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We actively develop and implement innovative solutions that increase efficiency and conserve energy, water, and groundwater resources.

Let us help you. With over two decades of environmental experience, our team of professionals is ready to assist in all aspects of your environmental or groundwater project.

## Applied Technologies:

- Diver-DXT\*
- Diver-DXD\*
- Diver-Pocket\*
- Diver-Office\*
- Mini-Diver\*
- Micro-Diver\*
- CTD-Diver\*
- Cera-Diver\*
- Baro-Diver\*

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## Monitoring Groundwater Without Boundaries

Guelph, ON, Canada



The Diver-NETZ wireless network decreased data collection efforts from 160 to 16 h/mth

### Highlights:

- The City of Guelph Waterworks Department introduced Diver-NETZ in an effort to alleviate expensive groundwater compliance efforts
- With Diver-NETZ, the City developed a complete long-term strategy for monitoring groundwater resources
- The Diver-NETZ network consisted of field instrumentation, wireless communication, and data management capabilities
- The City of Guelph Waterworks Department concluded that Diver-NETZ was 70% more efficient than traditional methods for collecting groundwater data

### Background

In September 2006, management at the City of Guelph's Waterworks Department moved one step closer toward solving a long-running monitoring efficiency problem in its 51,229 cubic meter groundwater reservoir. The successful completion of a pilot project covering 19 functioning wells scattered around 12 facilities and extended over 150km<sup>2</sup> of land has resulted in an increase in groundwater monitoring efficiency of up to 70%. Using Diver-NETZ for the study, the integrated monitoring network involved field instrumentation, advanced wireless communication, and data management capabilities.

Guelph's water comes from a permeable zone within the Amabel Formation. In places, the bedrock is overlain by overburden deposits – clays, silts and sands that were deposited by glaciers. Some of these layers are aquitards where groundwater movement is extremely slow. The aquitards act as barriers to protect the deeper groundwater aquifers.

The City conducted the pilot study in its biggest aquifer, the Arkell Spring Grounds. Located in the township of Puslinch, the Arkell Spring aquifer supplies the City with up to 60 percent of the drinking water.

"Historically, we weren't able to collect a great deal of data because it was all done manually", recalled Kier Taylor, Compliance Coordinator. "What we are able to do with the use of [wireless] dataloggers is to increase the quantity and the quality of the data –more units per unit-time over a dollar value".

Taylor said that the funds allocated to the Diver-NETZ groundwater monitoring network was instrumental in meeting the City's legislation compliance efforts while staying within budgetary constraints.

# Case Study: Monitoring Groundwater Without Boundaries

## Challenges

Consisting of a Water Level Meter (WLM) tape and numerous man-hours, the traditional method for collecting data involved a series of manual tasks such as traveling to proximity, locating wells, opening and unlocking caps, lowering WLM, and taking readings from each nested well.

Technicians spent over 160 hours collecting groundwater data from 23 wells when measuring conditions such as groundwater level, temperature, conductivity, and barometric pressure. From lock-to-lock, 300 data points incurred a total cost of \$33,600 per year on groundwater data collection (\$9.33 per data point, \$2,800 per month). Factoring in all other costs such as managing and visualizing data, and producing monitoring reports, the City was limited to a small number of readings per month thus jeopardizing legislative compliance efforts.

Additional intrinsic costs incurred by the City before the adoption of Diver-NETZ included the hiring of qualified personnel, extensive personnel training, and expenses related to vehicle maintenance and operation.



Data was wirelessly collected from a distance of 150 meters

## Solution

The City of Guelph introduced the Diver-NETZ system in two phases. The first phase involved the use of Diver dataloggers (Diver-Suite), Diver Data Cables (DDC) and Diver-Pocket software. This program allowed for a substantial increase in accuracy and provided hourly data. In addition, the readings were collected from all wells simultaneously, providing an accurate and complete snapshot of the monitoring system.

The second phase was the incorporation of the wireless and in-office solutions (Diver-DXT, Diver-DXD, and Diver-Office). With a wireless connection range of up to 150 meters, technicians were able to locate and collect data from roads and pathways without having to walk directly to wells. In turn, the 2-man, 75-hour collection excursion was decrease to a one-person, 4-hour walk and drive.

Training on wireless data collection was also provided for technicians and assistants. A four-hour training session was implemented to educate city workers on how to program, collect, and download information for visualizing and reporting.

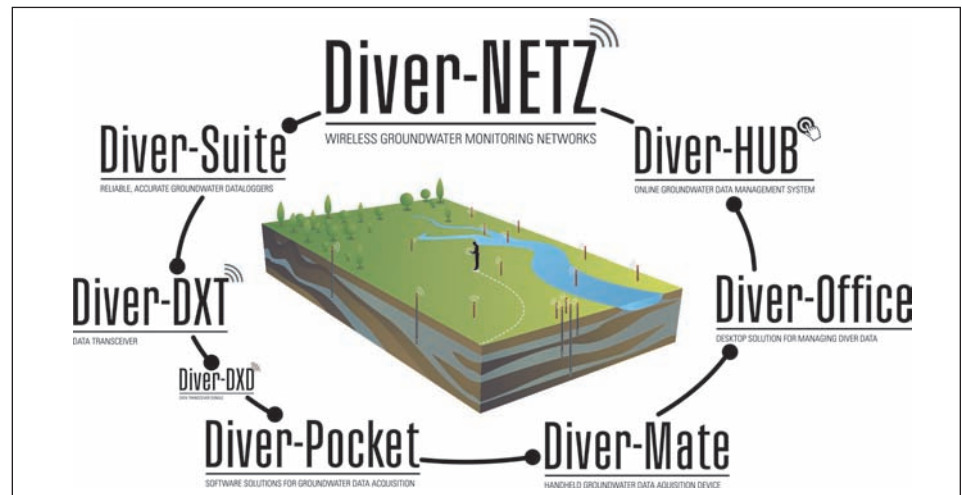
## Results

Quantitative results from the inception of Diver-NETZ are summarized as follows:

- Tenfold reduction in man-hours for collection of 300 data points (from 160 to 16 hours)
- Dramatic decrease in cost per data point collected (from \$9.33 to \$0.25 pdp)
- Decrease in monthly cost of data collection (from \$2,800 to \$75, annual reduction from \$33,600 to \$900)
- Increase in data collected monthly (from 300 to 3,000 data points, 750 readings)

Other qualitative results were also obtained. While there was a substantial decrease in training hours and level of expertise required for collecting data, technicians were able to avoid site obstacles and hazards including fenced private property, inclines, and rivers.

Through further analysis, the City of Guelph's Waterworks Department concluded that Diver-NETZ was 70% more efficient than traditional methods for collecting groundwater data.



Diver-NETZ provided the City of Guelph with a wireless monitoring network that increased the quantity and quality of data collected