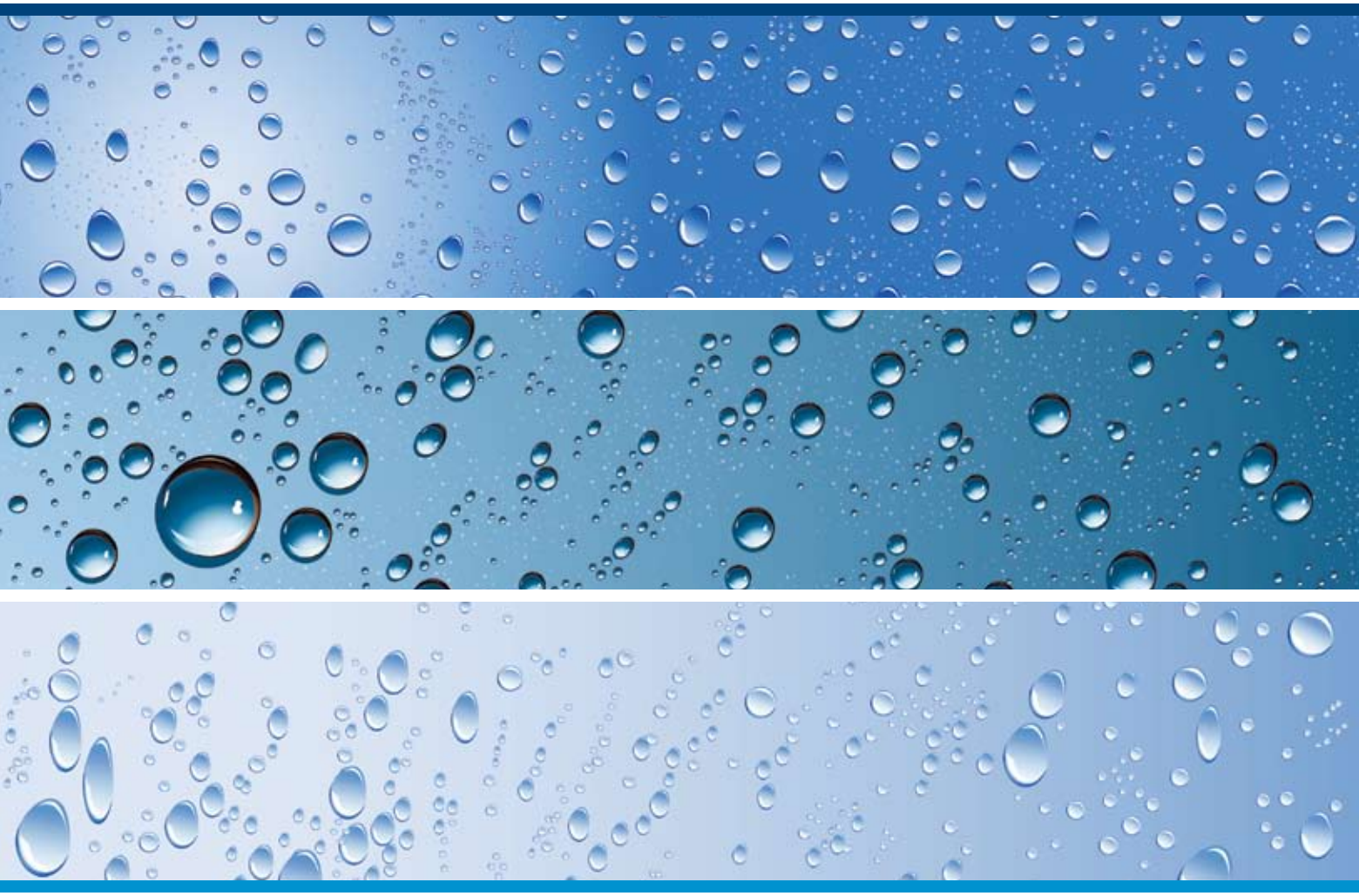
THE WATER OPPORTUNITY FOR ONTARIO



March 2010

THE WATER OPPORTUNITY FOR ONTARIO

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PREFACE

"Changing attitudes and behaviour around water use and introducing progressive policies and regulations are critical; however, in the long term we will not be able to manage this resource in a sustainable manner without new technologies."

Dr. Vicky Sharpe
President and CEO
Sustainable Development Technology Canada

"By providing platforms for testing and demonstrating new water technologies, Ontario will provide a critical component that enables water companies to prosper in the $400 billion (US) global water market."

Robin Kind
Interim CEO
Ontario Clean Water Agency

"By fostering partnerships and collaborations that drive industry relevant research, and by empowering companies to compete globally, Ontario is at the forefront in moving clean and sustainable water technologies to the marketplace."

Doug Wright
Managing Director
Ontario Centres of Excellence
Centre for Earth and Environmental Technologies

"To capitalize on its existing water strengths and become a recognized brand in the global water industry, Ontario needs to accelerate its education and marketing efforts, both domestically and internationally."

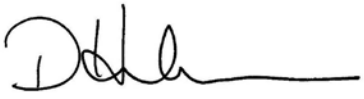
Todd Latham
Publisher
Water Canada magazine

It has been our pleasure to collaborate with several organizations on this project – including Sustainable Development Technology Canada, the Ontario Clean Water Agency, the Ontario Centres of Excellence, Water Canada magazine, and the Ontario government – represented by the Ministries of Environment; Research and Innovation; and Economic Development and Trade. The direct involvement of these three separate Ministries is a clear indication that the Government of Ontario recognizes that water is pervasive and cross-cutting, and therefore requires policy alignment to achieve multiple objectives around protection of the environment and public health; the development and commercialization of new water technologies and products; and the development and growth of existing and new businesses to create jobs and wealth for Ontario.

We would also like to acknowledge the range of water ecosystem stakeholders and organizations that have contributed to this report: researchers from leading universities and colleges; provincial innovation and commercialization organizations; water technology and product developers; municipal and industrial water and wastewater facility operators; the engineering services "integrators"; investors and financial institutions; and non-governmental organizations.

It is clear that these stakeholders are passionate about water and that Ontario is well positioned to become a global leader in addressing water challenges in Ontario and other markets. Doing this requires an organized and focused collaborative partnership that can build on Ontario's strengths and create a platform to capitalize on the growing global water technology opportunity.

Kevin Jones
President & CEO
OCETA



David Henderson
Managing Director
XPV Capital Corporation

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EXECUTIVE SUMMARY

"…by 2025, just 15 years from now, nearly two-thirds of the world's countries will be water-stressed. Many sources of freshwater will be under additional strain from climate change and population growth… 2.4 billion people will face absolute water scarcity – the point at which a lack of water threatens social and economic development."

Hillary Rodham Clinton
US Secretary of State

Ontario is well positioned to become a world leader in the $400 billion (US) global water market. This report examines water market opportunities that will enable Ontario-based water stakeholders to build and strengthen a competitive Ontario clean water industry. It provides recommendations to create the market conditions that will enable investment in water infrastructure, technologies and services, and will support the establishment and growth of existing and new Ontario water companies. By developing smart water policies, Ontario can implement water solutions to meet domestic needs and accelerate the development and growth of exports to global markets.

More than 100 organizations and companies, representing a diverse range of university, industry, environmental and government stakeholders, were consulted as part of this market analysis. Five approaches were used to gather information, including:

- Review of market strategies and experiences in Ontario and other jurisdictions;
- On-line survey of stakeholders in Ontario, with inputs from key companies and organizations;
- Interviews with technology and infrastructure investors and market leaders;
- Focus group discussion with Ontario program managers and regulatory authorities; and
- Dialogue with Ontario stakeholders to obtain feedback on preliminary findings.

To become a global water technology leader and effectively compete with other jurisdictions, Ontario must build on its existing strengths and create an integrated water industry platform to drive growth and encourage private sector investment. The foundation for this platform should be based upon implementing and adopting the following recommendations and actions.

Establish a Bold Vision

Vision and strong leadership are essential requirements for the development and deployment of integrated water solutions. Water must be an integral part of the political agenda in a positive and proactive way, with common goals shared by government, industry, academia and the public. By developing a bold vision and strategy for water, Ontario would send a clear, unifying message that water is a high priority, now and for the future.

Ontario should embrace the following vision:
By the year 2015, Ontario is recognized as a global leader and centre of expertise for providing safe, clean, affordable and sustainable water solutions.

Create an Ontario Sustainable Water Opportunity Act
Ontario has become a global leader in energy conservation and renewable energy with the introduction of the *Green Energy Act, 2009*, and has many of the fundamental elements to drive similar economic development in the water industry through the creation of an Ontario Sustainable Water Opportunity Act. Introducing such an Act in Ontario would strategically change the way Ontarians perceive, understand and value water, resulting in positive behaviour change. It would accelerate efforts to conserve water, improve water efficiency, integrate and build upon existing government initiatives and attract private sector investment.

There should be four main objectives of the Act:

- Encourage Sustainable Water Behaviour;
- Adopt Transparent Costing and Accounting of Water Use;
- Support Water Technology Demonstration and Early Adoption; and
- Attract Early Stage, Innovative Water Technology Companies to Ontario.

Increase Alignment and Collaboration
The unifying vision recommended in this report requires greater alignment and collaboration amongst all water stakeholders to address the fragmented nature of Ontario's water industry. This would identify and address market barriers and create opportunities for water related investment and growth. Government, industry, academia and the public must all be involved.

Brand Ontario as a Leader in Sustainable Water
Ontario needs to actively develop and market its "brand" as a leader in sustainable water. This requires promotion of Ontario's water industry as an integrated, world-class provider of technologies, services and know-how for innovative water solutions. A clear articulation of Ontario's unique water story, both within and outside Ontario, would increase the perceived value of Ontario's water industry, products and services.

"I am convinced, under the present conditions and with the way water is being managed; we will run out of water long before we run out of fuel."

Peter Brabeck Lethmathe
Chairman
Nestlé

"The water industry is going through a period of significant change. This creates a great opportunity in Ontario, where under the right strategy, we can grow numerous 'next generation' ZENONs, with thousands of high-value knowledge-based jobs. We can build Ontario's leadership position in the global water technology market."

John Coburn
Former Chief Operating Officer,
ZENON Environmental and
Managing Director,
XPV Capital Corporation

Outcomes and Benefits

Maximizing the economic, environmental and social benefits from the water opportunity would result in considerable benefits for Ontario, including:

- Recognition of Ontario's "water brand" that provides the Province with a clear competitive advantage in attracting domestic and global investment, creating and maintaining new industries and jobs, expanding tourism and creating a highly educated work force;
- Creation of Ontario-based water technology companies that employ highly skilled people and capture a significant market share of the global water industry;
- Formation of "made-in-Ontario" supply chains and other national and international partnerships, thereby maximizing job creation and other economic benefits for Ontario;
- Attraction of significant levels of private sector investment in the research, commercialization and development of Ontario world-class water technology;
- Mobilization of Ontario's vast public sector assets as a platform for the testing and demonstration of innovative water technologies;
- Significant reductions in water use and energy consumption in municipal, industrial, commercial and agricultural water and wastewater processes; and
- Significant ecosystem health improvements through pollution prevention, including a reduction in the discharge of toxic chemicals and other contaminants into the environment.

1.0 INTRODUCTION

This report examines market opportunities that will enable Ontario-based stakeholders to build and strengthen a competitive Ontario clean water industry. It provides recommendations to create the market conditions that will enable investment in innovative water technologies and services, and will support the establishment and growth of existing and new Ontario water companies. By developing smart water policies, Ontario can implement water solutions to meet domestic needs and accelerate the development and growth of water technology exports to global markets.

Over 100 organizations and companies, representing a diverse range of university, industry, environmental and government stakeholders, were consulted as part of this market analysis.

1.1 Key Assumptions

The key assumptions that formed the basis of this analysis are:

- Ontario recognizes the importance of a clear vision and leadership in addressing water challenges and opportunities;
- Building a robust clean water industry as part of a sustainable economy is an economic, social and environmental imperative, involving investment and jobs;
- Optimizing water and wastewater systems requires both rebuilding and rethinking infrastructure. This entails the revitalization of communities, resource industries and manufacturing. It also means accelerating development and application of innovative water technologies, and increasing competitiveness; and
- The amount of investment required to renew infrastructure, develop and implement new technologies, and become a global leader in sustainable water requires a collaborative and coordinated approach involving government, the private sector and non-governmental organizations.

1.2 Methodology and Approach

The following methodology was used to gather information in support of the market analysis for this report:

- Review of market strategies and experiences in Ontario and other jurisdictions;
- On-line survey of stakeholders in Ontario, including researchers, technology developers, service providers, technology users and system operators, with inputs from key companies and organizations;
- Interviews with water technology investors and market leaders;
- Focus group discussion with key Ontario water program managers and regulatory authorities; and
- Dialogue with Ontario water stakeholders to obtain feedback on preliminary findings.

More than 100 individual stakeholders representing researchers, technology developers, service providers, system owners and operators, government program managers, and private investors were consulted throughout this process. The intent of this consultation was to obtain input from key individuals and stakeholders regarding the needs, opportunities, and barriers to growth of Ontario water and wastewater companies in the areas of drinking water treatment and distribution, wastewater collection and treatment, monitoring and analytical testing, and the provision of related equipment, instrumentation and services.

The stakeholder dialogue session in November 2009 involved individuals who had participated in one or more of the earlier phases of the study. A background document of preliminary findings was prepared and distributed in advance to those attending. These findings were presented to the attendees, and a stakeholder panel provided input on Ontario's strengths and possible future directions.

This report, which integrates the information gathered and the subsequent analysis, is organized into five sections:

- Introduction;
- Why Sustainable Water?;
- What Leading Jurisdictions are Doing to Drive Sustainable Water Solutions;
- Ontario's Strengths in Sustainable Water; and
- Ontario as a Global Sustainable Water Leader – Recommended Path Forward.

2.0 WHY SUSTAINABLE WATER?

Water is essential for human and ecosystem health; it is required for all sustainable production and consumption activities. It is pervasive; the integration of water in all aspects of life continues to shape our communities and lives. Despite 70 percent of the Earth being covered in water, less than one percent is readily accessible fresh water. Additionally, the remaining accessible fresh water is under considerable threat as water scarcity and pollution increasingly impact all regions of the world.

Water is essential for all life on earth and there is no substitute.

2.1 Global Macro Trends

There are five major global macro trends that have now reached a tipping point, which simultaneously impact the world's fresh water resources. The five trends include:

Population growth, urbanization, and industrialization are driving the increasing demand for fresh water, while failing infrastructure and climate change is seriously threatening its supply.

Population Growth: The demand for fresh water has increased at over twice the rate of population growth this past century. By 2050, the global population is projected to exceed nine billion people and with the continued increase in water demand, it is expected that over four billion of these people will live in regions with chronically short water supplies[1].

Increasing Urbanization: In 2008, for the first time in human civilization, more people lived in cities than in rural areas[2]. Domestic per capita water use is significantly higher in urban regions. For example, Shanghai, one of China's most urbanized cities, uses five times more water per capita than surrounding regions.

Industrial Growth: Industrial growth results in an increased demand for water globally. A recent study estimates that for every $1 million (US) increase in GDP per year, 22,000 cubic meters of water is required[3]. For example, producing one litre of gasoline consumes 10 litres of water while producing one kilogram of paper consumes 324 litres of water[4]. In addition, as the standard of living increases, people consume more water intensive foods and consumer products, which significantly increases total water consumption.

Climate Change: Decreasing snowpack and increasing glacial melts are resulting in a greater shift of fresh water to saline water. The continued loss of this natural and most cost-effective method of storing fresh water will have a dramatic impact on the water supplies that are "mission critical" to sustaining regional economies and social prosperity.

Deteriorating and Insufficient Water Infrastructure: The existing water and wastewater management infrastructure has been built over decades, and in some cases, are significantly beyond the capacity and life span for which they were originally intended. For example, in Ontario water main breaks alone cost $40 million (CDN) and result in a loss of 40 percent of purified water produced every year. The estimated cost of upgrading the water infrastructure in Canada is between $80 and $90 billion (CDN) over a ten-year period[5]. Global required water infrastructure upgrading is estimated to be a staggering $22.6 trillion (US)[6].

2.2 New Water Economy

We have entered an era where key global macro trends have reached a tipping point simultaneously. The result is a compounding effect, causing a supply and demand imbalance, higher input costs to deliver water safely, and an increase in the actual and intrinsic value of water.

The global macro trends described above have initiated a dynamic transformation of the global water economy as characterized by the three major factors below.

Supply and Demand Imbalance: The net result of these macro trends is a dramatic and growing supply and demand imbalance for fresh water. These trends show no sign of abating, making this imbalance a growing and sustained change that will drive a requirement for new water technologies and better water conservation practices.

Higher Input Costs: The cost of delivering water to all end users has risen dramatically due to increasing demand, but also due to underlying factors such as the increase in the price of electricity, chemicals and basic raw materials. This is further compounded by increasing regulations and higher required standards, which has led to an increasing total cost of managing water processes. This is driving the need for increased efficiency and the implementation of innovative and sustainable water technologies and solutions.

Increasing Value of Water: This includes both the actual price and intrinsic value. The fundamental value of water extends beyond its price. Without water, power plants cannot operate, most industrial processes would be constrained, and buildings could not be heated or cooled. Municipal water rates have increased by an average of 58 percent in Canada according to the Earth Policy Institute[7]. However, increasing water rates alone will not address the problem.

2.3 The Water Opportunity

A report by the Conference Board of Canada estimates that the global market for water and wastewater is in excess of $400 billion (US)[8]. Defined by the global macro trends noted in the previous section, this creates significant economic drivers that elevate demand for next generation water technologies and solutions.

LUX Research has estimated that by 2020, the water market will be worth nearly $1 trillion (US), with over $87 billion (US) coming from high-growth market segments[3].

These technologies and solutions fall under four main categories:

Demand Destruction: The concept of reducing water consumption in municipal, industrial, agricultural and other processes is often the lowest cost solution to reduce the reliance on vulnerable water supplies. In addition, solutions that help reduce the amount of chemicals, energy, and other key inputs in any water process can have a material impact in reducing the cost and environmental footprint of treating, delivering, or using water and wastewater.

Wastewater to Product: New sources of revenues, which can offset other operating costs, can be realized in various water streams. Many technologies exist to recover metals, fertilizers and other materials from industrial wastewater streams. Furthermore, new technologies are being developed to help recover and generate energy from wastewater. These technologies have the potential to convert every municipal wastewater treatment plant into a renewable energy generator.

Reuse: Another solution to reduce fresh water withdrawals is to reuse wastewater in many applications. Technologies such as membrane bioreactors, advanced oxidation and ultraviolet disinfection enable the reuse of wastewater streams.

Infrastructure Renewal: This involves reducing capital expenditure requirements by extending the life of the current infrastructure. These include leak detection equipment for identifying at-risk sections of underground pipes; in-situ pipe rehabilitation solutions that allow utilities to repair pipes without digging trenches; technologies that increase the treatment capacity of land constrained wastewater treatment plants that have exceeded their design capacity; instrumentation technologies allowing for the remote monitoring and control of infrastructure; rapid detection of waterborne contaminants; and "smart water grid" solutions to optimize the current infrastructure. These solutions can also help water and wastewater treatment operators meet new regulations.

By optimizing and developing these technologies and solutions, water and wastewater systems that service a growing economy can be rebuilt, jobs can be created and communities can be revitalized. This would improve the competitiveness of local industries and reduce energy use and corresponding greenhouse gas emissions province-wide. Furthermore, by investing in the expertise and technologies needed to improve our local water systems and supplies, Ontario will be developing exportable skills and products that are in demand globally.

Today, Ontario is home to a number of companies capitalizing on these opportunities and given the right support, they can follow in the footsteps of other successful Ontario-based companies that have changed the way the world uses and manages water resources.

With the right strategies and investments, Ontario can leverage its capabilities to capture a greater share of the global water market, and become a global leader and centre of expertise for providing safe, clean, affordable and sustainable water solutions.

3.0 WHAT LEADING JURISDICTIONS ARE DOING TO DRIVE SUSTAINABLE WATER SOLUTIONS

Internationally, a number of jurisdictions with competitive strengths in the water industry are developing progressive policies to improve their position and global reputation as sustainable water leaders. These jurisdictions are making considerable investments in strategic water initiatives to increase the global presence and market share of their domestic water companies. The drivers for these policies and investments are water scarcity, water quality and water security, as well as issues created by climate change. Ontario is competing with these jurisdictions to capture a share of the global water technology and solutions market.

In the United States, the National Science Foundation is establishing a network of water institutions. The Milwaukee 7 Water Council has been established in Milwaukee, Wisconsin to coordinate water-related research and build partnerships between academia and industry. The European Union has created a Water Supply and Sanitation Technology Platform. Germany, the Netherlands, the United Kingdom and other countries have formed water partnerships with mandates to strengthen the competitiveness of domestic companies. In France, two large water and wastewater utility companies dominate the market, and use this competitive advantage to position themselves as global leaders. Israel has leveraged its technological capabilities and entrepreneurship to drive innovation and Singapore has committed significant financial resources to attract the global water research activities of multinational companies. All of these initiatives are addressing social, economic and environmental goals by expanding and optimizing water knowledge and technological capacity, and catalyzing domestic and international networks.

Examples of major policies and initiatives implemented by three recognized leading jurisdictions in water are summarized below.

By addressing social, economic and environmental issues and opportunities associated with water, leading jurisdictions around the world are implementing bold measures to capture a share of the growing $400 billion (US) global water industry.

The German Water Partnership is an example of an integrated platform of know-how and collaboration amongst key water stakeholders with a sophisticated understanding of sustainable water management.

"All the people that work in the water business… know that there is a German Water Partnership. We want to be the (global) address of the German water industry..."

Michael Beckereit
Chairman
German Water Partnership

3.1 Germany

The German Water Partnership (GWP) was formed in 2008. It includes a large number of equipment, engineering and consulting companies in the German water industry, a number of research and development facilities, and several associations and institutions that underpin the German water industry. The Partnership is supported and promoted by a number of Federal Ministries, focused on export development – the GWP promotes itself as a "central contact partner to answer all questions about German water competence and exchange experiences, promote innovation, create trust and solve problems."[9] It also works with the German Agency for Technical Cooperation (GTZ) to migrate German water standards, technical specifications, legislative and regulatory frameworks, and technology to developing and middle income countries. The GTZ has trained numerous public and private sector managers and technical personnel in other countries, creating opportunities for German water technology and service companies to successfully gain a commercial foothold in new markets.

The German Water Partnership is an example of an integrated platform of know-how, with a sophisticated grasp of the principles and practices of water management and local stakeholder involvement. By serving as an enabling vehicle for water action, the GWP has generated significant project and research activity in German industry, scientific organizations and not-for-profit organizations involved in the environment. These results have been achieved by integrating financing, engineering and innovative technologies with proven infrastructure construction, supervision and commissioning capabilities and, where required, the contract operation of facilities and training of local operations management and personnel.

To ensure policy alignment on all levels, Israel has organized a highly coordinated interministerial committee that includes members from the Prime Minister's Office and all key ministries.

3.2 Israel

Israel has a long history of being a recognized leader in the development of water technologies and solutions to address issues associated with water scarcity and security. These include desalination, water reuse and drip irrigation. Building on this capacity, Israel has made water a top priority, consolidating its water strategy under a centralized authority with highly coordinated inter-ministerial governance. As a result, Israel's water industry exports doubled between 2005 and 2008, rising to $1.4 billion (US), and are projected to be worth $2.5 billion (US) by 2011.[10]

In 2006, Israel launched the Novel Efficiency Water Technologies program (NEWTech). This program aims to build on Israel's experience in addressing its water scarcity problems, while advancing its water technology capability at an international level through strategic investments and allocation of substantial resources. NEWTech is led by the Ministry of Industry, Trade, and Labour, which oversees a multi-ministerial steering committee. The committee is comprised of members from the Prime Minister's Office and the Ministries of Foreign Affairs, Finance, Science, National Infrastructure, and Environmental Protection, as well as the Israel Water Authority, water and sewage program with an annual budget of $300 million (US)[11]. NEWTech has established 24 private and government-funded water technology incubators that assist entrepreneurs in commercializing new technologies. These incubators have helped attract around $772 million (US) in private investment to date[12]. NEWTech has also invested in promoting Israel's water technologies globally, establishing international partnerships and developing WATEC, an international exhibition and conference showcasing technologies, products and services to support a sustainable economy. WATEC attracted over 20,000 visitors in 2009.

"Israel offers financial government support in the form of investment grants, R&D grants and tax benefits, as well as guidance throughout the investment process."

State of Israel
Ministry of Industry Trade and Labor

3.3 Singapore

Singapore is a water stressed country that is heavily reliant on imported water. Imported water has historically accounted for 40 percent of Singapore's national water supply and comes from neighbouring Malaysia. The increased need for self-sufficiency and the recognized economic benefits of the water opportunity have been catalysts for the government of Singapore to strategically align economic, social and environmental requirements into a focused policy that prioritizes the water industry as a key economic growth area.

Creating enabling conditions under which policy reform can be implemented has been a key component of Singapore's strategy to supply water independently and to create a thriving water industry. Singapore has consolidated all water-related administrations under the Ministry of Environment and Water in order to remove administrative barriers. The main national water utility, the Public Utilities Board (PUB), has become a statutory board member and has responsibility for managing all comprehensive water-related matters. The PUB facilitates research and technology development through funding and the use of its facilities as testing and demonstration sites.

Singapore's strategy includes creating international branding and partnerships, fostering key stakeholder collaboration, training a skilled workforce and actively promoting public awareness.

"By 2015, the Environment and Water Sector is expected to contribute $1.7 billion (US) to Singapore's GDP and create 11,000 jobs, with a majority in professional and skilled categories … from a $458 million (US) investment started in 2003."

EDB Singapore

Branding has also played a key role in Singapore's success. International branding includes the "Singapore International Water Week" and the development of strategic partnerships with international organizations and government bodies. Domestic branding has involved investment in training a skilled workforce and in promoting innovation through scholarships and research funding. The Singapore PUB, whose tagline is "Water for All: Conserve, Value, Enjoy", has built public awareness through three major avenues: specialized campaigns; education; and an annual "Clean and Green" Week, which promotes a different water theme each year.

Tax breaks and other financial incentives have ensured a steady influx of interest and investment from multi-national companies in Singapore's water industry. Examples include:

- GE's 2006 investment of $83 million (US) to build a global R&D centre in Singapore, resulted in the immediate employment of 100 top-tier researchers. More recently, in 2009, GE Water and the National University of Singapore (NUS) announced the establishment of a NUS-GE Singapore Water Technology Centre, which involved an initial investment of $100 million (US). The partnership is expected to expedite fundamental research and industry innovation in water treatment, while also strengthening collaboration with government and industry in Singapore and abroad;
- Siemens Water Technologies announced the opening of its global water R&D centre in Singapore in 2008. The centre collaborates with Singapore's PUB, universities and environmental authorities on water and wastewater projects. $32.6 million (US) has been invested in the centre to date with 60 local and foreign researchers and professionals employed; and
- Leading consulting engineering firm CH2M HILL established its regional headquarters in Singapore in 2006. While it was initially expected to be staffed with 160 people, the office now employs more than 350 highly trained professionals. Considered as one of the most highly innovative consulting engineering firms in the water industry, CH2M HILL helps bring new technologies to market by working with local companies developing next generation water technologies.

3.4 Best Practices of Global Leaders in Water

Some of the water policies and initiatives that have been used by leading jurisdictions can be adopted and implemented in Ontario.

The following is a summary of the best practices being used by leading jurisdictions to promote sustainable water solutions:

- **Vision and leadership** – Establishment of a bold vision with strong leadership to send a clear, unifying message that water is a high priority.
- **Responsiveness to domestic needs** – Focus on implementing innovative solutions to address domestic water challenges, which support the growth of domestic water technology and service companies.
- **Measurable goals and targets** – Development of well defined goals and performance targets, to provide focus and strategic direction.
- **Build on existing strengths** – Implementation of new policies and initiatives that build on existing strengths, address gaps and provide a platform to attract investment and create economic development opportunities.
- **Alignment and coordination** – Greater alignment and coordination of policies and program initiatives across the entire innovation chain to support the development and commercialization of new technologies.
- **Development of human capital** – Development of local expertise and know-how to ensure that a highly skilled and knowledgeable workforce is available to the water industry.
- **Strategic investment** – Provision of seed investment and other strategic funding that act as a catalyst to develop and grow the water industry.
- **International branding, promotion and partnerships** – Creation of strong domestic and international brands to attract foreign investment and open up export markets for water technology companies.

Common best practices among the leading jurisdictions include establishing a strong leadership and vision, building on existing strengths, the alignment and collaboration of all water stakeholders, and international branding and promotion.

4.0 ONTARIO'S STRENGTHS IN SUSTAINABLE WATER

Ontario is uniquely placed next to the largest water market in the world. It has robust regulations and standards, together with existing assets and expertise, and a competitive research capacity. Ontario has the foundations to become a global leader in sustainable water.

Ontario has a number of strengths that provide a distinct competitive advantage in capitalizing on the global water opportunity. This section describes key strengths related to Ontario's geographic advantage, public sector policy and governance, operational assets and expertise, research capacity and private sector technology and know-how. These strengths provide the foundation that can enable Ontario to become a global leader in sustainable water.

4.1 Geographic Advantage

Ontario is the largest market in Canada and is located next to the largest water market in the world where the United States (US) government estimates that 36 states will face water shortages in the next five years[13]. Ontario's geographical location and history of international cooperation with the US in the management of shared water resources represents a unique opportunity for Ontario to access a major global market through a variety of existing and new business and cooperative arrangements.

Ontario has a broad range of water end users including urban, rural and remote communities, a large food and beverage processing sector, a diverse industrial manufacturing sector, energy producers, agriculture and First Nations communities. These end users need innovative solutions to address their current and future water needs. They also represent a strong domestic market for new water technologies that can be exported for global applications.

Ontario has strong water regulations and standards, and is developing integrated policies related to water management that will create opportunities for Ontario companies, municipalities, and system operators to develop world leading expertise.

4.2 Public Sector Policy and Governance

Ontario has strong water regulations and standards. It is also developing integrated policies related to water management that will create opportunities for Ontario companies, municipalities, and system operators to develop world leading expertise. These include source water protection regulations, the Lake Simcoe Protection Plan, the soon-to-be-released Water Conservation and Efficiency Strategy, and the Financial Plans Regulation that will require municipalities to prepare financial plans to ensure sustainable operation of their drinking water systems. In addition, under the *Green Energy Act, 2009*, the Province has the authority to set and enforce water efficiency standards for commercial products.

Ontario has a number of organizations and programs that can support innovation within the province. For example, the Province provides financial support through the Innovation Demonstration Fund for the development and demonstration of new energy and water technologies. The Ontario Ministry of the Environment operates the New Environmental Technology Evaluation Program that can assist in the development, marketing, and application of new water technologies. The Ontario Ministry of Research and Innovation has implemented programs to support the development and commercialization of innovative technologies, including those in water. These include business acceleration and industry-academic collaboration programs. The Government of Ontario has also announced the Green Focus on Innovation and Technology (GreenFIT) strategy. Through its own purchasing, the government is creating opportunities for new green technology companies as they introduce innovative and sustainable solutions into the local and global marketplace.

Export assistance is provided at the provincial level through the Ontario Ministry of Economic Development and Trade, which coordinates its efforts with federal organizations including the Department of Foreign Affairs and International Trade and Export Development Canada. There are also a number of provincial and federal infrastructure funds, such as the Federal Economic Development Agency for Southern Ontario and the Federation of Canadian Municipalities Green Municipal Fund that could be used to accelerate growth and innovation in Ontario's water industry.

4.3 Operational Assets and Expertise

Ontario has made considerable investments to develop its water and wastewater assets and expertise. For example, a key strength to Ontario is the Ontario Clean Water Agency (OCWA). As one of the largest operators of water and wastewater facilities in North America, OCWA has the expertise to provide advice on not only the operational and infrastructure issues facing facility owners, but also the potential treatment technologies and operational strategies to address clean water challenges. OCWA serves over three million people by operating and maintaining 570 facilities

The Ontario Clean Water Agency is one of the largest operators of water and wastewater facilities in North America that can provide a unique platform to demonstrate new technologies in a diverse set of operating environments.

across Ontario, including urban, rural and First Nations communities. For drinking water, these range from one of the largest membrane installations in the world to small rural systems in remote areas. For wastewater, OCWA's operational expertise ranges from the world's largest fluidized bed incineration complex to simple lagoon systems.

There is a significant opportunity to partner with OCWA to test and demonstrate innovative energy and water technology solutions in a wide range of water and wastewater operational environments. A portion of OCWA's financial portfolio could be used to fund research or finance the early adoption of new technologies. The Agency has made research contributions to a number of municipalities and, through its coordination of the Ontario Water and Wastewater Research Consortium, has helped in establishing a substantive baseline of valuable water research.

Ontario is the location of 19 water-related organizations including universities, research centres and national water institutes that provide a foundation for a broad range of leading water expertise.

4.4 Research Capacity

Leading water organizations and institutes are located in Ontario. Academic departments at the universities and colleges in Ontario are continuously updating their strategic research plans to align their projects with emerging issues in water sustainability.

Ontario is the location of 19 water-related institutes and is ranked eighth worldwide in number of citations per publication. Examples of Ontario research institutes include:

- **McMaster University** - Brockhouse Institute for Materials Research; Centre for Engineering and Public Policy; School of Engineering Practice; Institute of Environment and Health; McMaster Institute for Polymer Production Technology; McMaster Membrane Research Group; and Water Resources Environmental Information Systems Laboratory;
- **University of Guelph** - Water Reclamation and Reuse Information Centre; Water Resource Engineering; Guelph Institute for the Environment; Controlled Environment Systems Research Facility; ecology@Guelph; Urban System Environmental Design Centre; Ontario Rural Wastewater Centre; and over 20 centres/ institutes/ working groups and 11 research chairs involved in the nature, delivery or quality of water;
- **University of Toronto** - Drinking Water Research Group, Institute for Environmental Studies; Pulp and Paper Centre; and a research facility for the application of ultraviolet light in water disinfection and purification;

- **University of Windsor** - Great Lakes Institute for Environmental Research;
- **University of Western Ontario** - Centre for Environment and Sustainability;
- **Carleton University** - Canada Research Chair in Wastewater and Public Health Engineering;
- **Trent University** - The Worsfold Water Quality Centre; Institute for Watershed Science; and the Canadian Environmental Modeling Centre;
- **University of Waterloo** - Waterloo Institute for Groundwater Research; and Affiliated with the Canadian Water Network; and NSERC Chair in Water Treatment;
- **Walkerton Clean Water Centre** - Technology demonstration facility to demonstrate leading-edge drinking water technologies. The Centre also identifies research needs to help ensure safe drinking water and funds or participates in a number of research projects; and
- **Other research centres** - Centre for Alternative Wastewater Treatment at Fleming College; Ontario Centres of Excellence for Earth and Environmental Technologies; Ontario Ministry of the Environment, Dorset Environmental Science Centre; and the recently announced Wastewater Technology Advancement Centre in London, Ontario, which is a partnership between Trojan Technologies and the University of Western Ontario.

While Ontario possesses expertise in water research, no single institute coordinates the research at the provincial level.

At the federal level, the National Water Research Institute (NWRI), funded by Environment Canada and part of the Canada Centre for Inland Waters, is the largest fresh water science organization in Canada. The NWRI has particular expertise in water quality monitoring. In addition, the federal government Networks of Centres of Excellence Program supports the Canadian Water Network, a multi-institutional research network located at the University of Waterloo. Ontario is also home to the United Nations University Institute on Water, Environment and Health. This institute provides international recognition of Ontario's expertise, as well as access to an international network of resources that can be utilized to further develop and demonstrate water technologies and solutions.

Ontario's water strengths and talents are reflected in the establishment of successful world-class water technologies and companies such as ZENON Environmental, which was acquired by GE for $760 million (CDN), and Trojan Technologies, acquired by Danaher for $246 million (CDN).

4.5 Private Sector Technology and Know-How

Ontario has a strong private water industry. There are hundreds of companies, which generated approximately $2 billion (CDN) in revenue in 2004, including $285 million (CDN) in exports, from the sale of water supply, treatment, and conservation goods and services[14]. Ontario has a proven track record in creating world-class water technologies and companies such as ZENON Environmental, Trojan Technologies and Glegg Industries, as well as significant capabilities in:

- Advanced filtration and disinfection technologies;
- Water reuse and efficiency applications for municipal, industrial and commercial markets;
- Water metering, quality monitoring and assessment;
- Process automation and instrumentation; and
- Wastewater treatment and value extraction.

Ontario is also home to a number of organizations with a proven track record in working with the private sector to support the commercialization and development of new technologies. These include the Ontario Centres of Excellence and the MaRS Discovery District, which help to commercialize new technologies through mentoring, industry research and financial support, and the Ontario Centre for Environmental Technology Advancement (OCETA), which identifies customer needs and opportunities for the adoption and deployment of commercially viable, clean technologies.

4.6 Access to Capital

An important contributor to successfully developing a vibrant water technology cluster is access to capital. The corporate head offices of Canada's major banks and other financial institutions are located in Toronto, Ontario, as well as the Toronto Stock Exchange (TSX) and TSX Venture Exchange. The TSX has a history with listing the most successful Ontario-based water companies known to date, including ZENON Environmental and Trojan Technologies. TSX companies are followed by a growing number of investment analysts, both domestically and internationally. The Capital Pool Company (CPC) Program, created by the TSX Venture Exchange, is a unique-to-Ontario listing mechanism that serves as an alternative to traditional initial public offerings. CPC helps growing companies to cost-effectively access public market capital and allows them to benefit from experienced public company management.

Ontario also has a growing venture capital market. Ontario is home to XPV Capital Corporation, one of the few venture capital funds in the world dedicated to water technology companies, along with Emerald Technology Ventures, which has a dedicated water group, and Investeco. The National Angel Capital Organization also has its corporate head office located in Ontario.

The Ontario government supports private sector capital through several funds. These include the Ontario Venture Capital Fund, the Ontario Emerging Technologies Fund, the Investment Accelerator Fund and the Innovation Demonstration Fund.

At the federal level, Sustainable Development Technology Canada (SDTC) funds sustainable development projects (including clean water technologies) and builds private sector partnerships to bring new technologies to market. Development of new water technologies in Ontario can also be eligible for support from the federal government Scientific Research and Experimental Development (SR&ED) Tax Incentive Program.

Ontario is the global headquarters for the Canadian banking system that has been recognized as the safest in the world; the TMX, a world-leading resource and cleantech stock exchange; and highly specialized water venture capital firms such as XPV Capital Corporation.

5.0 ONTARIO AS A GLOBAL SUSTAINABLE WATER LEADER – RECOMMENDED PATH FORWARD

By the year 2015, Ontario will be recognized as a global leader and centre of expertise for providing safe, clean, affordable and sustainable water solutions.

Ontario is a leading jurisdiction with considerable water strengths and assets, including a strong regulatory regime, an internationally recognized research community and an established track record in developing world-class technologies. Ontario is also well-situated geographically, with excellent business connections to a large and diverse US market.

Many of the water challenges faced by Ontario, such as the need to improve water efficiency, reduce the increasing cost of managing water, deliver clean water to rural and remote communities, as well as maintain and revitalize aging infrastructure, are also concerns in other jurisdictions across Canada and around the world. Twenty-first century water management solutions, innovative thinking and proactive strategies must be applied to address these key drivers of water investment.

To become a global leader in sustainable water and effectively compete with other jurisdictions, Ontario must lever its existing strengths and create an integrated water industry platform to drive growth and encourage private sector investment. The foundation for this platform should be based upon key recommendations and specific actions outlined below, which, if fully implemented and adopted, would enable Ontario to become a global leader in sustainable water.

Vision and strong leadership are essential requirements for the development and deployment of integrated water solutions.

5.1 Recommendation 1 - Establish a Bold Vision

Vision and strong leadership are essential requirements for the development and deployment of integrated water solutions. Water must be an integral part of the political agenda in a positive and proactive way, with common goals shared by government, industry, academia and the public. By developing a bold vision and strategy for water, Ontario will send a clear, unifying message that water is a high priority, now and for the future.

Ontario should embrace the following vision:

By the year 2015, Ontario is recognized as a global leader and centre of expertise for providing safe, clean, affordable, and sustainable water solutions.

5.2 Recommendation 2 - Create an Ontario Sustainable Water Opportunity Act

Ontario has become a global leader in energy conservation and renewable energy with the introduction of the *Green Energy Act, 2009*, and has many of the fundamental elements to drive similar economic development in the water industry through the creation of an Ontario Sustainable Water Opportunity Act. Introducing such an Act would strategically change the way Ontarians perceive, understand and value water, resulting in positive behaviour change. It would define opportunities and accelerate efforts to conserve water, improve water efficiency, integrate and build upon existing government initiatives and attract private sector investment. For example, as water and energy are inextricably linked, water system operators that implement energy efficiency improvements and remove electricity demand from Ontario's power grid could be provided with financial incentives in a manner similar to Ontario's existing Feed-In Tariff program.

As outlined below, there should be four main objectives of the Act.

Sustainable Water Resources Management - The Ontario government should implement an education and outreach campaign with municipalities, schools, corporations, the agricultural community and the general public to communicate the value of water, and the related behaviour changes that are necessary to manage, produce and use water in a more sustainable manner. New policies are needed that would balance market "demand side" requirements, while effectively mobilizing "supply side" water technology and solution providers and their potential to succeed. A public-private forum that includes representatives of key water stakeholders should be established to develop and drive policy proposals and action plans that lever Ontario's water strengths, optimize the use of available capital, and encourage water efficient and sustainable water management practices.

Transparent Costing and Accounting of Water Use - Given the projected shortfalls in public resources for water and wastewater management, new water technologies are

Following in the footsteps of the *Green Energy Act, 2009*, Ontario should create an Ontario Sustainable Water Opportunity Act with four main objectives:

1. Sustainable Water Resources Management
2. Transparent Costing and Accounting of Water Use
3. Technology Demonstration and Early Adoption
4. Attract Early Stage, Innovative Companies to Ontario

needed to optimize and maintain water systems and related infrastructure. If water was tracked and managed in a transparent way, it would allow for the delivery of meaningful and useful information to water users, leading to a greater motivation to justify the adoption of more efficient water technologies, conservation measures and management practices. This would result in the acceptance of, and a natural progression towards, accounting for the full value of water. Ontario should implement water management policies that embed the principles of life cycle costing, long-term strategic asset management, continuous improvement and value creation. To exemplify global best practices, Ontario should consider a phased-in approach that takes into account affordability and equity issues for different water users.

Technology Demonstration and Early Adoption - Ontario should establish a reference customer network of "early adopters" and demonstration sites for clean water technologies. These should include municipalities, First Nations communities, major Ontario industrial sectors such as pulp and paper, mining, agriculture, food and beverage, automotive and chemical, and energy generation facilities. Reference customers from these demonstrations would provide critical feedback, generate market acceptance, accelerate the adoption of clean water technologies and support the growth of existing and new water companies. Priority should be given to test and demonstrate technologies that address the energy-water nexus, reduce the environmental impact of water treatment processes, increase water reuse, recycle wastewater by-products, and increase the overall productivity of operating and maintaining Ontario's water assets.

Attract Early Stage, Innovative Companies to Ontario - Ontario should implement a mechanism to attract leading foreign water technology firms to establish a presence in Ontario as a gateway to the North American market. Attracting these companies will further develop the water innovation cluster in Ontario, create employment, provide access to leading edge technology for local end users, and stimulate international collaborations.

5.3 Recommendation 3 - Increase Alignment and Collaboration

The unifying vision recommended in this report requires greater alignment and collaboration amongst all stakeholders to address the fragmented nature of Ontario's water industry. This would identify and address market barriers and create opportunities for water related investment and growth. Government, industry, academia and the public must all be involved.

Increased collaboration amongst government, industry and research, and NGOs will ensure a unifying vision for Ontario's fragmented water industry.

Government - Water is pervasive throughout Ontario's economy with policy implications for every provincial government ministry. Historically, the water focus of government has been regulatory driven. By contrast, other industries (e.g., manufacturing, agriculture, tourism) are primarily driven by an economic development agenda.

For Ontario to become a leader in sustainable water, it must align and integrate existing and future water policies and programs with its economic development priorities. The mandate to ensure enabling policies and regulations that protect Ontario's water resources and support economic development of Ontario's water industry should be the responsibility of Cabinet.

Industry and Research - Strong linkages and better communication are needed between researchers and industry to facilitate the exchange of knowledge, ideas and technologies to improve the commercial potential and beneficial outcomes of relevant water research.

Ontario should encourage the commercialization of competitive technologies developed through relevant research that supports well-defined water and resource efficiency goals and objectives. This would make it more attractive for industry to license water-related patents and make it easier to transform patented technologies into industry leading products. It would help academia develop the research and development capacity and skilled labour force required to meet the needs of system operators and solution providers. It would also facilitate the successful demonstration and adoption of innovative technologies, and improve the ability of Ontario companies to access growing international markets.

Non-Governmental Organizations - Ontario has a number of non-governmental organizations with considerable water expertise and knowledge. Greater collaboration and coordination is needed amongst these organizations to identify water priorities and build consensus around local initiatives and policy enhancements that support and optimize effective water solutions. This is essential for promoting local successes internationally and for demonstrating leadership in water governance and risk management.

A Sustainable Water Network for community-based water programs and initiatives should be created as a focal point in Ontario. The Network would work with existing non-governmental organizations to improve knowledge transfer across the entire innovation chain to strengthen relationships and streamline the routes to market for innovative water technologies and solutions. The Network would facilitate engagement through targeted workshops and conferences and serve as a water clearinghouse with an interactive website to increase market awareness and cooperation.

Ontario needs to actively develop and market its "brand" as a leader in sustainable water, both domestically and internationally.

5.4 Recommendation 4 - Brand Ontario as a Leader in Sustainable Water

Ontario needs to actively develop and market its "brand" as a leader in sustainable water. This requires promotion of Ontario's water industry as an integrated, world-class provider of technologies, services and know-how for innovative water solutions. A clear articulation of Ontario's unique water story, both within and outside Ontario, would increase the perceived value of Ontario's water industry, products and services.

Outside Ontario - Global branding of Ontario as the place to commercialize and develop innovative water technologies and solutions would attract investors, researchers, entrepreneurs and companies. A strong Ontario brand would add credibility and value to Ontario-based companies seeking to grow their businesses and expand operations outside of Ontario, thereby opening new markets and accelerating exports. This global branding initiative would include targeted awareness campaigns, trade missions and cooperative agreements with other national water centres (e.g., United States, Israel, Singapore, and Europe). The objective would be to showcase Ontario water technologies and solutions at major international water conferences and events, and develop collaborative strategies with export-oriented government

organizations. Maintaining a strong and credible brand outside Ontario would support the continued development of Ontario's water industry.

Within Ontario - A visible water brand within Ontario would change attitudes and behaviour, and create the necessary public support and political will to drive Ontario's sustainable water transformation. Ontario should adopt a model similar to Singapore that would raise the public profile of sustainable water resources management. Public awareness can be built through water campaigns, incorporating water into education curricula and the implementation of other engagement initiatives in collaboration with associations and non-governmental organizations.

5.5 Outcomes and Benefits

Maximizing the economic, environmental and social benefits from the water opportunity would result in considerable benefits for Ontario, including:

- Recognition of Ontario's "water brand" that provides the Province with a clear competitive advantage in attracting domestic and global investment, creating and maintaining new industries and jobs, expanding tourism and creating a highly educated work force;
- Creation of Ontario-based water technology companies that employ highly skilled people and capture a significant market share of the global water industry;
- Formation of "made-in-Ontario" supply chains and other national and international partnerships, thereby maximizing job creation and other economic benefits for Ontario;
- Attraction of significant levels of private sector investment in the research, commercialization and development of Ontario world-class water technology;
- Mobilization of Ontario's vast public sector assets as a platform for the testing and demonstration of innovative water technologies;
- Significant reductions in water use and energy consumption in municipal, industrial, commercial and agricultural water and wastewater processes; and
- Significant ecosystem health improvements through pollution prevention, including a reduction in the discharge of toxic chemicals and other contaminants into the environment.

Ontario will be recognized as a global centre of water excellence and world-class provider of technologies services and know-how for innovative sustainable water solutions.

APPENDIX A – REFERENCES

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