



## Solinst LevelSender Telemetry Aids Agriculture & Water Quality Research

Globally, agricultural producers are facing tougher rules and challenges when it comes to water use and water quality associated with their operations.

In Canada, the Department of Agriculture and Agri-Food (AAFC) conducts research in support of agricultural producers, providing them with the latest information to help them succeed.

As part of their initiatives, AAFC operates and manages a network of water monitoring sites for water quality research purposes. The goal of the network is to better understand the quantity and quality of surface water through time in agricultural regions of Canada.

In spring 2018, three water quality monitoring stations were upgraded with Solinst LevelSender telemetry systems. LevelSender telemetry systems regularly send water data from connected sensors in the field, to a

central database without having to visit the site.

The purpose of each monitoring site is to measure the water level in a waterway. The water level data is further converted to discharge measurements using stage discharge relations that are derived from Acoustic Doppler current profilers, and other means.

Various types of waterways are being studied. One station is monitoring the water level in a small roadside stream in a vegetated area, another in a stream as it enters a river, and the final station records water level in a river.

Each monitoring station consists of a LevelSender connected to a Levellogger water level datalogger and/or a Rainlogger rainfall datalogger (which counts and logs the tips of a connected tipping bucket rain gauge). The Levelloggers are installed directly



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## High-Resolution Groundwater Data Proves Value Of CMT Systems In Botlek Area

The Botlek area of Rotterdam, Netherlands is a highly industrialized zone near the west coast. Due to chemical and petrochemical plume emissions from local factories and industrial plants, an emphasis has been put on groundwater contamination studies.

In 2015, Spectrasens, the exclusive distributor of Solinst products in the Netherlands, first proposed the use of Solinst CMT Multilevel Monitoring Systems to help gather high-resolution groundwater data in the Botlek region.

Spectrasens introduced CMT Systems as an option to various government bodies, including the Province of South Holland. After receiving acceptance from the province, a CMT pilot project was approved to go ahead in September 2016. The initial pilot project included the installation of thirty CMT wells.

To begin, three staff were trained on the proper construction of monitoring ports in



the CMT, after which five CMT Systems were successfully installed in the field.

In total, thirty CMT Multilevel Groundwater Monitoring Systems were completed, ranging in depths from 30 m to 70 m. To best fit the diameter of the monitoring wells, centralizers were created and spaced out along the CMT to keep it centered in the boreholes.

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# Solinst Levelloggers Vital In Lithuania's Water Conservation Efforts

Solinst Levelloggers have played an important role in Lithuania's water conservation and management efforts for a number of years.

In 2005, Solinst Levelloggers were deployed as part of the country's national groundwater monitoring network. An upgrade to the network in 2018 revealed that about 50 of the original Levelloggers and accessories are still in good working order!

Today, Levelloggers are not only helping track groundwater resources in Lithuania but are also being used in a number of surface water monitoring projects.



## Estimating Ecological Flow

About 100 small hydropower plants have been constructed in Latvian-Lithuanian trans-boundary river basins. These installations create changes in the river flow regimes, which can negatively affect the surrounding ecosystems.

A number of project partners have teamed up with the goal of developing a new methodology to measure ecological flow in the impacted rivers. In short, ecological flow can be considered the minimum flow required to sustain the existing hydrological and ecological functions of the river.

As part of the program, three Solinst Levelloggers are installed in a pilot project in the Suosa River. One Levellogger is deployed in the river upstream from a hydropower plant reservoir, another is installed downstream, and the third is installed in the reservoir itself.

Discharge measurements, along with the Levellogger water level data, will be used to establish a rating curve of the relationship and help provide estimates of ecological flow. These measurements will be made along various river stretches in the region.

Estimating ecological flow will help ensure hydropower plant installations have minimal effects on the existing environments.

## Conserving the Aquatic Warbler

A 7-year project funded by the EU is underway in Lithuania and Belarus to conserve the Aquatic Warbler population. The Aquatic Warbler is categorized as a globally threatened species. Already, a number of Aquatic Warbler nests have been successfully translocated from Belarus to Lithuania.

Aquatic Warbler habitat restoration and conservation are key components of the



project. As their name suggests, Aquatic Warblers make their homes in wetlands and marshes. The species is very sensitive to changes in the water balance of these ecosystems.

As such, water level management programs are underway to ensure ideal conditions are maintained or improved in selected areas. A number of Levelloggers have been installed as part of the programs to monitor the changes in water levels over time.

Preserving and expanding Aquatic Warbler habitats will reduce fragmentation of the population, allowing the species to genetically diversify and ultimately recover.

For more details, read the full post in our **ON THE LEVEL Blog**.

*Solinst thanks Bernardas Paukštys, the exclusive distributor of Solinst products in Lithuania, for providing the details of these projects.*

## High-Resolution Groundwater Data

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Water levels in the CMT Systems are measured using Solinst Model 102 Water Level Meters, which have narrow cables and probes. Water sampling is completed using peristaltic pumps; gas analyzers were used for solvent checks. Initial sampling rounds resulted in "interesting" data.

With the preliminary installations and monitoring results, the Province of South Holland is very pleased with the performance of the CMT wells and the high-resolution subsurface data they provide. Subsequently, the second round of CMT Systems has been ordered.

Through the pilot project, Spectrasens learned that once you have clearly explained how CMT Multilevel Groundwater Monitoring Systems work and their benefits, it is easy to gain support for the technology. Training of staff to construct and install CMT Systems was straightforward.

Because of the positive feedback and useful data gained, Spectrasens expects the number of CMT System installations to increase greatly in the future.

*Solinst thanks Spectrasens, for providing the details of this project.*

## NEW 2 Products in 1 101D Water Level DrawDown Meter

The 101D Water Level DrawDown Meter has all of the same qualities as our well-known 101 P7 Water Level Meter, with the added feature of a drawdown mode. One simple toggle switches between static water level and drawdown measurements. Ideal for:

- Measuring depth to water in wells, boreholes, standpipes & tanks
- Monitoring drawdown during:
  - Low flow groundwater sampling
  - Well development & purging
  - Dewatering applications
  - Pumping, slug, & other aquifer/well tests



# Packer Tests & Transient Hydraulic Tomography In India

Like many countries worldwide, India is facing intense pressures on their groundwater resources. An Experimental Hydrogeological Park established in Hyderabad is helping to better understand the impacts on groundwater.

Students at the Indian Institute of Technology Hyderabad are taking part in a transient hydraulic tomography project at the Park.

Part of their study includes sequential cross-hole hydraulic tests. Field trials involve slug testing, single hole pumping, and cross-hole pumping tests. To conduct the tests, a number of groundwater monitoring wells are fitted with pneumatic packers to create multiple depth-discrete monitoring zones in each well.

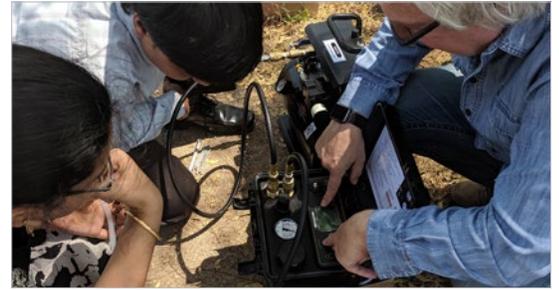
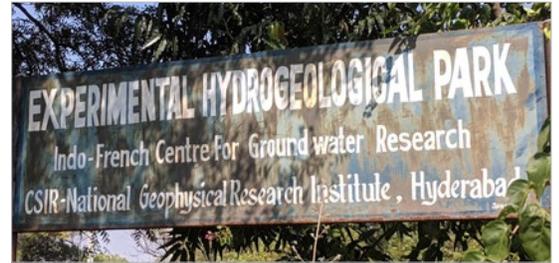
Recently, Solinst staff visited the site to provide hands-on instruction for the equipment used in the project.

Model 800 Low Pressure Pneumatic Packers are used to isolate the discrete zones in the groundwater monitoring wells to perform the slug and single hole/cross-hole pumping tests.

LTC Levellogger Edge dataloggers are deployed in the wells to monitor water level, temperature, and conductivity.

Model 407 Bladder Pumps and 408 Double Valve Pumps are used for low flow groundwater sampling during tracer and contaminant transport tests. Both Pumps are controlled using the Model 464 Electronic Control Unit. A Solinst 12V Compressor is used to supply air to drive the pumps.

Overall, the data collected will help map the heterogeneity of hydraulic conductivity and specific storage in the crystalline rock aquifer and determine the location of large fractures and highly conductive zones.



For more details, read the full post in our **ON THE LEVEL Blog**.



## The Importance of Measuring Drawdown

How Using a Levellogger and 101D Together Provides Essential Data

### What is Drawdown?

Drawdown is a change in groundwater level due to an applied stress, caused by events such as:

- Pumping from a well
- Pumping from a neighbouring well
- Intensive water taking from local area
- Seasonal declines as recharge rates lower

### How is Drawdown Measured?

#### Levellogger Water Level Dataloggers

Drawdown can be measured using a pressure transducer with built-in datalogger that records water level fluctuations over time—a Solinst Model 3001 Levellogger, for example. Levelloggers are easily

installed below the lowest anticipated drawdown level to record water levels as often as 1/8th of a second. Levelloggers are ideal to use when more frequent drawdown readings, or continuous long-term water level monitoring is required.

#### 101D Water Level DrawDown Meter

The Solinst Model 101D Water Level DrawDown Meter measures depth to water and detects falling head levels (drawdown). The 101D provides a manual measurement method when only periodic water level and drawdown measurements are required. One simple toggle makes it easy to switch between the two functions. In Drawdown mode, the 101D can ensure drawdown levels remain constant, as the buzzer and light sound when the probe is out of water.

### When used together...

Using these two instruments together ensures accurate readings and saves you time when dealing with post data processing.

As a QC check, you can use 101D Water Level DrawDown Meter depth to water measurements to verify the Levellogger is reading correctly. Manual measurements should be taken when the Levellogger is deployed, periodically during the recording period, and at the end of the monitoring period.

After you have downloaded the data from the Levellogger, you can use the depth to water measurements to convert Levellogger pressure readings to depth to water readings or elevation measurements to meet your specific application or model requirements. These

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# Solinst LevelSender Telemetry Aids Agriculture & Water Quality Research

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in the waterways, deployed inside protective perforated ABS pipe that has been pushed into the stream beds.

Data from each Levellogger and Rainlogger is recorded every hour. Every twelve hours the accumulated data is sent from the LevelSender via e-mail to a database at the Ottawa Research Development Centre. The data is then transferred to a central database

for storage and use by AAFC researchers.

Researchers report that the Solinst products have performed as expected in the field environment and they are very pleased with the quality of data the Levelloggers and Rainloggers produce.

They have found a number of advantages to using LevelSender telemetry in the monitoring network. Water levels can be monitored on a regular basis (every hour) and slight changes in water level, especially following a rain event, can be captured.

Additionally, LevelSender telemetry allows them to regularly view and check the station status. If a battery drains or a station fails to report data, the LevelSender notifies them immediately, instead of finding out at the end of the year. Data checks also enable them to plan whether on-site water sampling

activities are necessary, allowing them to be efficient and cost-effective at timing fieldwork activities.

Overall, AAFC research supports agricultural producers by providing them with a better understanding of the factors impacting hydrology in agricultural regions, such as climate, seasons, weather events, etc.

By monitoring water quality and quantity in agroecosystems, researchers can also determine the impact of beneficial management practices on environmental quality, and use the data to calibrate and validate predictive models.

For more details, read the full post in our **ON THE LEVEL Blog**.

*Solinst thanks Graham Wilkes, Amanda Ward, and David Lapen of Agriculture and Agri-Food Canada (AAFC) for providing the details of this project.*

## The Importance Of Measuring Drawdown

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calculations done automatically in the Levellogger Software Data Wizard, instead of another spreadsheet program, saves you time.

### How a Levellogger and 101D Water Level DrawDown Meter are Essential Tools

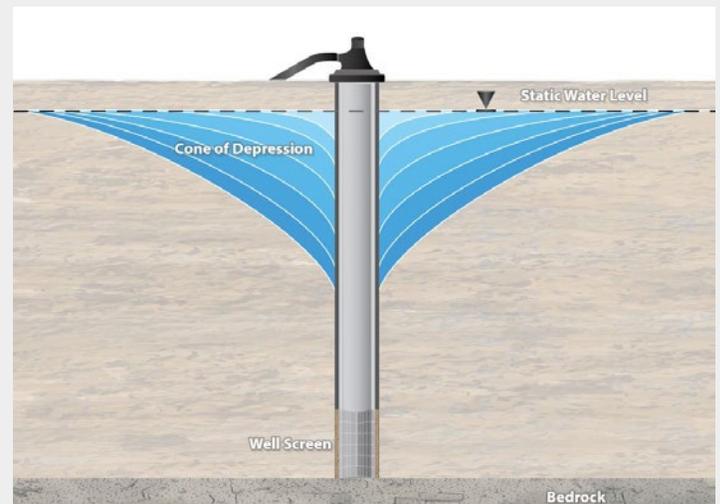
Drawdown levels are monitored during aquifer characterization tests, such as pumping, slug, and constant-head tests. These tests provide information to determine fundamental aquifer characteristics including hydraulic conductivity, transmissivity, and storativity.

It is now common practice to use pressure transducers with built-in dataloggers to record water level data during aquifer tests. Using a Levellogger increases the accuracy and productivity of a pumping test, compared to only using manual water level measurements, as was done in the past.

Using Levellogger Software, scheduled sampling sets the rates at which the water level data is collected for a number of separate intervals, allowing the typical aquifer test logarithmic-style sampling schedule to be set. You can customize a program to record water levels before, during, and after a pumping test (baseline, drawdown, and aquifer recovery).

Although not efficient for the bulk of the aquifer test readings, manual measurements are also a vital part of an aquifer test, for a number of reasons.

Prior to applying stress to the aquifer, a manual depth to water measurement (with date and time) should be recorded from each well using the 101D Water Level DrawDown Meter. This data can be used to ensure the Levelloggers are recording properly. Taking periodic water level measurements



throughout, and at the end of the test period, is good quality control.

Manual water level readings can also be used to adjust all pressure readings in a logged file, to express the data as depth to water or elevation values. You can use the Manual Data Adjustment option in the Levellogger Software Data Wizard and input the manual readings.

The 101D Water Level DrawDown Meter in drawdown mode is excellent for tests that require a constant level of drawdown, such as during a constant-head or step-drawdown aquifer test. The 101D sounds when the probe is in air, allowing you to adjust pumping rates as required to maintain the level of drawdown.

For more details, read the full post in our **ON THE LEVEL Blog**.

## High Quality Groundwater and Surface Water Monitoring Instrumentation

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