



IMPROVE LIFE.



GENERATING GLOBAL RESPECT FOR GROUNDWATER



GLOBAL LIFEBLOOD

The first day anyone realized something was wrong was May 17, 2000. Three days later, 40 residents of Walkerton, Ontario were hospitalized with symptoms of bacterial infection. Public utilities commission officials insisted that the town's water supply was safe even as independent testing discovered E. coli bacteria. Ultimately, Walkerton's contaminated water would cause seven deaths and make nearly half the town sick. The water in Walkerton homes is well water.

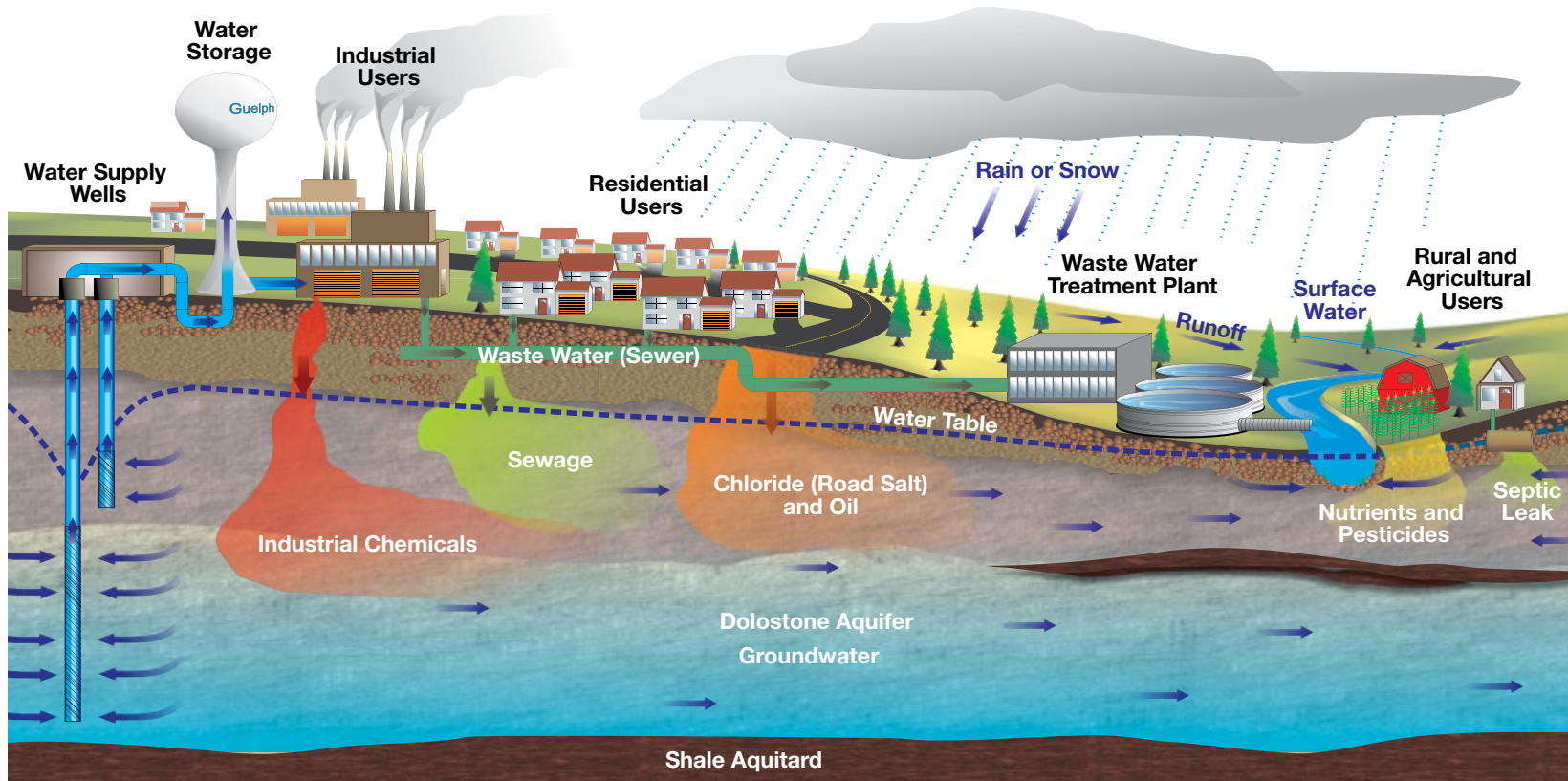
In rural and remote communities everywhere and throughout the developing world, access to clean, safe water can be a life-and-death challenge. The best solution is often tapping into bedrock groundwater aquifers as a reliable source of freshwater for drinking, farming and sanitation. The better we understand the subsurface component of the hydrologic cycle, the better we can use and manage our fresh water as an essential life-supporting resource.



In some countries, well water is responsible for as much as **70% of the nation's entire freshwater supply.**



THE TRUTH ABOUT GROUNDWATER



communities relying on well water. Globally, 45% of water used in agricultural irrigation is groundwater and, in some countries, well water accounts for as much as 70% of the nation's entire freshwater supply. Ecologically, groundwater sustains more than half of the flow in rivers and lakes and mitigates the effects of both flooding and drought, placing groundwater at the heart of our ability to survive and adapt to the impacts of climate change.

“At the University of Guelph, Improve Life is both our mission and our commitment to you. ... Our approach to research, teaching and community engagement addresses some of the most pressing issues facing our world today.”

- Dr. Charlotte Yates | President and Vice-Chancellor

Life depends on freshwater. Freshwater shapes and sustains ecosystems. It propels societal progress. It is essential to the health and prosperity of both communities and individuals. Freshwater is a vital element of agriculture, power generation and industry. Increasingly, freshwater is even a critical component of political and economic stability.

• Ninety-nine percent of available liquid freshwater on our planet is underground, making groundwater our most important water resource. These subterranean supplies, which are less vulnerable to contamination than surface water, provide almost half of all drinking water worldwide and are particularly vital in remote, rural and Indigenous communities, with 80% of people in Canada's rural

Groundwater is a key to community wellbeing. It supports resilience, sustainability, prosperity and progress. It supports *life*. That's why the University of Guelph's work in groundwater science, innovation and learning is so central to the University's mission to *Improve Life*.

UNIVERSITY OF GUELPH'S LEGACY IN GROUNDWATER

For nearly fifteen years, the University of Guelph has been a world leader in bedrock groundwater research, in developing innovative groundwater technology and practice and in training the next generation of groundwater scientists and engineers. Our multi-faceted approach to groundwater is unique. The Morwick G360 Groundwater Research Institute is field-based and interdisciplinary – just like the real world – and the value

of our partnerships with consultants, equipment manufacturers, service providers and governments is unmatched in the scholarly community. Our innovations apply novel tools to real-world issues

including groundwater remediation, field data collection and developing conceptual and numerical models of groundwater environments. In fact, University of Guelph groundwater scientists and engineers, led by Dr. Beth Parker, have developed four technology patents and several trademarked methodologies.



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THE MORWICK G360 GROUNDWATER RESEARCH INSTITUTE



The Morwick G360 Groundwater Research Institute is at the heart of the University of Guelph's goal to improve life. The Institute develops sustainable responses to the threats that contamination, climate change and overuse pose to our groundwater, an irreplaceable building block of human and ecological health.

The Institute – recently renamed in honour of visionary philanthropist Ted Morwick – is a multi-disciplinary research hub with 15 principal investigators guiding a team of more than 50 graduate students, post-doctoral fellows, research staff, visiting scientists and technicians. The team's hands-on work at groundwater sites around the world combines fundamental science with practical application to bridge the gaps that traditionally separate academia from industry and communities. In fact, a hallmark of the Institute's research and innovative approach to field work is its ongoing collaboration with private-sector partners in the groundwater industry who are also continuously developing new tools and technologies. Together, we accelerate the adoption of new methods that advance professional practice.



The Institute is also involved in advocacy and education related to groundwater and is a partner in, for example, the international Groundwater Project (GW-P), a free e-book initiative designed to educate children, university students and professionals in the societal and scientific issues related to groundwater.

In total, our work is local and global. We have collaborations and field sites around the world and partnerships with private landowners and municipalities including the City of Guelph. Our new research facility will allow us to develop and test technologies and gather data on the Institute's doorstep. Our partnerships in the groundwater industry give us a unique ability to apply our innovations at field sites swiftly which accelerates the process of turning our innovative technologies and approaches into industry standard practice. We are also nurturing the next generation of groundwater innovators and professionals by training graduate students and researchers through field-based experience and by enriching the skills of the corporations and agencies involved in groundwater usage and management.

GLOSSARY

AQUIFER – body of porous rock or sediment containing groundwater that can resurface through springs or be extracted via wells.

AQUITARD – geological formation containing and transmitting water at slower rates than an aquifer, and usually in materials like clays or shale that prohibit water extraction by well.

BEDROCK – solid rock that can extend hundreds of metres beneath surface materials that can include soil and gravel.

CORE – small portions of a geological formation extracted by drilling for analysis related to factors including porosity, permeability, fluid content and age.

ECOSYSTEM – geographic area where plants, animals, geography, geological features and atmospheric/weather conditions form an interdependent life zone.

GROUNDWATER – slow-moving, slowly accumulated, often purified water found underground in cracks and spaces in soil, sand and rock.

HYDROGEOLOGY (GEOHYDROLOGY, GROUNDWATER HYDROLOGY) – study of groundwater including how it gets into and moves through the subsurface and interacts with soil and rock.

G360 VISION & MISSION

The vision for the Morwick G360 Groundwater Research Institute is simple, but vital:

GENERATE GLOBAL RESPECT FOR GROUNDWATER THROUGH FIELD RESEARCH.



Specifically, the Institute delivers world-class research that helps foster evidence-informed groundwater stewardship worldwide. The Institute's work also involves training and collaborations that advance knowledge, build expertise and lead to more effective professional practice and policies.

CLOSE TO HOME

More than 30% of Canadians rely on groundwater for municipal, domestic and agricultural use. The Guelph community, for example, depends heavily on its local aquifer, so protecting groundwater is a focus of the city's commitment to reduce its water use by 20% by 2025. Groundwater is also a key element of the city's goal of achieving 100% renewable energy use by 2050. Those aspirations are in jeopardy because demand for freshwater is increasing as the local population grows and as threats including road salt, industrial contaminants, waste disposal, quarrying, septic issues and commercial water-taking all put the health and sustainability of Guelph-area aquifers at risk.

The city, however, has a powerful tool working in its favour. Over the last 15 years, the G360 Institute has guided the city in creating an advanced monitoring system. This system has collected data at frequent intervals from different depths across the City of Guelph's wells, turning the entire well network into an innovative and globally unique real-world research lab. By providing unparalleled data and insights into natural processes that cannot be reproduced in conventional laboratory settings, this system has become a cornerstone of the City of Guelph's progress toward achieving its sustainability goals. The network is also an invaluable research tool for the Institute.



By 2025, an estimated 1.8 billion people will be living in areas with absolute water scarcity and two-thirds of the global population will be living in water-stressed conditions.

▼ LIFEBLOOD AT RISK

Our planet's groundwater has never been more vulnerable as many of the world's largest aquifers are being pumped out faster than they can be replenished. According to NASA, 21 of the world's 37 largest aquifers have surpassed their sustainability thresholds and a growing portion of the rainfall that had replenished our aquifers for millennia is now running into the surface water system due to deforestation, agricultural expansion and urban sprawl. At the same time, groundwater is also threatened by contamination from industrial and agricultural activity that can render an aquifer unusable for decades. The United States alone has more than 300,000 contaminated groundwater sites.

Even more ominously, every threat to the safety and sustainability of our groundwater is exacerbated by climate change. As we face drier, hotter, more volatile weather, we will become increasingly dependent on groundwater to sustain us through droughts and to support the industrial agriculture that feeds our expanding global population. By 2025, an estimated 1.8 billion people will be living in areas with absolute water scarcity and two-thirds of the global population will be living in water-stressed conditions.

To reverse these trends and protect our groundwater, we need coherent and connected local, national and global groundwater strategies based on a strong and shared understanding of this invisible resource. We need to support and advance those strategies by developing sophisticated technologies and systems that allow us to learn more about aquifers while protecting them from threats of all kinds. We need to improve access to information about groundwater systems. We need to engage people in developing appropriate solutions for sustainable freshwater resources, including groundwater. If we can't, the foundations of our society will be at risk.



Dr. Parker's research has redefined our understanding of how contaminants travel through bedrock.

OUR LEADER

– BETH PARKER



The founder and director of the Morwick G360 Groundwater Research Institute is Dr. Beth Parker, a professor in the University of Guelph's School of Engineering, the NSERC Senior Industrial Research Chair in Fractured Rock

Contaminant Hydrology and now also the Morwick Chair in Groundwater Research. Dr. Parker's research has redefined our understanding of how contaminants travel through bedrock. Her discoveries and methodological innovations, including the Discrete Fracture Network field approach she developed to enhance our understanding of groundwater contamination in complex fractured bedrock, represent significant breakthroughs in groundwater science. For decades, her work has helped municipalities and corporations accurately assess groundwater contamination risks and take appropriate and effective action.

Dr. Parker is co-director of the longest-standing, industry-funded independent research program in Canada, the University Consortium for Field-Focused Groundwater Research. She holds the 2021 Tage Erlander Visiting Professorship with the Swedish Research Council hosted by Lund University and she is a fellow of both the Canadian Academy of Engineering and the American Geophysical Union. She is an award-winning member of the International Association of Hydrogeologists and the National Groundwater Association.

WATERSHED MOMENT

– NEW FACILITY,
NEW TRAJECTORY

In late 2019, Ted Morwick – already one of the University of Guelph’s most generous donors – made a watershed gift to the G360 Institute for Groundwater Research, a gift that will propel the Institute to new levels of productivity and impact. As we begin to invest Mr. Morwick’s gift, the Institute that now bears his name is pursuing an expanded program, new tools, greater agility and an enhanced commitment to practical student learning.

Ted Morwick’s philanthropy will also help build a new home for the Institute. Likely breaking ground in 2022, the Morwick Groundwater Research Centre will set a

new Canadian and potentially international standard for groundwater research facilities. By incorporating boreholes and real-time monitoring technologies on site, the Centre will redefine our ability to conduct hands-on research and training – combining both indoor and outdoor activities and developing the kinds of scientists, innovators and professionals who will lead the next era in groundwater scholarship and stewardship. The Centre, which will unite the Institute’s three current locations under one roof, will also model the Institute’s sustainability principles by embracing green design and technologies.



THE GOAL

The Morwick G360 Groundwater Research Institute is transforming our relationship with water. With the right support, the next steps in that transformation are within reach. The key is being able to transfer cornerstone innovations – many of them developed and honed in the Institute – into widespread practice. The Institute’s next phase, therefore, will see the continued development of new patented technologies while also collaborating with groundwater equipment vendors to test, prove and improve new approaches as we continue to accelerate the groundwater industry’s move to more responsible and sustainable practices.

An increasingly high priority for the Morwick G360 Groundwater Research Institute is exploring the relationships between groundwater and climate change. Groundwater is a key to our resilience in facing climate change, yet few governments and individuals recognize the connections. The Institute will continue exploring the best ways to balance the competing needs of communities, agriculture, industry and ecosystems as our climate changes and as our subsurface water resources transform as a result.



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NEW RESEARCH

The Institute continues to push for new breakthroughs related to critical groundwater quality and quantity issues. With more than 50 field research sites globally, we are working in Brazil, China, Australia, Sweden, France, Germany and Italy; in the United States in Florida, New Jersey, California, Wisconsin and South Carolina; and at Canadian sites from Vancouver Island to Prince Edward Island.



OUR RESEARCH PROGRAM IS DIVERSE, RESPONSIVE AND CONSTANTLY EVOLVING, BUT THE CURRENT PILLARS OF OUR RESEARCH ARE:

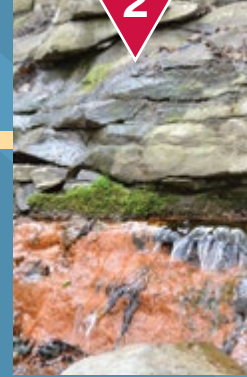
1



Bedrock Aquifers

Studying groundwater flow and water supply in one of the most important but complex aquifer types.

2



Contaminated Sites

Investigating legacy and emerging contaminants in sedimentary bedrock aquifers, typically at industrial sites with long-term (20-60 years) contamination.

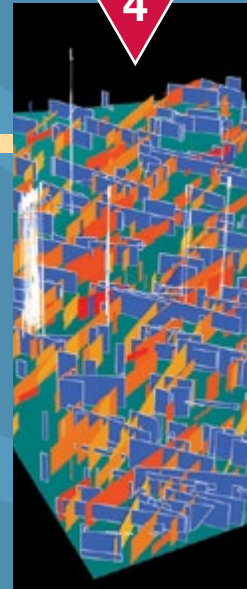
3



Aquitards

Advancing the delineation and characterization of aquitard units through a combination of methods to determine how aquitards help protect our groundwater resources from a variety of threats.

4



New Tools

Developing new methods and technologies for investigating the subsurface by adding to the list of Institute-created technologies such as the CORE^{DFN} (Discrete Fracture Network) high-resolution matrix diffusion analysis system, fibre optic Active Distributed Temperature Sensing and Active Line Source (ALS) wireline temperature logging.



Your gift can influence the trajectory of the Morwick G360 Groundwater Research Institute at the exact moment in its history when it is best poised to capitalize on your generosity. With a new Centre in development and with a larger, better-supported team in place thanks to Ted Morwick's watershed gift, your support will benefit from the momentum that is launching a new era of the Institute's legacy.

▼ THE POWER OF YOUR GIFT

Our funding priorities include completing the resources required to develop the Morwick Groundwater Research Centre and to support the varied research of the Morwick G360 Groundwater Research Institute.





MORWICK GROUNDWATER RESEARCH CENTRE



Main Auditorium/Classroom

This hands-on experiential learning space will accommodate exhibitions as well as technical and historical displays. With 2,380 square feet and 120 seats, the space will be home to classes, professional short courses, public events, seminars and conferences. Naming rights for the venue are valued at \$1,000,000.



Rock Core Library & Technology Storage Facility

Home to one of the largest rock core libraries in Ontario, this facility's 2,528 square feet will store more than 13,200 linear feet of rock core using a system that facilitates easy retrieval for hands-on student learning, professional training and research. The facility will also keep the Institute's groundwater monitoring and characterization tools ready for field mobilization and educational displays. Naming rights for the library and technology storage facility are valued at \$500,000.



MORWICK GROUNDWATER RESEARCH CENTRE



Field Demonstration Patio

An integral element of the new Centre, the sheltered outdoor classroom space incorporates a fully functioning borehole capable of supporting technology demonstrations that enrich experiential learning and public outreach. Naming rights for the 572-square foot patio are valued at \$250,000.



Morwick Groundwater Research Centre Sustaining Donors

The new Morwick Groundwater Research Centre will provide adaptable spaces and facilities that help drive the Institute's teaching, research and outreach missions. A central part of the Centre plan is ensuring that resources are available to support operations and the continual updating of the Centre and its equipment. Donors contributing \$50,000 or more will be recognized on the donor wall in the main atrium.





The Morwick G360 Research Innovation Fund

By its nature, innovation is both strategic and opportunistic – moving steadily forward through ongoing concerted effort, yet often taking sudden leaps on the strength of breakthroughs. The G360 Research Innovation Fund focuses investment in two vital areas: **IDEAS AND PEOPLE**. This fund will allow the Institute to allocate funds swiftly and efficiently to high-potential projects in order to seize opportunities as they arise. It will also enhance the Institute’s research and teaching capacity through professorships and fellowships, enrich student accessibility and learning through scholarships and experiential learning programs, and engage with the public and partners in advancing all aspects of the **INSTITUTE’S MISSION: GROUNDWATER RESEARCH, LEARNING AND ADVOCACY**.





JOIN US IN GENERATING GLOBAL RESPECT FOR GROUNDWATER

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The University of Guelph logo, featuring the words "UNIVERSITY of GUELPH" in a white, serif font on a black rectangular background.

UNIVERSITY
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IMPROVE LIFE.