

ON THE LEVEL

Water Monitoring News and Updates

Solinst[®]

High Quality
Groundwater
and Surface Water
Monitoring
Instrumentation

IN THIS ISSUE

New STS Edge
Telemetry System

Levelloggers Monitor
Groundwater in Kenya

Simplify Your Pumping Test

Water Level Dataloggers &
Stormwater Monitoring

5 Tips for Accurate
LTC Edge Calibration

Solinst Telemetry Options



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New STS Edge Telemetry System!

STS Edge Telemetry Systems are designed for use with Solinst high quality dataloggers, including the Levellogger Series and AquaVent. The STS Edge sends water level, temperature, conductivity and rainfall data from the field to a Home Station PC.

- Intuitive software for easy programming and setup
- IP communication for reliable data transfer
- Database to integrate locally or push online
- Barometric compensation of remote water level data
- Remote schedule updates from the Home Station
- Battery level and status updates with each data report
- GPS allows location mapping in Telemetry Software
- High or low level alarm notifications

Levelloggers in Kenyan Groundwater Monitoring Network

The demand for clean, safe drinking water remains critical across rural areas of Kenya and much of East Africa, prompting many organizations to focus on increasing the number of water supply wells.

For the past five years, William (Bill) Halbert, a professional hydrogeologist and owner of Insight Geologic, Inc., has been working with Engineers Without Borders drilling wells in rural southwestern Kenya.

During his work, Bill became aware of the need for more reliable information on groundwater use and sustainability. This led to him forming the non-profit group Maji Walinzi, meaning "Water Guardians" in Swahili.

Maji Walinzi works with local and national groups, including the Water Resources Management Authority (WRMA) in Kenya, to provide equipment and training to monitor groundwater resources. A major goal of this organization is to establish a large, long-term groundwater monitoring network across rural villages.



Programming a Solinst Levellogger

Bill's two companies donated many automated, programmable water level dataloggers, including Solinst Levelloggers, to get the monitoring project started. "I've purchased a number of Levelloggers from Solinst over the years, and I've been very pleased with their performance as well as the user interface," says Bill.

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Leveloggers in Kenyan Groundwater Monitoring Network

(continued from page 1)

Currently, Leveloggers are installed on stainless steel cables in the supply wells. The water level dataloggers are programmed to record readings twice a day, and data is downloaded on an annual basis.

As areas are suffering from drought and many wells are heavily used, some shallow range M10 (10 metre) Leveloggers have become insufficient to handle the larger water level fluctuations. As such, they must be replaced with dataloggers that can withstand deeper deployment.

A recent donation from Solinst allowed Maji Walinzi to obtain four M100 (100 metre – deeper range) Levelogger Edge water level dataloggers and accompanying direct read cables. These Leveloggers will be used to replace existing M10 dataloggers. Once installed, direct read cables allow data download and programming, without having to remove the Leveloggers from their positions down well.

These Leveloggers are being installed in Migori County, Kenya, bringing the total to six boreholes in the groundwater monitoring network.



Data collected through the groundwater monitoring network helps track long-term trends and changes in groundwater levels and rainfall recharge. The information is shared with both government agencies and non-government organizations.

Accurate data allows more informed decisions to be made on water use in these critical groundwater basins. With the added effects of climate change of great concern, long-term groundwater monitoring data is key in determining resource sustainability.

In addition, the data supplied through the groundwater monitoring network will be made available on a website for use by scientists, graduate students, local agencies, etc.

Solinst thanks, William Halbert for providing the information on this project.

Simplify your Pumping Test with a Water Level Datalogger

With instruments like Levelogger and AquaVent water level dataloggers, data collection is fully automated, increasing productivity and accuracy of a pumping test.

The Levelogger Edge uses an absolute pressure transducer, while the AquaVent is vented. A Levelogger requires a second barometric datalogger to compensate the water level readings for atmospheric effects. The AquaVent provides data that is automatically compensated for barometric pressure changes.

Both dataloggers use a Hastelloy pressure sensor. The Levelogger Edge comes in six different pressure ranges, and the AquaVent comes in three shallow ranges; you'll have to select a range appropriate to your application. Your datalogger must stay submerged for the entire pumping period while remaining within specification.

When determining the best instrument to use based on accuracy, the shallower the pressure range, the more accurate the readings. With absolute Leveloggers, you

have to take into account any inaccuracies in both the level sensor and separate barometric sensor when looking at the final water level data, even in shallow applications.

Generally, an AquaVent can provide more accurate water level data in shallow applications, when it is placed close to the surface. The deeper you go, or the higher the water level fluctuation, it is recommended to use a Levelogger. Vented transducers may be subject to slow responses to small changes in barometric pressure when submerged to greater depths.

Leveloggers and the AquaVent can be programmed with a customized sampling schedule. Scheduled sampling sets the rates at which the water level data is

collected for a number of separate intervals, allowing the typical logarithmic-style sampling schedule to be set.

You can customize a program to record water levels before, during, and after the pumping test (baseline, pumping, and aquifer recovery). Recording aquifer recovery and return to baseline values is often considered the most

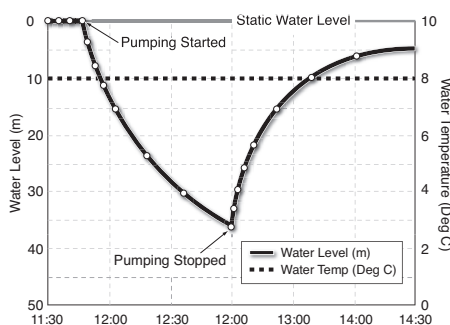


valuable part of any pumping test, especially for determining aquifer transmissivity.

Once Levelogger and Barologger data are downloaded to Solinst Levelogger Software, the "Data Wizard" can be used to barometrically compensate the data, and adjust it to depth measurements. Multiple Levelogger files can be barometrically compensated at once using one Barologger file.

Again, barometric compensation is not required for AquaVent data. However, the "Data Wizard" can be used to adjust the data to depth measurements.

You can view your data directly using Levelogger Software, or it can be exported in a standard .csv or .xml format for use in any hydrologic software for further analysis and interpretation.



For more tips, read the full article in our [ON THE LEVEL Blog](#).

Water Level Dataloggers for Assessing & Monitoring Stormwater Controls

Water level dataloggers, such as the Solinst AquaVent or Levelogger, can be simple tools to help evaluate the effectiveness, track performance, and maintain the integrity of certain stormwater control methods.

They provide an all-in-one solution, combining a pressure transducer, temperature sensor, and datalogger in watertight, rugged housings. Their weather-resistant material provides protection against the elements and ensures performance when deployed underwater for extended periods.

Solinst water level dataloggers are compact and have flexible deployment options. They are easy to install in surface water or groundwater monitoring applications.

As stormwater monitoring applications tend to be shallow installations, Solinst recommends using the AquaVent vented water level datalogger. The AquaVent provides highly accurate water level fluctuation data, especially in shallow conditions. However, for certain deployments, it may be easier to use the Solinst Levelogger.



Monitoring Stormwater Basins

Stormwater basins are very common methods of stormwater management. Basins collect stormwater and release it more slowly into receiving waters or conveyance structures.

When installed in stormwater basins, water level dataloggers monitor inflows, outflows, stormwater storage capacity, as well as stormwater overflows. Water levels track the flow of stormwater into and out of detention/retention structures.

Rainfall data from the same monitoring period tells you how much rainfall creates changes in water levels in the basin, and leads to higher flow rates and overflows.

Water level dataloggers are a convenient way to assess the performance of a stormwater basin. Water level dataloggers track the number of stormwater basin overflows.

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5 Tips to Ensure Accurate LTC Levelogger Edge Calibration

1. Make sure you have the latest Levelogger Software.

To calibrate an LTC Levelogger Edge, you require Levelogger PC Software; it includes the easy-to-follow Conductivity Calibration Wizard.

Solinst always recommends using the latest software and firmware versions to ensure compatibility.

2. Keep the LTC Levelogger Edge conductivity sensor clean.

The LTC Levelogger Edge conductivity sensor will not calibrate properly if it isn't clean. You should clean the conductivity cell and sensor pins thoroughly before calibration.

The pins of the LTC Levelogger sensor are platinum-coated, so they should not be roughly cleaned or touched with any metal. They can be cleaned with a soft bristle brush or Q-tip, or cloth.

Almost any acid solution can be used to clean the conductivity cell and sensor pins, provided it is highly diluted (generally less than 10% acid). For stubborn hard water deposits, etc., the LTC Levelogger Edge can be soaked in this diluted acid solution, but time should be monitored and kept to a minimum.

Always rinse with deionized water after cleaning and before you start calibration.

When you are performing a multipoint calibration, rinse the LTC Levelogger Edge with deionized water between each step, and then rinse with the next solution you will be using.

3. Select the appropriate calibration solutions.

To start, you have to use the specified conductivity solutions: 1413, 5000, 12,880, or 80,000 $\mu\text{S}/\text{cm}$.

The calibration solutions should be fresh. It's better to use ones that have a temperature error of $\pm 2\%$ or better.

For best LTC Levelogger Edge calibration, we recommend you use a 2-point calibration with solutions closest to what you expect to find in the field.

For example, use 1413 and 5000 $\mu\text{S}/\text{cm}$ solutions if you are expecting to encounter conductivities between those values during the monitoring period.

4. Get rid of the bubbles before calibrating.

When immersed in solution, the LTC Levelogger Edge conductivity sensor is designed to avoid bubbles from forming.

But, just in case, ensure there are no air bubbles on the conductivity sensor before calibrating in a solution.

Stir and lightly tap the LTC Levelogger Edge in solution to remove the bubbles – this should only take a few seconds. It is helpful to use a clear container for calibration, so that you can see the bubbles leaving the sensor.

After stirring, allow the sensor to stabilize and thermally equilibrate. Waiting for the sensor to properly equilibrate can take from 30 seconds up to a few minutes.

5. Maintain temperatures throughout calibration.

The deionized water, calibration solutions, and conductivity sensor should all be at similar temperatures and should be maintained throughout the LTC Levelogger Edge calibration.

During calibration, the solutions should be kept as close as possible to the manufacturer's stated temperature (usually 25°C).

Generally, you should keep the solution between 10 and 30°C for best accuracy. Solution temperature should be kept stable throughout the calibration.



The LTC Levelogger Edge must be connected to an Optical Reader during calibration

For more details, read the full article in our [ON THE LEVEL Blog](#).

Solinst Telemetry Options for Water Resource Management

Solinst offers three different types of telemetry systems. Here are a few questions to narrow down which system will work for you:

How large will your monitoring network be?

If you are monitoring a smaller contained area right on site, such as a golf course or landfill, the RRL System could work for you. The RRL uses radio communication that relies on line-of-site (up to 20 miles (30 km)).

The advantage of radio communication is free airtime. Other systems require setting up a cellular account with a wireless carrier, and therefore monthly account fees. With no wireless carrier involved, you have complete control of a closed-loop network.

If you are monitoring over a larger area (e.g. a watershed or river basin), or there is not sufficient line-of-site, then the LevelSender or STS is the way to go. These systems use cellular communication, so wherever there is a good cellular signal, you can use them.

Do you need an option that allows discreet installation?

The LevelSender is designed to fit inside a 2" well casing. Its small size makes it easier to deploy. You can connect a Levellogger and a

Barologger to one LevelSender. (An STS or RRL System allows the connection of up to four dataloggers.)

Do you want to be in control of your own data?

Something that all Solinst telemetry systems have in common is a dynamic database that is automatically created on your home station PC when you download the telemetry system software.

The database is appended with each new data report from the remote telemetry system. The database can be accessed and queried using your own macros or program, to post the data to a website or any method of your choice to display the data.

Do you want your Levellogger data to automatically be barometrically compensated?

If you are using an STS or RRL System, the PC software program allows you to select a Barologger that will be used to compensate your Levellogger data automatically.

Do you want to get data sent regularly right to your smartphone?

If so, you'll want to select LevelSender telemetry. The LevelSender is designed to send data to your home station PC



database, your email, and as a text message to a smartphone.

Do you want to set up alarms for high or low water levels?

With the STS, you can set alarms for high and low water levels. An alarm notification will be sent to your email when the set level has been detected.

With the LevelSender, if you are not at the home station PC, you still have access to your water level data through your email or text messages. A more frequent data-reporting rate allows you to track these kinds of events more closely.

For more Q&As, read the full article in our [ON THE LEVEL Blog](#).

Dataloggers for Assessing & Monitoring Stormwater Controls

(continued from page 3)

Changes in water levels can suggest that infiltration is occurring in a retention basin, and provide an idea of the infiltration rate.

When overflows occur too frequently and infiltration rates are lower than expected, the need for improvements is realized. After implementing improvements, water level dataloggers are a great way to monitor and compare the results.

Continuous water level monitoring in stormwater basins provides an advance warning or indication of clogs in the system. Signs that infiltration rates are slowing can imply that the basin is in need of maintenance.

Measuring Stormwater Infiltration

Where traditional management strategies include re-directing the stormwater off-site, retaining it elsewhere, or simply diverting it directly into receiving waters, today more focus is put toward treating the problem on-site.

Practices promote infiltration, over controlling runoff. The common trend is to integrate stormwater management plans directly into new urban designs (low impact developments (LID)), with the aim to increase groundwater recharge in place, before becoming runoff.



Commonly, stormwater best management practices (BMPs) use vegetative controls, such as grass swales, vegetative filter strips, rain gardens and increase permeable surfaces using porous pavements and graveled areas.

With these stormwater management practices, water level dataloggers are useful when deployed in groundwater monitoring wells. Groundwater level fluctuations are observed, and infiltration rates estimated as a result of these practices.

As with monitoring water levels in stormwater basins, monitoring water levels in wells can help determine the effectiveness of the stormwater control measure.

For more details about Solinst Water Level Dataloggers and stormwater, read the full article in our [ON THE LEVEL Blog](#).