB members, conducts outreach and engagement on findings of the Collaborative

FUNDS

Funds have been provided, via the IJC, to initiate this project. Funds will be used for the hiring of a facilitator to support the initial start-up and organization of the Collaborative and for hiring a contractor to collect and assess data and information on nutrient/manure inputs, policies and practices, as outlined in the "Project Scope and Outcomes" section.

APPENDICES

Appendix 1 – Maumee River Watershed and Subwatersheds Map
Appendix 2 – Upper Thames River Watershed and Subwatersheds Map

APPENDIX 1 - MAUMEE RIVER WATERSHED AND SUBWATERSHEDS MAP

(*Source: Maumee River Basin Partnership of Local Governments, https://mrbplg.org/about-mrbplg/*)

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APPENDIX 2 - UPPER THAMES RIVER WATERSHED AND SUBWATERSHEDS MAP

(*Source: Upper Thames River Conservation Authority, http://thamesriver.on.ca/watershed-health/watershed-report-cards/*)

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