Environmental Services

MEMORANDUM

TO: Committee of the Whole

FROM: Erin Mahoney, Commissioner of Environmental Services

DATE: November 29, 2016

RE: **Response to Environmental Bill of Rights (EBR) Posting No. 012-8760: Proposal for Reducing Phosphorous to Minimize Algal Blooms in Lake Erie**

The Ministry of the Environment and Climate Change (the Ministry) released a Proposal for "Reducing Phosphorous to Minimize Algal Blooms in Lake Erie" on the Environmental Bill of Rights registry for a 45-day period, which closed on November 20, 2016. The proposal seeks to reduce phosphorous loading in Lake Erie by 40 per cent as required by the 2012 Canada-US Great Lakes Water Quality Agreement (also known as the Bi-National agreement). Due to the short duration of this posting, staff submitted comments to the Ministry on the proposal to meet the submission deadline (see Attachment 1). Staff have also requested that the Ministry consider any additional comments from Council submitted after the close of the public consultation period. Any comments provided at Committee of the Whole on December 1 or Council on December 15 will be submitted to the Ministry for consideration.

Staff have significant expertise in phosphorous management and can provide valuable input on the Great Lakes plans

Region staff have significant experience with phosphorous management through implementing the Lake Simcoe Protection Plan. Additionally, staff are currently working to investigate options to further reduce phosphorous at the Duffin Creek Plant, which is one of the largest and most advanced wastewater treatment facilities on Lake Ontario. This experience provides staff with a unique understanding of phosphorous management and challenges with developing an effective phosphorous management strategy.

Key recommendations outlined in Region's response will help the Province drive real change to meet phosphorous reduction targets

The recommendations outlined in the Region's response are positioned to help the Province drive real change on Lake Erie and Lake Ontario to meet phosphorous reduction targets. Staff advocated for proposed regulatory targets proportionate to the existing source load, including regulation of agricultural sources. In addition, staff encouraged municipal flexibility to manage sources of phosphorous through both treatment processes and offset programs.

Staff also recommended that the Ministry take a holistic and balanced approach to achieving Provincial goals and targets. For example, implementing methods for further phosphorous reduction at wastewater treatment plants increases greenhouse gas production, which has the opposite desired outcome for Provincial targets under the Climate Change Action Plan and the Paris Agreement. Other low cost solutions need to be investigated and staff recommended a quantification of all costs be used to determine optimum actions to reduce phosphorous loading to the Great Lakes.

Given the limitations on financial resources that exist at all levels of government, it is vital that phosphorous reduction efforts be prioritized according to their triple bottom line benefits (environmental, social and financial). As such, recommendations submitted by staff ask the Province to address priority sources like agricultural and stormwater runoff that offer significantly higher reductions per dollar spent. Phosphorous trading was also suggested as a future initiative.

Staff will continue to monitor developments as this proposal moves forward and report back to Council

Recommendations outlined in the staff response are aligned with those submitted by the Regional Public Works Commissioners of Ontario and aim to provide an on-the-ground perspective to drive real change in Lake Erie and Lake Ontario to meet phosphorous reduction targets. Staff will continue to monitor developments as this proposal moves forward and will report back to Council as required.

Erin Mahoney, M. Eng
Commissioner, Environmental Services

DS/BM

Attachment
#7127546

November 18, 2016

Madhu Malhotra
Manager
Ministry of the Environment and Climate Change
Climate Change and Environmental Policy Division
Land and Water Policy Branch
135 St. Clair Ave. W., 6th Floor
Toronto, ON M4V 1P5

Dear Ms. Malhotra:

RE: York Region Response – Reducing Phosphorous to Minimize Algal Blooms in Lake Erie – EBR Number 012-8760

York Region staff have significant expertise in phosphorous management and can provide valuable input on the Great Lakes plans

York Region staff thanks the Ministry of the Environment and Climate Change (the Ministry) for the opportunity to comment on the Proposal for Reducing Phosphorous to Minimize Algal Blooms in Lake Erie (the Proposal). As advocates for a healthy environment, we believe more can to be done to effectively protect the health of the Great Lakes which are Ontario's largest drinking water source.

Due to the length and timing of the Ministry's consultation period, Council endorsement was not possible prior to submission. This response will be considered by Council on December 15, 2016. It is requested that the Ministry consider any supplementary comments from Council as a part of this submission.

York Region staff have significant experience with phosphorous management through implementing the Lake Simcoe Protection Plan. In addition, staff are currently working with the Ministry to investigate options to reduce phosphorous at the Duffin Creek Water Pollution Control Plant, which is one of the largest and most advanced wastewater treatment facilities on Lake Ontario. Our frontline experience provides us with a unique understanding of phosphorous management and the challenges with developing an effective phosphorous management strategy. The Ministry must go beyond voluntary actions for the largest sources of phosphorus to the lake in order to achieve meaningful reductions in phosphorous loadings.

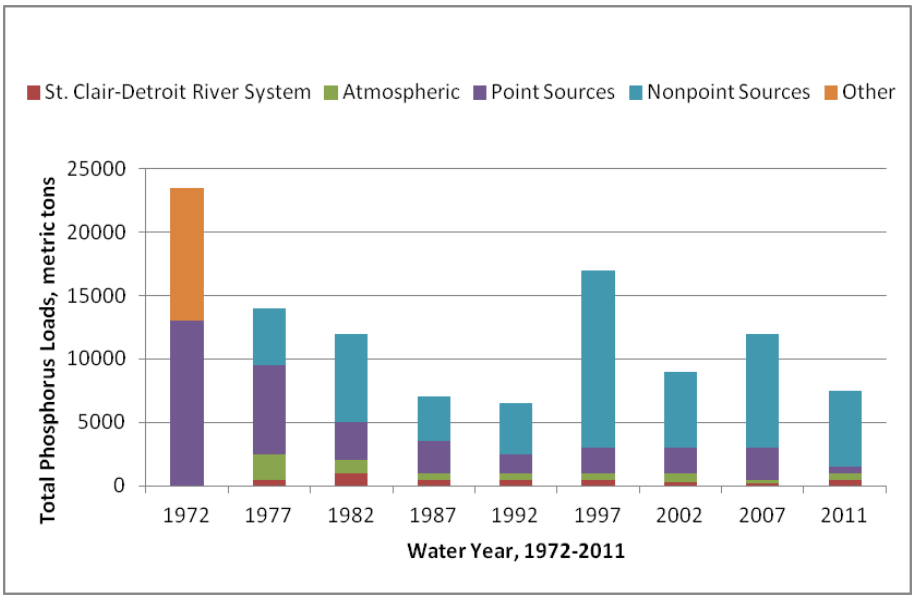
We have included a number of recommendations in this response to help the Province drive real change on Lakes Erie and Lake Ontario to meet phosphorous reduction targets under Annex 4 of the *Great Lakes Water Quality Agreement* and the *Great Lakes Protection Act, 2015*. Given the limitations on financial resources that exist at all

levels of government, constraints make it vital that any required actions are prioritized based on triple bottom line benefits (environmental, social and financial).

Wastewater treatment plants have already reduced phosphorous loading, focus must now shift to other priority sources

Regulating wastewater treatment plants (WWTPs) and other point sources was a logical first step to address phosphorous and algae issues in the 1970s. Identified as 'low-hanging fruit' at the time, WWTPs offered the highest measurable area for phosphorous reduction. More than $7.5 billion in phosphorous related infrastructure investments were made from 1972 to 1985 on Great Lakes WWTPs (Makarewicz, 1991). As Figure 1 demonstrates, WWTPs have significantly reduced phosphorous outputs. Data from 2011 demonstrates that WWTPs and other point sources have declined as most WWTPs have implemented secondary treatment processes that significantly reduce phosphorous loading. If primary treatment WWTPs still exist on the Great Lakes, these facilities must be prioritized first rather than reducing the overall effluent limit for all WWTPs.

Figure 1: Annual Phosphorous Loading for Lake Erie (LENT Joint Action Plan)



Source: LENT, 2015: Annual loading of Total Phosphorus to Lake Erie by major sources. Excerpted and modified from Ohio Lake Erie Task Force II Final Report; original data provided by Dr. David Dolan, University of Wisconsin, Green Bay. May 2013.

Action plan must set goals proportionate to the existing source load

As identified in the Proposal, the Province has committed to reducing phosphorous loading by 40 per cent; however, point sources only represent about 10 per cent of the identified total phosphorous loading. The Province must reconsider the approach proposed in the Action Plan to drive real change. Further, it is important to note that point sources also include other industrial operations which may be subject to less stringent requirements than WWTPs. Instead of focusing on already regulated WWTPs,

the Province needs to include other emitters under the proposed regulatory framework to achieve desired reductions. Further reductions to WWTP effluent limits will not effectively resolve phosphorous loading or the resultant algae issues faced by the Great Lakes. The roadmap to achieve reduction targets must set goals that are proportionate to existing sources. In addition, **it is recommended that the Province allow municipalities the flexibility to determine how best to manage sources of phosphorus through existing and innovative treatment processes and offset programs** (described later in this response). We believe this approach is an effective way for the Province to maximize infrastructure investments and reduce barriers to innovation for adoption of clean water technologies.

Additional levels of treatment represent increased capital costs and significant energy consumption, which thwarts climate change efforts

It is the Region's experience that improving water and wastewater treatment beyond secondary treatment generally requires increased energy use. For example, advanced treatment technologies designed to increase phosphorous removal have an increased carbon footprint for associated chemicals and energy consumption over secondary levels of treatment. Increased phosphorous removal is a priority to meet Provincial targets as identified in the Proposal; however, implementing methods for further phosphorus reduction at WWTPs increases greenhouse gas emissions, which has the opposite desired outcome for Provincial targets under the *Climate Change Action Plan* and the *Paris Agreement* pertaining to climate change. It is recommended the Ministry take a holistic and balanced approach to achieving Provincial goals and targets.

Focus on Wastewater Treatments Plants will not achieve 40 per cent reduction

York Region staff are disappointed that one of the key aspects of the Proposal is to target wastewater treatment plants (WWTPs) by reducing overall phosphorous effluent limits to 0.5mg/L. When phosphorous issues were identified in the 1970s as a major cause of algal blooms, municipalities on Lake Erie made significant upgrades and improvements to WWTPs to reach an effluent limit of 1mg/L. This investment reduced WWTP contributions of phosphorous loadings by 84 per cent (Makarewicz et. al., 1991). With finite financial resources available to the Province and municipalities, focusing on limiting phosphorus reductions from WWTPs is not the most prudent approach and will not maximize improvements to the health of the Great Lakes.

Similar research performed on Lake Ontario and published in the Journal of Great Lakes Research (Makarewicz et. al., 2012) notes, on a lake wide basis, WWTPs are a minor contributor to phosphorous loading. As such, non-point sources are shown to be the major contributor of phosphorous loading. If the stated intent is to reduce phosphorus, real action must be taken to drive down non-point sources.

Agriculture runoff is responsible for 75 per cent of loading in Lake Erie; significant reductions are required from this sector to meet Provincial targets

In order to effectively meet the Province's phosphorous reduction targets, the vast majority of reductions will need to come from the agricultural sector. Despite the pressing need to reduce phosphorous, the **Proposal does not propose a single regulatory measure for the agricultural sector, which is the largest and main source of loadings**. Not only does this place an unfair burden on municipalities, it is highly unlikely that the intended approach will allow the Province to achieve its targets under the Bi-National Agreement. This position is supported by the *International Joint Commission's Lake Erie Ecosystem Priority Report*, which states:

> *"While sewage plants still contribute some phosphorus to Lake Erie, diffuse runoff from rural and urban lands is a leading factor in eutrophication. Of particular concern is runoff of dissolved reactive phosphorus, the portion of total phosphorus that is most readily available to support algae growth and thus a primary cause of renewed algal blooms. Addressing runoff requires strategies tailored to particular land uses, rather than controls on sewage plants alone." (IJC, 2014)*

Regulation of agricultural phosphorous requires government attention

Presently, all the actions proposed for the agricultural sector are focused on voluntary initiatives. While York Region staff support the development of an Ontario 4Rs nutrient management initiative, the Proposal indicates it would only be voluntary. It is recommended that the 4Rs initiative be a legally binding initiative included in a regulation to compel compliance or make all sector funding elements contingent on compliance with this program.

Changes to farm practices can be effective in reducing phosphorous loading. For example, a study found that during a significant precipitation event, phosphorous levels in runoff from a field that had undergone surface application of manure had a phosphorous level of 2.75 mg/L. When the same amount of manure was incorporated at a plowing depth of 10 cm, it reduced phosphorous levels to 1.70mg/L. If the manure was placed 5 cm below the surface of the soil and capped, phosphorous levels in runoff would be reduced to 0.15 mg/L (Sharpley et al, 2001). This change in application process has the potential to decrease phosphorus surface runoff by of 2.6 mg/L, a much more significant decrease than the proposed reduction for WWTPs.

Effectively regulating changes in farming practices under the *Nutrient Management Act, 2002* is likely to result in far greater phosphorous reductions for far less overall cost than lower effluent limits on WWTPs. For innovative farm practices to be effective, increased Provincial enforcement efforts and potential funding may be required. Effectively regulating and enforcing management practices for the agricultural community should be the focus of the next phase of phosphorous reduction to the Great Lakes.

Effective on-farm nutrient management achieves phosphorus and GHG reductions

The Provincial mandate letters identified that support be provided to the Minister of the Environment and Climate Change and Minister of Energy to identify opportunities to strengthen rural economic development and reduce greenhouse gas emissions by promoting the production and use of renewable natural gas from Ontario farms and food processing facilities. On-farm anaerobic digestion systems would help meet this goal. These facilities can manage onsite manure and other high nutrient materials that help prevent nutrient-laden runoff. They can also capture and use methane to generate electricity, which reduces GHG emissions while providing green electricity to the grid. Further, these systems are generally profitable, which can help provide long-term financial support for the agricultural community.

Compost, instead of fertilizer, supports soil health, municipal green bin programs and the circular economy

In alignment with Ministry of the Environment and Climate Change's mandate letter, another potential low-cost solution is to encourage the use of compost to improve the organic content of the soil. Many municipalities operate green bin and yard waste programs that generate a high-quality soil amendment. Compost improves soil quality and reduces the need for commercial fertilizers. Further, it would support the circular economy, a priority initiative identified under the Waste Free Ontario Act, 2015 and the Ministry's mandate letter. Since compost is created primarily with food scraps from Ontario residents, this would be returning the organic fraction back into Ontario soils creating a closed loop system. It is worth noting that improving the health of soil by amending it with organics was specifically identified as an example of the circular economy in action by Minister Murray during his speech to the Circular Economy Lab on October 26, 2016.

Costs related to phosphorous reduction projects are generally high and can vary significantly

Projects to reduce phosphorus loading are generally very expensive to implement. This is especially true for WWTPs, but there are other options that offer a more cost-effective approach. The Lake Simcoe Region Conservation Authority (LSRCA) commissioned XCG Consulting to develop a framework for phosphorus trading in the Lake Simcoe watershed to determine the best options to reduce phosphorous levels for Lake Simcoe, a lake that is experiencing significant phosphorous issues. **The study highlights that**

actions to address agricultural and stormwater runoff offer significantly higher phosphorous reductions per dollar spent. Results are summarized in the Table 1.

Table 1: Cost per kg of Phosphorous Removal for Lake Simcoe

Project	Cost per kg of Phosphorous Removed ($)
Agriculture	
Field management BMPs	3.45 – 31.33
Streambank and Gully BMPs	7.90 – 19.93
Manure management BMPs	145.11 – 269.96
Stormwater	
Stormwater retrofits	1,700
Sewage Treatment	
Upgrade Sunderland WPCP from lagoon system to mechanical plant with Tertiary filtration	8,033
Upgrade Cannington WPCP from lagoon system to mechanical plant with Tertiary filtration	6,014
Upgrade Holland Landing WPCP from lagoon system to mechanical plant with Tertiary filtration	5,281

Source: Lake Simcoe Phosphorus Offsetting Program Report Appendices, August, 2014, XCG

In contrast to the range of costs listed above, tertiary wastewater treatment upgrades recently completed at the Keswick Water Resource Recovery to accommodate approved growth has resulted in an **estimated phosphorous removal cost of $45,000 per kilogram removed**. Our conservative estimates indicate quaternary treatment is significantly more expensive at approximately $100,000 per kilogram removed.

To ensure the most effective use of limited available resources, it is strongly recommended that a similar **quantification of costs be used to determine optimum actions to reduce phosphorous** loading for the Great Lakes.

Phosphorous offsetting programs offer incentives for improvement

Based on research performed and the sources of loading identified in the Proposal, runoff from urban and rural areas represents 85 to 90 per cent of the loading. An approach that can provide a market mechanism to address these issues is a phosphorous offsetting program. It would allow sectors with high-costs for phosphorous management to fund other high-impact activities at lower costs.

York Region has proposed a phosphorous offset program under an Environmental Assessment (EA) for the Upper York Sewage Solutions (UYSS) project. As proposed, it includes stormwater retrofits in addition to a capital and energy-intensive reverse osmosis system. The stormwater retrofit projects proposed through the UYSS EA will result in greater reductions of phosphorous than what is achievable by only installing a tertiary treatment system.

Phosphorous trading beneficial tool that provides a market mechanism to manage phosphorous; a reasonable and logical next step

In addition to phosphorous offsetting initiatives as outlined above, it is recommended that the Province give consideration to phosphorous trading as a future initiative. Phosphorous trading operates in a similar manner to a cap and trade program for greenhouse gas emissions. It allows those that are facing higher phosphorous control costs to purchase reduction credits from another generator that can reduce their phosphorus levels at a lower cost. Under a phosphorous trading program, municipalities and the development community may be able to support reductions within the agricultural sector. This approach benefits municipal WWTPs by providing a lower cost alternative to expensive capital upgrades, while providing the agricultural community an economic incentive to reduce their phosphorous impact.

Amelia Letnes of the US Environmental Protection Agency (EPA) recently published a paper that outlines how to establish a baseline for phosphorous and the US EPA has also published proposed guidelines for a phosphorous trading program (Letnes, 2016). Meeting phosphorous reduction targets of 40 per cent will be challenging and will require consideration of innovative approaches, such as phosphorous trading.

Critical that actions be assessed on a lake-by-lake basis due to significant differences

While there are some common best management practices discussed in this response, one key lesson learned is: every lake is a distinct and complex system that requires actions to be assessed on an individual and lake wide basis.

Lake specific factors must be considered in developing workable solutions. For example, Lake Erie experiences issues with blue-green algae, which have toxic byproducts and health implications. This differs from Lake Ontario algae, which are predominantly *Cladophora*, a non-toxic nuisance-type algae. Research performed on the Lake Ontario ecosystem has found that invasive species, specifically zebra and quagga mussels, contribute to increased growth of *Cladophora* algae. All levels of government on both sides of the national border need to take coordinated action on invasive species control measures to help mitigate ancillary factors for phosphorous.

Conversely, research has indicated that while these mussels are significant factors for Lake Ontario, there are other significant factors for blue-green algal blooms in Lake Erie including long-term trends in agricultural practices combined with more significant precipitation events, weak water circulation (particularly between the Maumee and Detroit rivers) and lower winds (Michelak, et. al., 2013). Characterizing phosphorous inputs for each of the Great Lakes is an important step and should extend beyond simply determining sources. As such, York Region recommends an evidence based approach be taken for each lake so that local variables can be taken into account when prioritizing phosphorous reduction actions.

Robust real time integrated monitoring and open data sets required to track sources of phosphorous and maximize effectiveness of programs

A key component of the Ministry's phosphorous plan will need to be a robust monitoring program to measure desired results. York Region in partnership with Durham Region and the Toronto and Region Conservation Authority (TRCA) have undertaken a detailed near-shore water quality monitoring program tracking an array of parameters that contribute to algae growth, which is publicly accessible on the TRCA website. Research confirms that phosphorous loading issues and algae growth are influenced by a number of widespread inputs that directly affect algal growth in specific areas of the lake.

It is recommended that the Province investigate potential phosphorous tracking technology solutions that are market-ready or are being developed by innovative companies. The *Water Opportunities Act, 2010* established the Water Technology Acceleration Project (WaterTAP) to develop and promote technology solutions for water-related systems. It is recommended that the Province leverage WaterTAP to determine technology options that can support phosphorous tracking. Many of the issues related to phosphorous management are due to challenges in determining the source of the loading. This is likely to be an important determinant for the Lake Erie and Lake Ontario watersheds given the proportion of phosphorous loadings from non-point sources.

Science, integrated monitoring and public access to monitoring data are critical to the success of reducing phosphorus loadings. The Province, Federal and Bi-National governments involved in identifying actions must take a leadership role in establishing standardized monitoring methods and testing procedures that take into account existing data sets so that "apples to apples" comparisons can be made going forward. Further, monitoring data from all levels of government should be made available to the public through a centralized open data portal to share valuable insights, reduce data gathering duplication and maintain transparency between stakeholders.

Urban runoff likely to become increasing source of phosphorous. Infrastructure investments will pay increasing dividends in future

Non-point sources from urban areas, including runoff and septic systems, represent approximately 5 to 10 per cent of the total loading according to the Proposal. Surface and stormwater system runoff has a major impact during significant storm events. Figure 2 highlights the impact of a significant storm event that occurred in July 2005. The image shows a large sediment plume entering Lake Ontario from the Duffins Creek tributary. Monitoring performed by TRCA (referenced later in this response) confirms that storm sewer discharges and discharge outlets from rivers and streams contain high concentrations of total phosphorous, which are conveyed to near shore lake water. As weather continues to intensify, the impacts of urban and land based phosphorous entering the Great Lakes can be expected to increase unless action is taken to minimize this source of loading. Rather than upgrading WWTPs, it is recommended that urban runoff be addressed in a more holistic manner. Specific actions are needed in the

Proposal that address phosphorous transportation off land and into waterways during intense storms and snow melts.

Figure 2: Large sediment plume entering Lake Ontario from the Duffins Creek tributary, July 2005

Implementation requirements need to be considered as a part of development of the action plan

To ensure the Proposal for Lake Erie is effective in meeting its goals, it will be critical for an implementation plan to be developed. Municipalities and conservation authorities are often the front-line implementers of these plans and it is recommended that the Ministry consider how municipalities and conservation authorities can support planned actions. The Lake Simcoe Protection Plan resulted in a number of policies that had a direct impact on municipalities and their Official Plans. Although it was a Provincial initiative, municipalities did not have the necessary tools to fund and implement policies in the most efficient manner. To date, York Region is the only upper-tier municipality to integrate these policies into its Official Plan. It is strongly recommended that the Ministry develop implementation strategies, including funding policies to support the Proposal and ensure key stakeholders are engaged in its development.

A key reason that the Province has been able to meet their goals in Lake Simcoe is due to the leadership of the Lake Simcoe Conservation Authority (LSRCA). In particular, the LSRCA's sub-watershed planning efforts provide a localized road map for municipalities and other stakeholders to reduce phosphorus. The Province is encouraged to use LSRCA's model to achieve the same level of measurable outcomes for all of the Great Lakes.

Region staff thank the Province for consulting with municipalities

York Region staff would like to thank the Ministry for considering these comments and for engaging municipalities on the Proposal to Reduce Phosphorous to Minimize Algal Blooms in Lake Erie. Staff look forward to an opportunity for continued consultation as the Ministry moves forward with development of a formal proposal.

If you have any questions regarding this response, please contact David Szeptycki, Director of Strategy and Innovation at david.szeptycki@york.ca.

Yours truly,

D. Szeptycki, for

Erin Mahoney, M. Eng.
Commissioner
Environmental Services
The Regional Municipality of York

YORK-#7065280

Summary of York Region Recommendations Outlined in this response

1. For the province to achieve its desired reductions, proposed regulatory targets must be proportionate to the existing source load, recognizing reductions made by Wastewater Treatment plants. If the stated intent is to reduce phosphorus, real action must be required on non-point sources.

2. Province should allow municipalities flexibility to determine how best to manage sources of phosphorus through existing and innovative treatment processes and offset programs as an integral way of maximizing infrastructure investments and reducing barriers to innovation for adoption of clean water technologies.

3. Increased phosphorous removal is a priority to meet Provincial targets as identified in this Proposal; however, implementing methods for further phosphorus reduction at WWTPs increases greenhouse gas production which has the opposite desired outcome for Provincial targets under the *Climate Change Action Plan* and the *Paris Agreement* pertaining to climate change. It is recommended the Ministry take a holistic and balanced approach to achieving Provincial goals and targets**.**

4. To effectively meet the Province's phosphorous reduction targets, the Province should propose regulatory measures for the agricultural sector which represent a significant source of loading through the Great Lakes. It is recommended that the 4Rs initiative be a legally binding initiative included in a regulation to compel compliance or make all sector funding elements contingent on compliance with this program.

5. In alignment with Ministry of the Environment and Climate Change's mandate letter, another potential low-cost solution is to encourage the use of compost to improve the organic content of the soil.

6. To ensure the most effective use of limited available resources, it is strongly recommended that quantification of costs be used to determine optimum actions to reduce phosphorous loading for the Great Lakes.

7. In addition to Provincial support for phosphorous offsetting initiatives currently underway, it is recommended that the Province give consideration to phosphorous trading as a future initiative**.**

8. Rather than upgrading WWTPs, it is recommended that urban runoff be addressed in a more holistic manner. Specific actions are needed in the proposal that address phosphorous transportation off land and into waterways during intense storms and snow melts.

9. All levels of government on both sides of the national border need to take coordinated action on invasive species control measures to help mitigate ancillary factors for phosphorous.

10. Characterizing phosphorous inputs for each of the Great Lakes is an important step and should extend beyond simply determining sources. As such, it is recommended that an evidence based approach be taken for each Great Lake so that local variables can be taken into account when prioritizing phosphorous reduction actions.

11. Provincial and Federal governments investigate phosphorus technology solutions that are market-ready or are being developed by innovative companies.

12. The Province, Federal and Bi-National governments involved in identifying actions must take a leadership role in establishing standardized monitoring methods and testing procedures that take into account existing data sets so that “apples to apples” comparisons can be made going forward.

13. It is strongly recommended that the Ministry develop implementation strategies, including funding policies, to support the action plan and ensure that key stakeholders are engaged in its development.