ON THE LEVEL

Water Monitoring News and Updates

Solinst®

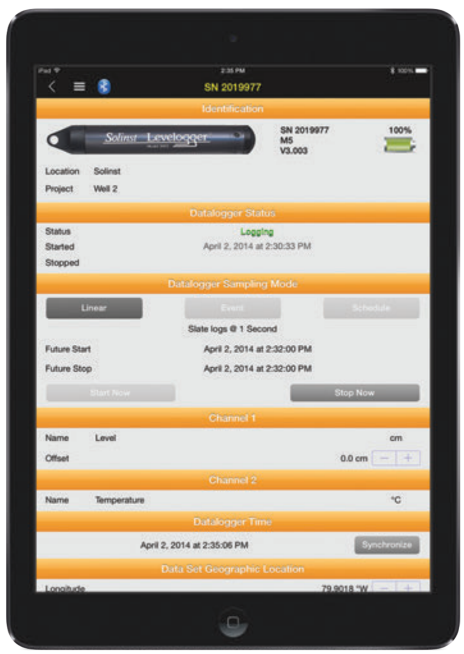
High Quality Groundwater and Surface Water Monitoring Instrumentation

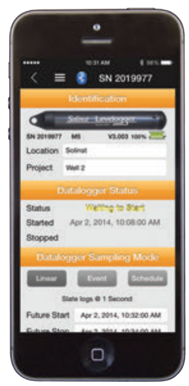
IN THIS ISSUE

Fall 2014

Bridging the Gap Between Solinst Leveloggers and iOS

For years, Solinst has offered convenient PC software for programming the Levelogger Series of dataloggers. Now, Apple® mobile users have another option!





The Solinst Levelogger App can be downloaded to your Apple smart device running iOS 7 (or higher). The streamlined App provides all the same, major programming options available as the Leveloggers PC Software – but right on your iPhone®, iPad®, iPad mini™ or iPod touch®. The Solinst Levelogger App is available to download free from the Apple App Store℠.

The Solinst Levelogger App works with your Leveloggers that are deployed in the field (or connected in the office) with a Direct Read Cable. The Levelogger App Interface threads onto the top of the Direct Read Cable. Using Bluetooth® technology, the Levelogger App Interface pairs with your smart device, creating a wireless connection between your smart device and your Levelogger.

Download on the App Store

...continued on page 7

Biofoul Screens for Leveloggers Make a Difference in Salt Marsh Restoration Project

Salt marshes are unique coastal ecosystems that are regularly flooded by tides. The Louis Berger Group, an internationally recognized consulting firm, is involved in numerous salt marsh restoration projects. Much of their restoration work can be seen in the mid-Atlantic states and New England.

Many of these project sites have been previously filled through development activities, or partially or even completely cut off from the tide. The reduction or loss of regular tidal flushing typically results in the expansion of invasive plants, most notably Phragmites australis, which forms a monoculture of poor ecological function. Salt marshes rank among the most biologically productive habitats on the planet, and significant losses have occurred over the past century. Myriad bird species, small fish, shellfish and microorganisms call salt marshes their home, making salt marsh restoration particularly important.

A Levelogger fouled by Bay Barnacles and Platform Mussels in the Hackensack River, NJ.

...continued overleaf

Biofoul Screens Make a Difference in Salt Marsh Restoration

(continued from page 1)

Berger's restoration work often includes removing fill materials, restoring, and widening channels to reestablish the flow of seawater to salt marshes, followed by planting of salt marsh plant species. Monitoring the results and effectiveness of restoration measures is also conducted. Solinst Leveloggers are being used in many of these restoration efforts in the planning, construction and post-construction stages of restoration projects to monitor the changes in water levels.

The Lincoln Park Wetland Restoration Project was recently completed in the New York-New Jersey Harbor area. Berger restored the Lincoln Park wetland system as part of a project that also saw a nearby landfill redeveloped for recreational purposes. The team excavated landfill debris, reestablished tidal channels, and re-introduced native marsh and coastal scrub-shrub vegetation to restore 42-acres of new wildlife habitat, including 24 acres of tidal marsh, 11 acres of open water/mud flat, 4 acres of scrub shrub habitat and additional areas with pedestrian pathways and bridges along the Hackensack River in Jersey City, New Jersey. This project received the Coastal America 2011 Partnership Award.

A number of Leveloggers were deployed at this restoration site along the Hackensack River as a permit requirement to document tidal hydrology. Over the many months that the Leveloggers were deployed, heavy biofouling was observed on the Leveloggers. Excessive biofouling can affect the Levelogger sensors, compromising their readings. This biofouling included barnacles, mussels, bryozoans, tunicates, and other encrusting invertebrates. Biofouling increased dramatically when the waters warmed up in the springtime and these encrusting invertebrates began spawning.

Levelogger fouled by Bay Barnacles and various other Invertebrates in the Hackensack River, NJ.

During the Lincoln Park project monitoring phase, it was found that regular and frequent cleaning was required to keep the Leveloggers free of biofouling. After soaking the Leveloggers in a diluted acid solution for about one hour, the biofouling was successfully removed. Although this cleaning method was successful, and ensured that the Leveloggers kept recording accurately, it was inconvenient to have to visit the sites so frequently. A solution that could reduce the degree of biofouling and the frequency of site visits was needed.

During the Lincoln Park restoration project, Berger decided to try Biofoul Screens on their Leveloggers. Solinst Biofoul Screens simply consist of a Delrin sleeve wrapped in copper wire. The Biofoul Screens slip on to the sensor ends of the Leveloggers and are held in place with a compression fitting. The copper coiling naturally resists biofouling, while allowing water to freely enter the Levelogger sensor inlets.

The team deployed three Leveloggers, two with the Biofoul Screens, and one without as a control. The Leveloggers were deployed in September 2012.

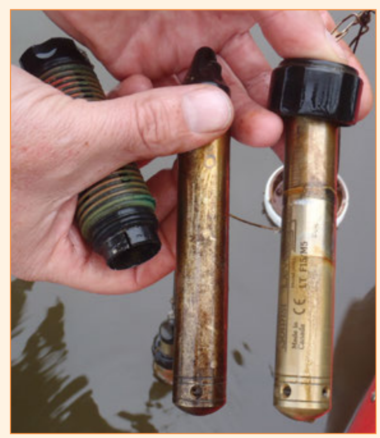
An interesting side note: while the Leveloggers were deployed, they were able to accurately capture the storm surge from Hurricane Sandy as it hit the New Jersey coast in October 2012.

Little biofouling occurred on Leveloggers with Biofoul Screens. The control Levelogger had significant biofouling.

The Leveloggers were checked in December 2012, and no biofouling was observed on either the Biofoul Screens or Leveloggers (including the control Levelogger). The Leveloggers were left deployed over the winter, and were again checked in the spring. No significant biofouling was observed in April 2013.

Biofouling was expected to occur as the water temperatures warmed over the spring and invertebrate spawning commenced. Following the invertebrate spawning and recruitment period, the Leveloggers were pulled from the water.

In all, the Biofoul Screen-protected Leveloggers and control Levelogger were deployed for ten months. The results of the testing were positive. As can be seen in the photos, one of the screened Leveloggers had a few small barnacles on the bottom of the Biofoul Screen, and the other screened Levelogger had one barnacle on the Levelogger above the Biofoul Screen. Neither of the screened Leveloggers had any biological fouling near the copper coils.



The portion of the Levelogger under the Biofoul Screen remains in good condition.

When the Biofoul Screens were removed, the screened portions of the Leveloggers were clearly in much better condition. The control Levelogger, however, did not fare as well. The control Levelogger had the typical biofouling that had been seen in previous monitoring rounds, consisting of barnacles and platform mussels.

Tom Shinskey, Principal Environmental Scientist with The Louis Berger Group, is pleased with the results, saying "biofouling of the Leveloggers in the mesohaline waters of salt marsh restoration sites in the New York-New Jersey Harbor region were costing us extra labor and damaging our Leveloggers. Field testing of the Biofoul Screens through the spawning and recruitment periods of the macroinvertebrate fouling community demonstrated the effectiveness of this device in keeping Leveloggers free of fouling and allowing for their deployment over extended periods."

In the end, the Berger team found a solution that they can use in future monitoring efforts. Biofoul Screens ensure that Leveloggers perform properly; even in harsh saline environments, providing reliable readings over the long term, with less time spent maintaining them.

Acknowledgement: Solinst Thanks Tom Shinskey, Principal Environmental Scientist with The Louis Berger Group, for providing details about these projects.

Flexible CMT System Adapted to Measure Submarine Groundwater

Commonly, we hear of oceans being polluted by spills and contaminated run-off, but these are not the only major sources of contamination to coastal waters. Submarine groundwater discharge (SGD) is the discharge of fresh groundwater from the land into coastal salt water. Attention to this process has grown, as it has been observed that SGD is a major contributor of contaminants to coastal waters, which is resulting in the pollution and eutrophication of vital marine habitat worldwide.

SGD is hard to quantify, and site-specific field measurements are critical to accurately estimate rates of SGD. Universities, researchers and associations across North America have been teaming-up to try to understand this process, part of the broader understanding of groundwater-surface water interactions. This includes the University of Delaware (Delaware Geological Survey), who took the lead in a research project that is looking at how hydrological processes affect SGD, and hence contaminant fluxes into marine habitats.

7-Channel CMT System Wellhead

A. Scott Andres, a hydrogeologist with the Delaware Geology Survey, provided some background information about the project.

With the aid of Solinst CMT Multilevel Systems, their research is looking at the importance of hydrologic processes (such as tides, storms, and climate), and how they control the position of the fresh water-salt water interface in the subsurface and how SGD occurs. They are also looking at how these processes affect the timing and magnitude of water and contaminant fluxes into an estuary.

The study is being conducted in Delaware Seashore State Park, near Millville, Delaware, on Indian River Bay (an estuary). The project also includes participants from the U.S. Geological Survey, NOAA, and the University of Toledo, with funding from a National Science Foundation award. The multi-disciplinary team includes hydrogeologists, geochemists, modelers, and geophysicists, as well as ecologists and microbiologists.

As part of their research, the team installed eight 7-Channel CMT Systems in the bottom of Indian River Bay to monitor the groundwater below the bay. CMT Systems allow groundwater monitoring from multiple depth discrete zones in a single well. Not originally designed for use in open water applications, the CMT Systems were modified to meet the project requirements. A customized drill rig was also used to drill the open holes in the bottom of the bay for the CMT Systems.

The area that they are monitoring in the bay subsurface consists of an 80-foot thick unconsolidated sand aquifer with an overlying

...continued on page 5

Bladder Pumps Simplify Sampling at an Ontario Landfill

Bladder Pump Sampling Setup at the Newalta Stoney Creek Landfill

An environmental monitoring program is an essential part of any successful landfill operation. Monitoring ensures that a landfill is functioning as it should, and that wastes do not migrate off-site or pose potential risks to nearby receptors. Regular environmental reporting ensures that operators comply with the regulations and approvals that govern them.

Landfill Technicians Brad Mullin and Rob Schwartz head the environmental monitoring program at the Newalta Stoney Creek Landfill in Ontario, Canada. With over 21 and 8 years experience, respectively, working for Newalta, they are involved in every aspect of the environmental sampling program at the 59-hectare landfill site. The landfill accepts non-hazardous solid wastes from industrial, commercial, and institutional sources, and has been in operation for approximately 18 years.

Regular groundwater sampling is a part of their environmental monitoring program. There are over 170 monitoring wells at the landfill, which are sampled quarterly. In order to keep up with their reporting requirements, a solution was required for some "hard-to-sample" wells. A number of options were looked at, but in the end, they decided to try Solinst Model 407 Bladder Pumps.

The Model 407 Bladder Pumps appealed to them, as they provide an option for low flow sampling - which they noted is a sampling protocol more commonly accepted by regulators, including the Ontario Ministry of the Environment. They are also familiar with Solinst products, having worked with different Solinst instruments in the past.

What is low flow sampling? Low flow sampling involves extracting ground-water at rates comparable to ambient groundwater flow (typically less than 500 ml/min), so that the drawdown of the water level is minimized, and the mixing of stagnant water with water from the screened intake area in a well is reduced, overall, providing a representative sample.

Initially, there was hesitation to try instrumentation that was new to them, but after visiting Solinst for hands-on training, Brad and Rob have become very comfortable

...continued overleaf

Solinst Equipment Helps Fill Groundwater Data Gaps in EU Funded Project

Testing Solinst Equipment in Georgia

The Environmental Protection of International River Basins is a EU (European Union) funded project with the overall aim of improving water quality in the trans-boundary river basins of the wider Black Sea region and Belarus.

An objective of the project is to improve the availability and quality of water data in the region, including groundwater data, in order to create River Basin Management Plans.

Programming Leveloggers in Armenia

In the Caucasus countries of Armenia, Georgia and Azerbaijan, there are larger groundwater data gaps to be filled. To help resolve this, in April 2013, joint groundwater field surveys and training sessions were conducted in these countries.

Three groundwater experts and water management experts from each country were trained to use Solinst groundwater monitoring equipment, as well as other monitoring and sampling instruments. Their groundwater surveys and training included

...continued on page 7

Bladder Pumps Simplify Sampling at a Landfill

(continued from page 3)

with the equipment. Randy Blackburn, Product Manager with Solinst, demonstrated how to set-up and install the pumps, tubing, and wellhead, as well as how to operate the Solinst Model 464 Pump Control Unit. They were also shown how to simply calculate the amount of pressure and the drive/vent cycles required to retrieve a sample from a specific depth, at the ideal flow rate.

They are very impressed with the service and quick turn-around of information and product that they were provided. In all, six 1.66" diameter stainless steel Model 407 Bladder Pumps were purchased, along with dedicated wellheads for permanent installation of the pumps. A portable Model 464 Pump Control Unit and Solinst 12V Compressor were also purchased to operate the pumps.

The Bladder Pumps were installed in the field quickly and easily. They were able to install all six pumps themselves, with ease. Using a setup of spools, they lowered the drive and sample tubing, and the pump using a Kevlar support line, all at once to the desired depth. On average, the pumps are installed to a depth of 18 m.

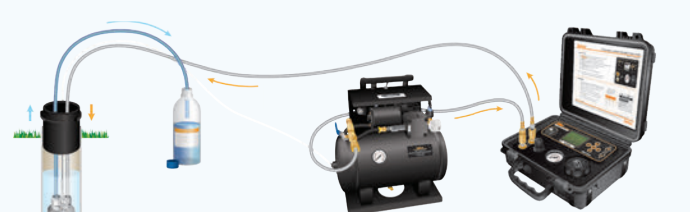
Given that this site experiences cold weather and receives substantial snow, Brad made the choice to include a freeze protection option with the Solinst well caps.

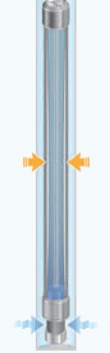
A team of technicians at the landfill performed the installations and the initial sampling rounds, but since, they have found that one technician can just as easily do the pumping on their own. This has become a major advantage of the Bladder Pump setups.

The results of the first round of sampling, as part of their reporting requirements, came this July. Brad noted "the pumping was done without any hick-ups, resulting in good samples obtained by the Bladder Pumps. The lab that processed the samples are also pleased with the samples provided to them."

"From installation to sampling, we are extremely happy with the Bladder Pumps," says Brad, "the entire process has gone very smoothly, without issues." With a section of the Stoney Creek Landfill being redeveloped as parkland, Brad and Rob are looking to add Solinst Bladder Pumps to more of their monitoring wells, especially to monitor in this critical location.

Acknowledgement: Solinst thanks Brad Mullin and Rob Schwartz of Newalta, for providing the details of their experience with Solinst Bladder Pumps.





How does a Bladder Pump work? When a Bladder Pump is placed in well, water rises inside the bladder and sample tubing to static level. Compressed nitrogen or air is supplied to the pump via the drive tubing using a Control Unit. Pressure causes the bladder to compress and closes the bottom check valve, forcing water from the bladder into the sample tubing. During a vent cycle the pressure is released. The bladder returns to its initial state as water refills the pump, while the top check valve prevents water in the sample tubing from falling back into the bladder. Cycling the drive and vent provides water flow.

For more details, view our Bladder Pump video.

Flexible CMT System Adapted to Measure Submarine Groundwater

(continued from page 3)

CMT Systems were Installed Below the Bay Bottom to Monitor Submarine Groundwater Discharge

low permeability mud layer. The CMT Systems were installed with monitoring ports from 3 ft. below the bay bottom down to 55 ft. below the bay bottom. Surface water depths in the bay at the installation points range from 2.5 ft. to 6 ft.

Five to seven sampling ports were created in each system, at different depths. Watertight wellheads had to be custom built to allow for sampling from the surface of the bay. The wellheads are finished right on the bay bottom. Sampling tube assemblies extend right from each sampling port through the well head to the surface, and are long enough to be reached for sampling from a boat at surface. Protective covers on the surface were constructed from barrel ends and chain wrapped corrugated pipe.

From a boat, a peristaltic pump was used to collect samples from each of the sampling tubes. While collecting samples, temperature, pH, Specific Conductance, Dissolved Oxygen, and ORP were measured with the use of a flow through cell. Samples were tested for major ions, nitrogen and phosphorus series, trace metals, tritium, 15N, and N2.

A series of sampling events in the course of just over a year provided data that showed definite depth discrete distributions of fresh and saline groundwater below the bay bottom. “The ability to repeatedly sample multiple depths from a single wellhead or site was critical to characterizing the short-length depth variability of salinity and geochemistry,” said Andres. The results also showed the presence of fresh (Total Dissolved Solids of less than 1000 mg/L) groundwater beneath the bay bottom at distances of more than 750 ft. from shore.

The data is being used to describe relationships between salinity levels and other physical/chemical constituents. It is also being used to develop models to describe nitrogen and phosphorus transformations in fresh groundwater as it discharges into the estuary. Previous models created for Indian River Bay estimated that SGD is responsible for as much as 1/3 of the nitrogen contamination in the estuary.

Although the CMTs are not currently being used for more testing, they remain installed. The process of integrating CMT-derived data with data from seepage meters, pore water sampling, downhole geophysical logging, and long-term monitoring of Specific Conductance, temperature, and pressure in offshore wells is ongoing.

The project team found that using the CMT offered them many advantages. They found the systems flexible, and easy to build and install; “We were pleased with the short learning curve to build and install CMTs and the flexibility to quickly adapt CMT design to our unique sampling needs and field-determined conditions,” said Andres.

According to Andres, accomplishing the same sampling strategy with a number of standard monitoring wells, or custom-built multi-port samplers, was not attainable with the available personnel, budget and timeline of their project. With the CMT, they were able to construct some CMT wells as the drilling was taking place.

Overall, the data derived from this study will be used to verify models, which help explain how different processes control submarine groundwater discharge, the effects on coastal salt waters, and how groundwater and salt water interact in the subsurface. This information can help reduce the potential for groundwater contaminants to enter marine waters.

Andres said these findings will be passed on to inform policy makers and regulators in governmental agencies who are responsible for developing laws and regulations that protect and improve water quality, so that appropriate measures can be taken to bring the State into compliance with the Clean Water Act.

Acknowledgement: Thanks to A. Scott Andres, with the Delaware Geological survey, for providing background information and the details about this project.

Simplified Data Wizard Makes Barometric Compensation Easy

Levelogger data needs to be barometrically compensated to get accurate water levels.

Levelogger dataloggers are self-contained; therefore, they measure total or absolute pressure. That means, when submerged, Leveloggers record a combination of barometric pressure and water pressure above their sensor. Because the goal of Leveloggers is to provide fluctuations in water pressure, their data must be compensated for barometric effects. In order to achieve this, barometric pressure must be subtracted from the Levelogger readings to give actual water level data.

Why is compensating for barometric effects important?

Especially important in long-term monitoring projects, barometric pressure can fluctuate by almost 0.1 m or 0.3 ft. on a typical day. Storm events can reduce total atmospheric pressure by about 1.7% from pre-existing high pressure conditions. This converts to approximately 0.6 ft. or 0.2 m of water level equivalent barometric fluctuation. The best way to correct for these fluctuations is to collect barometric data that corresponds to the Levelogger data. The easiest and most accurate way to do this, is to use a Barologger.

Levelogger Data can be Simply Compensated by Subtracting Corresponding Barologger Data

Using the Levelogger Software, set a Barologger to record at the same interval as your Levelogger – using the Future Start option you can set them to start at the same time.

...continued overleaf

Accounting for Altitude when Compensating Levelogger Data

Barometric Compensation Review

As you know, Leveloggers measure total or absolute pressure. When submerged, they record a combination of atmospheric pressure and water pressure above their sensor. Because the intent of using Leveloggers is to obtain fluctuations in water pressure only, their data must be compensated for atmospheric effects.

In order to achieve this, atmospheric (barometric) pressure must be subtracted from the Levelogger readings. The easiest way to barometrically compensate your Levelogger data is to use a Barologger that simultaneously records this barometric data.

Correcting Levelogger and Barologger Data

Atmospheric pressure can be considered the total weight of air above an object at any elevation. As you go higher in the atmosphere, there is less air above to weigh down the object. This translates to decreasing pressure as you go higher in the atmosphere.

So, what does this mean when barometrically compensating your Levelogger data?

Water column equivalent pressure decreases with altitude at a rate of approximately 1.2:1000 feet or meters **(altitude/826)** in the lower atmosphere below 16,400 ft. (5000 m). Therefore, if the Barologger that you are using to compensate your Levelogger is at a different elevation, there will be different atmospheric pressures associated with their locations.

Generally, you can use a Barologger to compensate Leveloggers within an elevation change of 1000 ft. (300 m) (and within a 20 mile (30 km) radius). If your Barologger and Levelogger are further than 1000 ft. (300 m) apart in height, then you have to consider correcting for this difference to get the most accurately compensated data.

Depending on the accuracy of data that you require, you may always want to consider accounting for altitude differences.

If your Barologger is deployed at a higher elevation than your Levelogger, then your Barologger will be recording a lower atmospheric pressure than what the Levelogger site is experiencing at static water level (atmospheric pressure acts on the static water level above the Levelogger). Before you can accurately compensate your Levelogger data, you need to add this difference in pressure to your Barologger data. The same goes when your Levelogger is deployed higher than your Barologger – you need to add the difference to your Levelogger data.

...continued on page 8

Simplified Data Wizard Makes Barometric Compensation Easy

(continued from page 5)

As a rule of thumb, one Barologger can be used to compensate all the Leveloggers within a 20-mile (30 km) radius and/or with every 1000 ft. (300 m) change in elevation.

Once you are done collecting the data, and have downloaded it, you can use the Levelogger Software Data Wizard to perform an automatic barometric compensation with your synchronized Levelogger and Barologger files.

Now, with the release of Levelogger Software Version 4.1, barometrically compensating your Levelogger data has become even easier. Levelogger Software Version 4.1 includes an improved Data Wizard that provides a more intuitive approach to data compensation. The new Data Wizard has Basic and Advanced compensation options to suit your project and application needs.

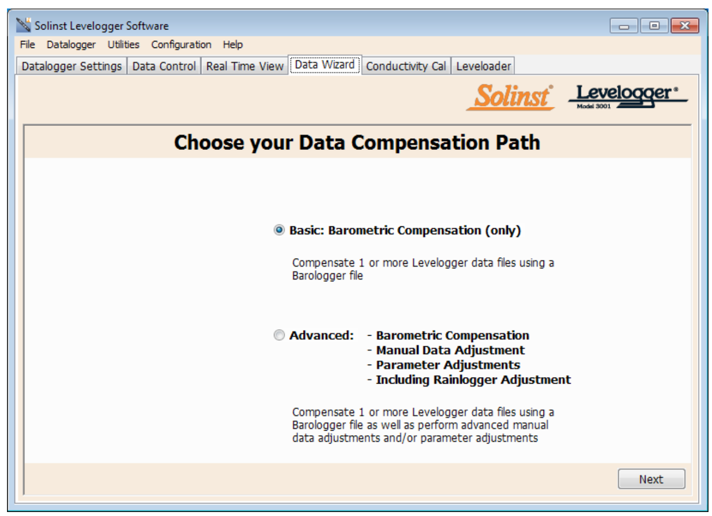
The Basic option is streamlined, allowing you to perform just barometric compensation of your Levelogger data. Simply select the Barologger file you want to use for compensation, and the Levelogger data files you want to compensate – the Data Wizard does the rest. You can compensate multiple Levelogger files using the same Barologger file, at the same time.

You don't have to worry about units of measure (i.e. feet, meters or psi), or worry about using an older Levelogger Gold with the new Barologger Edge, or vice versa. The Data Wizard takes into account any differences in measured units or model offsets.

Have some specific project requirements?

The Advanced option provides the opportunity to perform not only barometric compensation of your Levelogger data, but also change parameters such as the units of measurement, Rainlogger calibration constants, or convert conductivity readings to salinity. You can also adjust data for different altitudes, liquid densities and barometric efficiencies, making your data site-specific.

With the advanced option, you can also use a manual data input to adjust your data from the default height of water above the Levelogger sensor, to depth to static water level readings or elevation of water level readings.



Levelogger Software Data Wizard

Overall, the Data Wizard features more helpful graphics, and is a more intuitive process. In the advanced path, the major compensation options are in separate steps (i.e. Barometric Compensation, Parameter Adjustments, then Manual Data Adjustments). Because it is a systematic process, you complete the compensations as you go, and the final data files will include all compensations selected during the process. This allows you to perform all compensations that you require, at one time, on multiple files.

Whatever your projects requirements are, the new Data Wizard makes it easier to meet them. It is simple to select only the data compensations you want, and allows you to quickly perform a barometric compensation to get the true water level data that you need.

Solinst Equipment Helps Fill Groundwater Data Gaps

(continued from page 4)

Collecting Groundwater Samples in Azerbaijan

equipment programming, reading, and instrument calibration. During field measurements and sample collection (sample preservation and transportation), it was ensured that proper QA/QC procedures were followed.

As part of the surveys, groundwater wells were purged with submersible pumps, and then sampled; sampling included the use of Solinst Bailers. Groundwater levels in the wells were measured using Solinst Model 101 Water Level Meters. Water quality parameters (pH, temperature, conductivity, TDS, and DO) were also measured at the monitoring wells.

Pilot River Basins were selected for the Project in order to create River Basin Management Plans for each. In each of these Pilot Basins, Levelogger Edge dataloggers were preprogrammed and installed in monitoring wells. The local groundwater experts were trained to program the Leveloggers using PC Software, as well as read the data and re-program the Leveloggers in the field using a Leveloader Gold.

The local groundwater experts benefited greatly from the opportunity to use Solinst equipment in the field. The practical training that they received will allow them to continue monitoring the groundwater wells, and fill in the groundwater data gaps on their own. They are now set with field sampling procedures, as well as health and safety and QA/QC protocols.

The groundwater data gained will provide baseline data to include in the development of River Basin Management Plans, and continued monitoring will help ensure the Management Plans are implemented and maintained.

For more information on the Environmental Protection of International River Basins Project, please visit: http://blacksea-riverbasins.net/

Bridging the Gap Between Solinst Leveloggers and iOS

(continued from page 1)

When using this option in the field, it saves you from carrying a more cumbersome laptop to site! If you already have a compatible smart device – this is even more convenient!

Once you are connected to the Solinst Levelogger App, if you already had your Levelogger recording, you can stop it and download the data to view in a graph or list right in the App. The entire log can be downloaded, or you can append it to a previous log. The data log is saved on your smart device, and can be e-mailed to any address from the Solinst Levelogger App.

You can also e-mail real-time data to your colleagues, while you are on site. Real-time data can be viewed and collected, even if your Levelogger is still recording internally. The Solinst Levelogger App automatically saves each real-time logging session.

Alternatively, you can wait until you are back at the office, and transfer the data logs to your PC using iTunes®. The Solinst Levelogger App saves all the data files as *.xle files, which can be imported into Solinst Levelogger PC Software, for further data compensation.

The Solinst Levelogger App also allows you to reprogram (or initially program) a Levelogger in the field, and start it with a new sampling regime. A feature unique to the App, allows you to enter GPS coordinates for your Levelogger's

The Solinst Levelogger App Interface connects to the top end of your Levelogger's Direct Read Cable.

location. This can be done automatically, if you let the Solinst Levelogger App access your smart device's location.

The Solinst Levelogger App has all the same sampling options as the Levelogger PC Software, including linear, event-based, and scheduled sampling. For some Levelogger models you can set a future start time and a future stop time. It also allows you to set your Levelogger Edge with a compressed linear memory, allowing you to save up to 120,000 sets of data points.

If you need to program a number of Leveloggers for the same project, and they all require the same sampling setup, the Solinst Levelogger App also allows you to save a Setting, which can be applied to all the Leveloggers in the project. You can save up to 10 different Settings.

Overall, the Solinst Levelogger App, along with the Levelogger App Interface, provides Levelogger users with an affordable option that is smart-technology-friendly. The App is very intuitive, and can make data collection even more convenient and efficient. It is giving Levelogger users an alternative to brining a laptop PC to the field, and is employing the Apple smart device technology that they may already be using.

Accounting for Altitude when Compensating Data

(continued from page 6)

To simplify things, correcting for elevation differences can be done right in the Levelogger Software. When using a Levelogger Edge, Levelogger Junior Edge, LTC Levelogger Junior, or Barologger Edge, correcting for elevation is done post data collection. When compensating your data using the Levelogger Software Data Wizard, you can select the Advanced option, which allows you to enter the elevations at which your Levelogger(s) and Barologger are deployed.

You can enter elevations between -1000 ft. below sea level and 16,400 ft. (or -300 m and 5000 m) above sea level. The readings will then be automatically compensated for elevation differences. This can be done separately, or simultaneously with Barometric Compensation in the Advanced option of the Data Wizard.

Manual Data Correction

However, if you are manually correcting your data using a spreadsheet program, you will have to do the calculations yourself. Here's an example:

Levelogger is deployed at 500 ft. (AMSL)

Barologger is deployed at 2000 ft. (AMSL)

Your Levelogger is recording at 500 ft. AMSL (above mean sea level). Your Barologger is recording at 2000 ft. AMSL. At the 12:00 am timestamp, your Levelogger Edge recorded 40 ft. and your Barologger Edge recorded 99.9 kPa.

First, determine the difference in elevations:
2000 ft. – 500 ft. = 1500 ft.

Use this to determine the barometric pressure differential:
elevation/826 = barometric pressure differential
1500 ft. / 826 = 1.816 ft.

Since the Barologger is above the Levelogger, you will add 1.816 ft. to your Barologger readings, before proceeding with barometric compensation.

Note: If it were the opposite, and your Levelogger was at 2000 ft., and your Barologger was at 500 ft., you would add 1.816 ft. to your Levelogger readings.

To complete the barometric compensation, first, you have to ensure the Levelogger and Barologger data are in the same units.

Convert your Barologger reading from kPa to ft.:
99.9 kPa x ft. water column equivalent conversion factor = ft. H20
99.9 kPa x 0.335 = 33.467 ft.

Note: for water column equivalent conversions for other units, please see the Levelogger User Guide.

Now add the pressure differential to the Barologger reading:
33.467 ft. + 1.816 ft. = 35.283 ft.

Now subtract the corrected Barologger reading from the Levelogger reading:
40 ft. – 35.283 ft. = 4.717 ft.

Therefore, the true height of water above the Levelogger sensor was 4.717 ft.

Correcting Weather Station Data

The same methodology is a bit trickier if you did not use a Barologger to collect atmospheric pressure data. If you did not use a Barologger to collect readings for compensation, you will have to obtain them from another source – most often, this will be from a weather station.

It is important to remember that weather station barometric data will often contain an offset or normalization. Most weather stations normalize barometric pressure to sea level. In this case, you must determine the difference between the Levelogger's elevation and sea level to get the true amount of pressure acting on static water level.

Using the example of the Levelogger at 500 ft. AMSL and the weather station data normalized to sea level, the difference in elevation is:
500 ft. – 0 ft. (sea level) = 500 ft.

Use this to determine the barometric pressure differential:
elevation / 826 = barometric pressure differential
500 ft. / 826 = 0.6053 ft.

Since the Levelogger is above the weather station in elevation, you will add 0.6053 ft. to the Levelogger readings, before proceeding with barometric compensation.

Note: remember, weather station data may also include an offset, in addition to normalization, that you may have to correct for.

Using Levelogger Gold and Barologger Gold data? Refer to the Levelogger Software Version 3.4.1 User Guide for more information.

Visit the ON THE LEVEL Blog

Visit www.solinst.com/onthelevel-news/
to keep up with regular posts, including case studies, product tips, discussions, and announcements.

Printed in Canada

For further information contact: Solinst Canada Ltd.
Tel: +1 (905) 873-2255; (800) 661-2023 Fax: +1 (905) 873-1992; (800) 516-9081
35 Todd Road, Georgetown, Ontario Canada L7G 4R8
Web Site: www.solinst.com E-mail: instruments@solinst.com

Solinst®