ONTARIO SOCIETY OF PROFESSIONAL ENGINEERS

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Toward the Creation of a Canada Water Agency

The Ontario Society of Professional Engineers (OSPE) is the advocacy body and voice of the engineering profession. Ontario currently has over 85,000 professional engineers, 250,000 engineering graduates, 6,600 engineering post-graduate students and 37,000 engineering undergraduate students.

OSPE welcomes the opportunity to provide comment on Environment and Climate Change Canada's discussion paper *"Toward the Creation of a Canada Water Agency"*.

Canada remains one of the most water rich countries in the world and the province of Ontario benefits from access to the great lakes which contain approximately 18 per cent of the world's fresh water. This should imply that there is access to sufficient and safe drinking water for everyone in Ontario, however this is not always the case.

The threats to freshwater resources that we rely upon to nourish our communities and drive our economy are numerous. As our climate changes, water also presents several threats to society, including rising sea levels and increased flooding. To meet society's needs engineers, whom are tasked to design our community infrastructure, require good data and optimal technology.

Greater integration amongst the different levels of government and organizations charged with ensuring that all of our communities have access to safe water is critical to ensure the sustainable management of our water resources.

In the subsections below we identify the discussion paper section (in blue italics) followed by our corresponding response/comment(s) with respect to the summary objectives and discussion questions.

Section 3.1 Freshwater Objectives

- *Thoughts on the stated objectives*

We are supportive of the proposed objectives. Defining key performance indicators, milestones and timelines, and publicly tracking/communicating progress towards achieving the objectives is recommended. Because management of freshwater resources rests with many (e.g. provinces, territories, Indigenous communities, municipalities and in some cases international agencies), achieving the stated objectives requires a champion and sufficient resources to ensure efficient coordination and sharing of information.

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- *Priority objectives*

Ongoing boil water advisories in Indigenous communities must be addressed. While we cannot speak from the perspective of members of these communities, OSPE believes that best practices learned in developing and managing water resources in Ontario can be drawn from. For example, methods to engineer and maintain infrastructure, training and ongoing education of water treatment system operators, ongoing investment in data collection and source water protection.

The sustainable management of our water resources will require a community effort, therefore we support efforts to promote public engagement. Sharing of data regarding water use and water quality may further this goal. For example, contrasting the success we have achieved thus far in managing the Great Lakes, and gaps still to be closed in continuing to improve the great lakes water shed quality. This community effort includes Indigenous communities. It is our understanding that while the province, municipalities and conservation authorities have different responsibilities and resources, there is not always the resources or directive to facilitate sharing between these entities and Indigenous communities.

The Federal Government should continue to play a leading role in coordinating sustainable transboundary management of freshwater resources with the United States. As the climate changes there may be increased pressure to draw water outside watersheds, therefore, ongoing leadership in sustainable management of these shared resources is critical.

Significant groundwater aquifers are mapped, but there is limited information about local aquifers and limited data about how water quantity and quality will change over time as the climate changes. Many development (community intensification) decisions are based on modeling water taking with respect to a specific development at a specific point in time. However, investment in mapping, tracking and modeling of aquifers into the future may ensure more sustainable use of groundwater resources. This will be critical in Ontario in particular where urban sprawl is leading to community growth further from traditional surface water sources (e.g. the Great Lakes, Ottawa River, Lake Simcoe).

- *Missing objectives*

Leadership in freshwater technology, innovation and infrastructure is identified as an objective and we agree that this important to maintaining our strength in this regard. Specific areas in which we intend to maintain leadership, or become leaders in, freshwater technology, innovation and infrastructure are not identified, but should be considered. Specific areas of continued investment may include continued support of research into emerging contaminants of concern and solutions to mitigate them at the point of discharge (sewage treatment) or at intake (drinking water treatment).

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Other opportunities for leadership rest in addressing:

- water quality issues in Northern and Indigenous communities,
- the need for solutions that can be deployed and maintained in areas with smaller population
- the fewer resources to maintain infrastructure that was originally developed to serve our cities.

Leadership in these areas would allow us to export technology and know-how solutions.

Section 3.2 Freshwater Policy, Coordination and Multilateral Engagement

- *Thoughts on current level of Federal engagement and how the Federal Government can support engagement*
- *How Federal, Provincial, Municipal and Indigenous governments can work together to coordinate and address local and regional freshwater issues*
- *How the Federal Government can support freshwater-related international activities.*

We are supportive of the stated objectives in this section of the discussion paper and, the Federal Government's existing activities to enhance freshwater management and the commitments that have been made thus far to obtain a sustainable and structured approach to managing freshwater sustainably.

While Federal, Provincial, Municipal and Indigenous freshwater management jurisdictions exist, it is important to note that geographic variations in freshwater issues are common, hence the need for a collaborative effort by all stakeholders to capture and share information and best practices. For example, when a new threat is identified: by coordinating and sharing knowledge, upgrades can be made to treatment standards, infrastructure design, and training requirements.

The Federal Government can draw from/build upon the Conservation Authority model in Ontario, which tasks entities with managing watersheds. This model depends on access to sustained funding for data gathering/management and technical resources. This model could be expanded to increase our understanding and management of groundwater resources and enhance sharing of freshwater protection best practices at the federal and international levels.

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Section 3.3 Freshwater Prediction to Inform Climate Change Adaptation and Disaster Risk Reduction

- *What scale and geographic precision of modelling output is needed to support decision-making and how it may evolve over the next decade*
- *Needs for water quantity prediction products, services and applications*

National Hydrologic and Meteorological Data Collection Network:

Although water resources are primarily a provincial resource, the Federal Government has an important role to play in the collection of meteorological and hydrologic data through the Water Survey of Canada (established around 1908) and the Atmospheric Environment Service. Federal program cuts in the 1990's resulted in a significant reduction in the number of water gauging stations operated by the Water Survey of Canada through agreements with the provinces. Across Canada the number of water level gauging stations was reduced by 724 stations – 21% of the network.[1,2] The Atmospheric Environment Service budget was cut by roughly 50% in this same period – resulting in the thinning out of the hydrometric network. **The creation of the Canada Water Agency would be an opportune time to assess whether our data collection system is sufficient to support the planning and studies needed for sound water management policies.**

- *Needs not being met now and how needs may evolve over the next 10 years*

Flooding

An important aspect of managing Canada's water resources is the reduction of damages from large flood events. Canada has had many devastating floods – Burin Peninsula, Newfoundland 1929, Winnipeg 1953, Toronto 1954, Fort McMurray 2020 Saguenay 1996 to name just a few. In addition to private damages, these floods have necessitated large federal costs through federal/provincial cost-shared disaster assistance and the shared costs of dikes, dams and other flood prevention works.

The most effective way of reducing flood damages is through better land use planning and development controls to prevent flood vulnerable development in flood prone areas. The Province of Ontario has a great record in this regard as after the 1954 Hurricane Hazel flooding, good flood plain development policies were implemented through the Flood and Fill Regulations under the *Conservation Authorities Act* and sound municipal regulations implemented under the *Ontario Planning Act and Policy Statements.*

1. Shrubsole, Dan. Flood Management in Canada at the Crossroads, 2000, Institute of Loss Reduction

2. Scott, D., T.R. Yusyk, and C. Whitney. (1999). "The Evolution of Canada's Hydrometric Network: A Century of Development." *Partnerships in Water Resource Management.* Cambridge: Canadian Water Resources Association. 42-54

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However, other provinces were lacking these planning measures and flood damages across Canada kept increasing. In 1974, the Federal Government initiated a national Flood Damage Reduction Program (FDRP) to identify flood risk areas through mapping and to take measures to discourage flood prone development in these mapped areas. Agreements were made with most provinces, including Ontario, to share the cost of mapping and associated measures in flood risk areas. A key component of the program was the introduction of measures to discourage further flood risk development. The Federal Government would not provide CMHC insured mortgages for new flood-prone development nor would new development be eligible for federal flood disaster relief.

Under the Canada/Ontario Flood Damage Reduction Program, 1978 – 1998, over 500 communities were mapped and 320 flood risk areas were designated.

The Canadian Government planned to continue the FDRP on a reduced "maintenance level" scale to keep the maps current and keep the policies to deter flood prone development in place. However, federal program cuts in the late 90s led to the complete termination of the FDRP. Despite this, there is still a critical need to update mapping and maintain flood damage reduction policies. As a result, in many areas, flood risk maps are 25 years out of date. In addition, climate change is affecting the flood risk standards that should be used. In many areas, the standard has been the so-called 1:100 year flood level – this is the level associated with a flood risk of 1.0% each year. However, with climate change expected to increase the occurrence of extreme meteorological events, the flood risk standard should be re-evaluated.

While flooding is referenced in the Canada Water Agency discussion paper, it remains unclear whether the proposed flood risk mapping program will be carried out by ECCC or NRCan. NRCan had already been given the lead and some funding – but has little expertise in flood risk mapping, while ECCC has no money but some remaining expertise. Some clarity is needed on which agency will have this responsibility.

Northern and Indigenous Communities

The effects of climate change are more pronounced in northern communities. These communities also often have less engineered infrastructure to respond to these changes. Changes in weather patterns may affect the quantity and quality of water supply and increase flooding events. Climate change is also anticipated to affect the ecosystems that naturally regulate water quality and quantity. Ongoing research to model, monitor and adapt to climate change is absolutely necessary.

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Section 3.4 Indigenous Peoples and Freshwater Management

We are supportive of the government's intent and effort to ensure that Indigenous Peoples are fully consulted in meaningful way during the entire process of shaping and establishing the Clean Water Agency and in providing leadership and expertise.

OSPE supports the need to ensure that:

- Indigenous peoples have greater autonomy in freshwater management as part of the recognition and implementation of their right to self-government, and as an element of their vision for self-determination;
- the Government of Canada respects Indigenous rights, interests, and their relationships with freshwater ecosystems, in decisions related to development, commercial industries, conservation, and general freshwater governance;
- Indigenous knowledge systems carry equal weight to the Crown's ways of knowing; and
- the inclusion of traditional and contemporary Indigenous governance structures in the management of fresh water and the broader environment.

Furthermore, OSPE believes that there is a need for the government to invest in engineering training on how to properly engage with Indigenous communities, and therefore ensure that systems are properly designed, developed and integrated into these communities. It is also important for engineers to understand the need to operate infrastructure and/or gather data in the context of Indigenous laws, institutions, knowledge systems and values. The federal government must ensure that the engineering profession is properly equipped to serve Indigenous communities across Canada.

Section 3.5 Agriculture and Fresh Water

- *How Canada should support the agricultural sector to sustainably manage freshwater resources*

Agriculture is a significant contributor to the Canadian economy, generating about $140 billion in annual GDP. In 2018, Canadian agricultural producers used approximately 2.95 billion cubic meters of water to irrigate crops. This is a figure that has grown over the years as a result of changing climate conditions in Western Canada (i.e. dry weather conditions in Saskatchewan, Alberta and British Columbia). In light of this growing need for freshwater to support irrigation and livestock, a resilient freshwater management strategy is critical to sustain the agricultural sector and sustainably manage water resources.

While the agricultural sector relies on a large quantity of clean and reliable surface and groundwater for safe and efficient food production, it also has a significant impact on the surrounding environment, including freshwater sources. Industrial agricultural waste is a

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significant contributor to poor water conditions resulting from high concentrations of phosphorus and nitrogen associated with crop fertilizer and animal waste.

When crops are overdosed with fertilizers and animal waste is sprayed on fields, these contaminants eventually migrate into groundwater and surface water sources. The result is the pollution of groundwater resources like in Walkerton, Ontario and/or surface water bodies like Lake Erie.

High concentrations of agricultural contaminants make water treatment challenging, more costly, and threatens the sustainability of freshwater resources.

The efforts of the Government of Canada, through AAFC, the Canadian Agricultural Partnership, and the various agricultural organizations and programs are targeted at helping farmers across provinces and territories by focusing on priorities that will support sustainability of their operations. To support freshwater management activities across the country, a Canada Water Agency may provide leadership in:

- Coordination, monitoring and information gathering, and education of farmers to allow them to make informed decisions in their operations;
- Supporting agricultural innovations and efficient water technologies that will increase resilience and sustainability;
- Pushing for policy frameworks that will support stronger freshwater management and encourage more farms to utilize these new technologies for water conservation.

- *New or improved tools or science related information that would help the agriculture sector to enhance water management*

New technologies for agricultural water conservation are design upgrades and tools that increase water efficiency for agricultural use without compromising the quality and quantity of agricultural produce that sustains the whole of Canada. These technologies include:

1. More efficient irrigation equipment – These are upgrades to the traditional gravity or pumped irrigation systems that will allow efficient use of water in farms and avoid water wastage. Examples of these tools are:

    a. Drip irrigation systems that deliver water directly to the plant roots thereby reducing evaporation with water spraying systems;

    b. Smart irrigation systems, which are automated irrigation systems that save significant amount of water and reduce equipment wear by adapting to:

        i. Irrigation schedule – programmed to water during cooler parts of the day so water loss can be reduced;

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ii. Current conditions - monitors soil moisture and weather using apps in an automated system that measures and regulates flow with flow meters and control valves.

2. Soil management techniques that encourage healthy soil which promotes nutrient and water retention.
3. Where possible, recycling water by capturing runoffs due to overwatering or poor soil for irrigation.
4. Building reservoirs or ponds to capture and store rainfall for use throughout the year. This can help minimize impact to the surrounding watershed.
5. Development of best practices and funding to facilitate the implementation of naturalized buffers (e.g. biological systems engineering) at the periphery of agricultural operations to recapture runoff and attenuate resultant impacts.

An effective tool for a farm would combine all or part of these useful technologies to enhance water management for agricultural use and sustain its production.

Section 3.6 Economic Sectors and Freshwater

OSPE supports the need for the Federal Government to work:

1. Together with other governments and partners, support economic sectors in developing and implementing sector-specific freshwater sustainability strategies that consider both present and future challenges and opportunities.
2. Together with other governments, academia, industry, and others support the development, testing, and implementation of innovative technologies and approaches for sustainable freshwater management.
3. Collaboratively to improve coordination of science pursuits and information gathering activities to bridge knowledge gaps across jurisdictions and economic sectors, and ensure access to the data and knowledge needed to make effective freshwater management decisions.

The energy sector (comprising of oil and gas development and electricity generation) requires a large quantity of Canada's water resources to function. The petroleum industry utilizes water injection (an oil recovery process), thermal power plants and hydroelectric power plants rely upon significant volumes of freshwater for cooling and power generation respectively making the oil and energy sectors some of the largest water reliant sectors in Canada.

In the western provinces of Canada where oil and gas activities are predominant, the major challenges appear to be competing demand for water by other sectors (e.g. agriculture and manufacturing) and the risk of groundwater sources drying up in seasons of drought which has been amplified by effects of climate change.

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In Southern Ontario, there are more than 120 hydroelectric facilities producing 40% of power generated in Ontario. The amount of electricity a hydropower installation can produce depends on the quantity of water passing through its turbines and on the height which the water falls (hydrostatic head) – the bigger the reservoir, the better with hydroelectric power generation. Hydroelectric power provides the means to meet Canada's increasing energy needs without substantially increasing our carbon footprint but hydroelectric dams have also contributed to the disruption of ecosystems upstream and downstream, with short and long term effects on freshwater characteristics. Periods of drought present challenges to freshwater shortage for hydroelectric generation as the longer-term effects of climate change are manifested.

Section 3.7 Freshwater Science

- *Priority knowledge and research gaps to be filled to achieve effective freshwater management over the next 10 years*
- *How well is freshwater science coordinated today? If further coordination is needed, how might that be accomplished?*

Many communities in Ontario are situated along the Great Lakes and rely on these surface water bodies for their freshwater needs. We share the Great Lakes with the United States and, therefore, water takings and discharge of waste into the Great Lakes affects a large number of people on both sides of the border.

Many emerging contaminants of concern are not treated by our traditional waste treatment processes, so we increase the risk that these contaminants end up in our drinking water. Traditionally, dilution has been the solution, but many new emerging contaminants of concern are bioactive at very small concentrations (e.g. picomolar) and many of our toxicological models assume acute exposure but aren't well positioned to address chronic exposures (e.g. over a lifetime). Ongoing research into these emerging contaminants, development of technologies to treat them at the point of discharge or water intake and collaboration with the provincial and state authorities that set compliance standards is required.

Water quality will also be affected by climate change as it relates to the cycling of nutrients in surface water bodies and inputs of point source contaminants due to hardening of urban areas, peak storm events, and loss of natural capacity to attenuate impacts (e.g. wetlands). Ongoing monitoring and modeling of our water resources is necessary for engineers to make good design decisions to ensure the resiliency of infrastructure and to identify opportunities and best practices to reduce strain on water resources.

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Section 3.8 Freshwater Data

- *Experiences with freshwater data, what has worked well and areas for improvement.*
- *Advances in data analytics for management and decision-making, and the role of the Federal Government*
- *Examples of compatibility and interoperability of data across orders of government and non-government organizations*

OSPE is supportive of the stated objectives and efforts to promote the gathering and sharing of data. Data regarding the quantity and quality of surface and ground water resources informs engineering design. Efforts to aggregate data and evaluate trends over time, and to model effects of climate change would be welcomed. Groundwater resources in particular (e.g. regional and local aquifers) are currently poorly characterized.

Section 3.10 Freshwater Technology, Innovation and Infrastructure

- *Thoughts on technology and infrastructure priority areas*
- *Most important freshwater priorities for our community, including those needed to adapt to a changing climate*
- *Models the Federal Government should consider to enhance coordination and collaboration on freshwater technology, innovation and infrastructure*

Canada is generally a leader in water infrastructure and technology, however, investment in drinking water and sewage treatment infrastructure often lags these developments by many decades, due to capital budget limitations. We support the stated objectives in the Discussion Paper and the efforts of the Government to ensure ongoing leadership in the development and implementation of freshwater technology, innovation and infrastructure.

Ongoing investment to upgrade existing infrastructure (with consideration to resiliency in response to our changing climate) is required given that much of our infrastructure in Southern Ontario was developed in the early to mid last century. For example, many older communities still rely on combined sewers, which contribute to degraded water quality during peak precipitation events that are anticipated to become more intense and frequent.

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Section 3.12 Overarching Discussion Questions

- *Priority roles for the CWA*

The Previous Canada Water Agency (aka Inland Waters Directorate)

From the 1960's to the mid 1990's most federal programs related to water were administered by the Inland Waters Directorate (IWD).

Among its components were: the Water Survey; Water Quality Branch; and Water Planning and Management Branch, and two research centres, the National Hydrology Research Centre in Saskatoon and the National Water Research Institute in Burlington. Initially established in the Department of Energy Mines and Resources, Inland Waters Directorate was moved to the newly created Department of Environment in 1971. In the mid 1990's Inland Waters Directorate became a part of the Atmospheric Environment Service.

The new Canada Water Agency very much appears to be a re-creation of the former Inland Waters Directorate. As such, there should be an assessment of why the previous agency was dissolved and what lessons can we learn from this experience.

If you have any additional questions please contact Stuart Atkinson, OSPE Policy and Government Relations Lead at satkinson@ospe.on.ca or 416-223-9961 ext. 225.

Sincerely,

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