

ON THE LEVEL



Water Monitoring News and Updates

Solinst[®]

**High Quality
Groundwater
and Surface Water
Monitoring
Instrumentation**

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FALL 2006

Introducing the Solinst Levellogger Gold

The Next Generation of Solinst Levelloggers

Solinst is excited about the release of the new Levellogger Gold. The Levellogger Gold is an all-new, Solinst designed, engineered and manufactured Levellogger released this past January. It represents a major leap forward in water level monitoring, with new and improved features, benefits and pricing that position the Levellogger Gold years ahead of its competition. Some of the enhancements over the previous Levellogger include:

- 40% lower list price
- Double the accuracy
- Greater than 5 times the resolution
- Reading stability, an order of magnitude improved
- 67% larger memory in a new more secure non-volatile format
- Battery now lasts 10 years when reading every minute
- Updateable firmware that enables new features released in the future
- New Schedule Mode logging option allows you complete control of sampling rates and run times, in up to 30-step tests
- Easier and more intuitive software that's backwards compatible



Solinst has listened to you in the development of this new Levellogger Gold and incorporated the features and capabilities you need at pricing your budget can afford.

New Enhanced Remediation Device

Researchers at the University of Waterloo have developed a device utilizing a patented technology to allow the enhancement of natural groundwater remediation processes. The device works by providing a regulated, steady application of any amendment material (ie. any chemical or biological stimulant), such as oxygen or hydrogen to encourage aerobic or anaerobic bioremediation.

Manufactured and marketed by Solinst Canada, the Waterloo Emitter provides remediation engineers with a reliable, low-cost device which can be used on its own, or as part of a multi-phase approach to attenuate groundwater contamination.



This technology is based on diffusion principles whereby a concentration gradient is set up between the inside of the Waterloo Emitter tubing and the

Improve results in your next remediation project using the Waterloo Emitter™.

groundwater. A transfer of the amendment (liquid or gas) takes place on a molecular level providing a steady, regulated supply which is critical to the proper growth and sustainability of the natural in-situ microbial population.

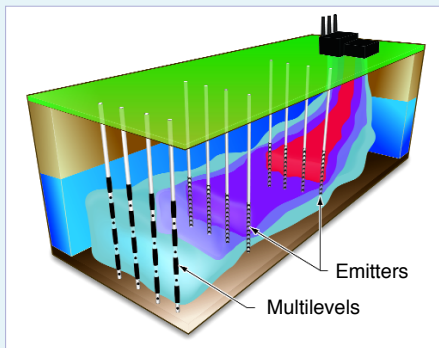
One remediation project showed a 900% increase in dissolved oxygen levels in Waterloo Emitter locations on the site, with an average 150% increase in down-gradient monitoring wells. A resulting decrease in TPH and BTEX levels of 20% to almost 40% was achieved after only three months in this enhanced remediation process.

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New Enhanced Remediation Device (cont'd)

One year later, core concentrations of BTEX and TPH had decreased by greater than 80% in the overburden aquifer and 99% in the bedrock aquifer.

The Waterloo Emitter has now been used effectively in hundreds of remediation projects throughout North America. Available in sizes for use in 2", 4" and 6" wells (50, 100, and 150 mm), the Emitter is easy to install and operate. The Solinst website includes a calculator program to help estimate the amount of oxygen which can be expected to be released into the groundwater for any specific application.



Typical Waterloo Emitter transect installation designed to enhanced natural attenuation. CMT or Waterloo Multilevel systems installed down gradient for Emitter efficiency assessment.

Absolute vs. Vented Pressure

The Solinst Levelogger has always been and continues to be based on an absolute pressure transducer. This means the Levelogger senses and presents all the pressure it is under, both water pressure (hydraulic head) and air pressure (barometric or atmospheric pressure). However, most users are interested in just the water level or hydraulic head, so Solinst offers a separate logger, the Barologger, to sense and log just barometric pressure and use its data to barometrically compensate the submerged Levelogger readings.

The barometric compensation is performed in a simple Data Compensation Wizard in the Levelogger software. As a rule of thumb, one Barologger can be used to compensate all the Leveloggers in a 20 mile (30km) radius, so often a project will need just one Barologger to compensate all the deployed Leveloggers.

The main alternative method of barometric compensation is the use of vented cabling where a very small vent tube runs down the length of cable from the surface and terminates behind the pressure transducer. The vent tube acts as a conduit for barometric pressure change at the surface and allows the barometric pressure on the water column to be cancelled out by the pressure transmitted in the tube. Solinst and its staff have considerable experience in the water level monitoring field with both absolute and vented technologies and chose the absolute method for the Levelogger because:



- It enables a less costly suspension cable or direct read cable deployment than that required for vented communication cable.
- The use of a Barologger produces water level data that is more accurate.
- The barometric data can be used to determine barometric efficiency, which can be very significant, especially in confined aquifers. Vented pressure sensors assume 100% barometric efficiency and provide no data to investigate otherwise.
- The absolute method is practically maintenance and trouble free, whereas the use of vented cable requires, at the very least, annual vent tube maintenance and assessment, the purchase of hydrophobic membranes and desiccants. It requires constant vigilance by the user to ensure the integrity of the barometric compensation method.
- Vent tubing can crimp, become flooded or blocked by moisture, debris or provide a conduit for water to enter the instrument. It creates uncertainty as to whether the barometric compensation system is functioning correctly.
- The absolute method is one reason why the Levelogger's factory calibration is expected to last the lifetime of the instrument. Vented transducers require constant recalibration.

Due to the simplicity and economy of use, the added data tools provided, the long-term maintenance savings, lifetime calibration expectancy and equipment peace-of-mind inherent in the absolute method, Solinst will continue to use this superior method of barometric compensation.

Comparison	Levellogger Gold	Old Levellogger
Backward Compatible	Yes	Yes
Pressure Transducer	Piezoresistive Silicon in 316L Stainless Steel	Ceramic
- Ranges	15, 30, 60, 100, 300 ft, Atmospheric Barologger 5, 10, 20, 30, 100m, Atmospheric Barologger	15, 30, 60, 100, 300 ft. + 5 ft. Barologger 5, 10, 20, 30, 100m + 1.5 m Barologger
- Accuracy (typical)	0.05% net FS \pm 0.010, 0.016, 0.032, 0.064, 0.328 ft. (\pm 0.3, .5, 1, 1.5, & 5cm) Barologger: \pm 0.003 ft. (0.1 cm)	0.1% net FS \pm 0.02, 0.03, 0.06. 0.10, 0.33 ft (\pm 0.5, 1, 2, 3, 10 cm) Barologger \pm 0.02 ft (0.5 cm)
- Accuracy (Max Error)	0.1% net FS - very stable readings Readings fluctuate within 0.01% FS	0.2% net FS Readings fluctuate up to 0.2% FS
- Resolution	Baro: 0.002% FS, M5/F15: 0.001 % FS, Other Ranges: 0.0006 % FS	Baro: 0.1%, All Other Ranges: .02%
- Calibration	Factory – Lifetime calibration	Factory – Lifetime calibration
- Response Time (90% Thermal Δ)	< 1 minute	1 – 3 minutes
- Temp Comp Range	-10 to +40°C	-10 to +40°C
Temp. Sensor	Platinum Resistance Temperature Detector	Spreading Resistance Silicon
- Temp. Accuracy	\pm 0.05°C	\pm 0.1°C
- Temp. Res.	0.003°C	0.01°C
- Op. Temp. Range	-20 - +80°C	-20 - +80° C
Clock Accuracy	\pm 1 minute / year.	< 1 second / day (6 min / year)
Battery Life	10 Years	8 - 10 years
Size	7/8 x 6" (22mm x 154 mm)	7/8 x 4.9" (22 mm x 124 mm)
Weight	6.3 oz (179 grams)	5.7 oz (160 grams)
Memory	40,000 Readings of Level and Temperature. Superior Reliability EEPROM Memory with redundant backup of last 1200 logs	24,000 Readings of Level and Temperature
Logging Rates	0.5 sec – 99 hours	0.5 sec – 99 hours
Logging Modes	Linear, Event & User-Selectable Schedules with 30 items, each with Sec, Min, Hours, Days or Weeks duration	Linear, Event and choice of 3 pre-set Logarithmic style schedules
Barometric Compensation	High accuracy, air-only, Barologger	Barologger - water based
Altitude Input	Range = -980 to 16,400 ft. (-300 to 5,000 m)	Range = -980 to 9,800 ft. (-300 to 3,000 m)
Corrosion Resistant Coating	Zirconium Nitride (ZrN) PVD	None
Other Wetted Materials	Delrin, Viton, Stainless Steel	Stainless Steel, Ceramics, Akulon, Viton
Direct Read Capability	Yes	Yes
Handheld Data Transfer Leveloader	Yes - with Levellogger 2.0 software	Yes
Software Version 3	Many new features Can be translated into other languages	Version 2
Offset	Allows input in range equal to Altitude Range = -980 to 16,400 ft. (-300 to 5,000 m)	Limited input based on transducer range
Firmware Updatable	Yes	Yes

Waterloo Multilevel Network Being Used to Characterize and Develop Remediation Strategy

Since 2002, Solinst has been working with STS Consultants in Green Bay, Wisconsin to provide a total of four Waterloo Multilevel Systems selected to monitor a chlorinated compound release. The release was from a forest products company and occurred decades ago. Chlorinated compounds have permeated the saturated and unsaturated zones and are present in both the overburden and bedrock on site.

The installation of four Model 401 Waterloo Multilevel Systems was conducted as part of a phased investigation. Jim Kauer from STS explains that initially the Solinst Model 425 Discrete Interval Sampler was used to obtain groundwater samples from a 430 ft conventional borehole, enabling identification of zones that contained impacted groundwater. This information combined with geophysical data provided the needed information to design the first of four Multilevel Monitoring Systems.



Completed 7 zone installation showing groundwater sampling using a Model 466 Pump Controller and level measurements using a Readout Box.

The Solinst Waterloo Systems have been installed on or around the site at depths ranging from 430 ft to 790 ft, with most systems monitoring a total of 7 zones. At each zone, ports in the monitoring system were constructed with Double Valve Pumps for groundwater sampling and Vibrating Wire Transducers to measure level fluctuations. The last installation was just completed in March 2006.

The Systems were used to collect representative samples of groundwater for laboratory analysis. STS found that the analysis provided repeatable results. Based on the information collected from the Multilevel Systems, the sampling of conventional wells, and both surface and borehole geophysical testing, a phased remedial approach has been implemented. Interim remedial action consists of pumping of the groundwater from several monitoring wells followed by air-stripping to permit discharge to a treatment facility. Data has demonstrated that degradation of the compounds is occurring through natural attenuation processes. Remedial activity to enhance this process is planned in the coming months.

In addition to providing detailed 3-dimensional data to better characterize this site, the selection of the Waterloo Multilevel Systems has resulted in considerable cost savings for this project. Single boreholes, with multiple monitoring zones, versus clustered conventional wells reduced drilling by over 9000 ft.

Acknowledgement: Solinst would like to thank Jim Kauer of STS Consultants in Green Bay, WI for providing details on the project and equipment performance for this Newsletter.

Technical Training Services

Solinst has training and display rooms, a 5 inch indoor well to 80 ft. (127 mm x 24 m) and an 8 inch outdoor well to 338 ft. (203 mm x 103 m). Solinst provides regular training sessions, either at the Solinst facility or at customer locations, for:

- Customers
- Distributors and Agents
- CMT Installers
- Staff



CMT Training for Parratt Wolff, NY

New CMT Bentonite Packers used by AECL

Solinst is delighted to announce another installation of the New Narrow 3 Channel CMT (Continuous Multichannel Tubing) Multilevel System using bentonite cartridges. The cartridges are designed to seal the interval between monitoring zones and are ideal for direct push applications where the annulus between the CMT installation and the drilled hole is too small to accurately backfill a seal.

This new technology is of particular interest to Direct-Push Installers.

Direct-Push Well Technology has become increasingly accepted as it provides samples of comparable quality to conventional wells in a very cost-efficient manner. The main limitation to this type of technology has been the requirement by many regulatory groups to have a larger annular space in which to backfill seals. This problem can now be overcome with the development of filter packs and clay cartridges for the CMT System. A guidance document just released by the ITRC (The Interstate Technology & Regulatory Council, March, 2006, discusses the advantages of using Direct Push methods and emphasizes that "Direct Push wells can be constructed



3-Channel CMT Bentonite Cartridge

with pre-installed filter packs and the well annulus can be sealed with a pre-installed bentonite sleeve".

Atomic Energy of Canada Limited (AECL) selected the Narrow CMT 3 Channel bentonite cartridge system for an installation on their Chalk River facility. The system was installed to a depth of 80 ft (24 m) in bedrock with three cartridges situated above and below each port to seal the monitoring zone. A week after the installation, the system revealed vertical gradients and differing chemistry between the monitoring zones – proof of the effectiveness of the bentonite cartridge seals. Sampling is being performed using a

peristaltic pump. Stephen Welch, a member of the AECL installation team indicated that the CMT construction and placement went off without a hitch and was "pretty slick". They plan to continue with the installation of more systems this Summer.

In addition to providing bentonite cartridges for the Narrow CMT 3 Channel System, Solinst also offers other accessories. These include sand cartridges to cover the screen area of the monitoring port and flow-through wellhead plugs to facilitate vapor monitoring. The system is entirely constructed at surface and then lowered into the borehole, ensuring accurate seal placement. The 7 Channel CMT system is also available for applications requiring a larger number of monitoring zones or installation in larger diameter boreholes using standard backfilling techniques.

ITRC (Interstate Technology & Regulatory Council). 2006. The Use of Direct-push Well Technology for Long-term Environmental Monitoring in Groundwater Investigations. SCM-2. Washington, D.C.: Interstate Technology and Regulatory Council, Sampling Characterization and Monitoring Team. www.itrcweb.org

Acknowledgement: Solinst would like to thank Stephen Welch of AECL for providing feedback and technical details on the CMT installation.

Solinst Technical Service & Support



Solinst Sales & Executive Team, from left to right: Susan Loit, Tim Foltz, Derek Yates, Jason Redwood, John Buckley, Jean Belshaw, Kirsten Cooper, Sarah Belshaw, Clayton Brown, Jim Pianosi, Randy Blackburn & Jason Nagasawa

Founded in 1975

Solinst began manufacturing its own line of Water Level Meters in 1982 when Doug Belshaw took over the company. His recognition of the needs of the U.S. groundwater professionals to measure water levels in feet and tenths, not feet and inches, was the early inspiration.

From that time on, Solinst has regularly added new items to the product line. The aim has always been to make high quality equipment that is reliable, accurate, simple-to-use, yet innovative. A strong research team and sales staff that understand the needs of our customers are very important in the process.

Solinst believes strongly in good, prompt service, highly trained hydrologists and hydrogeologists to provide technical support, and a website that is a strong resource.