



YSI incorporated

groundwater



Applications & Capabilities

- Aquifer testing
- Down-well sampling & monitoring
- Low-flow purging
- Remote, real-time data acquisition



YSI Locations Worldwide

- 1 San Diego, California, USA
- 2 Baton Rouge, Louisiana, USA
- 3 Yellow Springs, Ohio, USA
- 4 Marion, Massachusetts, USA
- 5 St. Petersburg, Florida, USA
- 6 Logan, Utah USA
- 7 Hertfordshire, England
- 8 Kingdom of Bahrain
- 9 Tokyo, Japan
- 10 Kawasaki City, Japan
- 11 Beijing, China
- 12 Hong Kong, China
- 13 Gurgaon, India
- 14 Queensland, Australia

How Do We Serve the Groundwater Market?

Access to a clean, reliable water source is necessary to sustain population growth and promote economic development. Currently, about 3 billion people, approximately 1/2 of the world's population, depend on groundwater supplies as their source of drinking water, withdrawing about 1,000 km³ annually.

Groundwater not only supplies drinking water for the global population, but also provides water for industrial and agricultural uses. Much of the world's irrigated crops rely on groundwater for production. Therefore, access to clean groundwater is more than a drinking water issue, but also a food supply issue.

All of this consumption does not come without consequences. Major problems that dominate current groundwater use include depletion caused by over pumping resulting in decreased yields, a rise in groundwater extraction costs as the most accessible sources are depleted, deterioration in the quality of the water due to saltwater intrusion and contamination from agricultural and industrial activities, degraded ecosystems, and land subsidence. (continued)



On the cover:

Farming alfalfa in Saudi Arabia with circle pivot irrigation, fed by wells pumping fossil water from an aquifer.

Applications & Capabilities

groundwater



In order for the global community to maintain its population growth, we need sustainable management of our groundwater resources.

YSI is committed to providing cost-effective monitoring and sampling solutions to help groundwater professionals meet this challenge. Our technologies offer real advantages that result in real savings.

Whether you require a handheld instrument for spot sampling down well or in a flow cell, a level instrument for aquifer tests, or an instrument for long-term monitoring with optional real time data acquisition, partnering with YSI provides you high quality data, field-worthy equipment, and low maintenance costs.

Another advantage in working with YSI is direct access to our knowledgeable technical support staff that is committed to helping you succeed in your job.

Thank you for your interest in YSI products. Please contact us if you have any questions, comments, or suggestions.

Tim Grooms
Global Business Development Manager

Applications

- Aquifer testing/monitoring
- Down well spot sampling/monitoring
- Low-flow purge tests with a flow cell
- Remediation monitoring
- Unattended real-time studies
- Aquifer storage/recovery monitoring

Parameters

Level, dissolved oxygen, pH, conductivity, temperature, salinity, ORP, turbidity, nitrate, chloride, alkalinity, hardness, meteorological sensors, total dissolved solids



Pressure transducers



Parameters

Level, pressure, temperature

Applications

- Groundwater/aquifer testing and long-term monitoring
- Aquifer storage and recovery monitoring
- Resource management
- Pump, slug, step, and recovery tests
- Soil Vapor Extraction tests
- Leachate monitoring

YSI's **Level Scout™** contains a highly accurate pressure transducer in a field-rugged housing. Accurate measurements, rugged housings and connectors, and easy data management make the Level Scout ideal for your next level monitoring application.

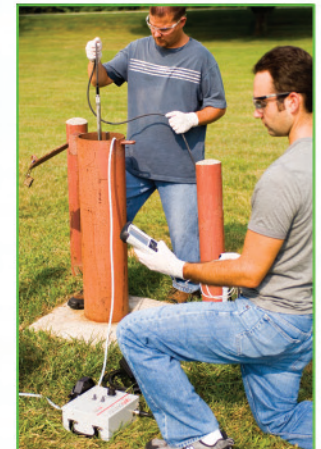
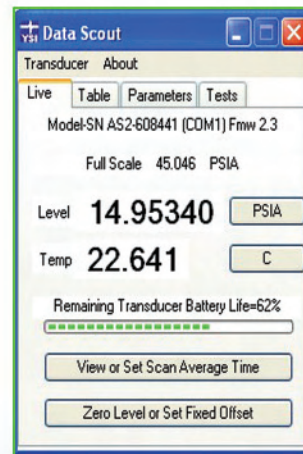
How this helps you:

- User-replaceable batteries prevents costly down-time
- Fastest sampling rate in the industry at 15 readings per second
- Battery life exceeds 3 years at 15 minute intervals minimizing maintenance requirements
- Built in sampling modes save time in instrument setup. Sampling modes include linear, linear average, logarithmic and event - triggered.
- 2-year warranty on instrument and cable protects your investment

level scout

The YSI Level Scout is available as

- vented or absolute
- stainless steel or titanium
- 2 mb (± 1.0 °C) or 4 mb (± 0.2 °C) of memory



Use the Level Scout in the field hooked up to your laptop or Pocket PC with Data Scout software to view live data, setup tests and download data.

Level measurements provide the fundamental source of knowledge for highly dynamic groundwater systems. Hydrologic stresses on these systems affect recharge rates, specific capacity and transmissivity.

Long-term water level measurements provide data to evaluate, develop, design, implement, and accurately monitor the effectiveness of groundwater use and management decisions.

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The human population currently withdraws approximately 1,000 km³ of groundwater annually.

Field Cable Selection Guide

711 - polyethylene jacket for use with stainless steel Level Scouts

721 - ETFE jacket for use with stainless steel Level Scouts

731 - polyethylene jacket for use with titanium Level Scouts

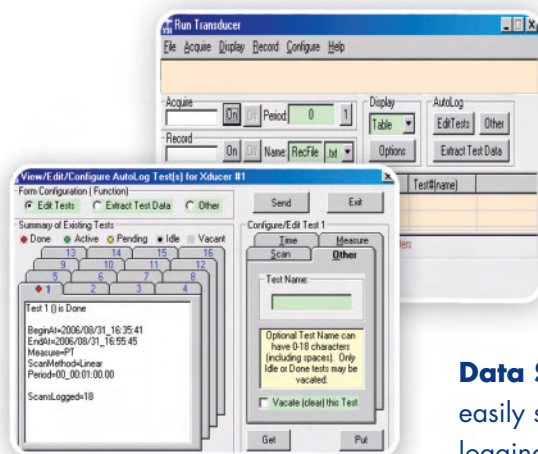
741 - ETFE jacket for use with titanium Level Scouts

Field cable with in-line vent filter



Life time vent filter with internal Silica dessicant
• Waterproof vent lets air in, but keeps water out

Level Scout shown with new, in-line vent filter



Data Scout™ allows you to easily set up 16 independent logging tests, display real time data, download data from multiple level scouts and configure alarms. **Data Scout Mobile** can be used on Pocket PCs.

Data Scout Advanced can perform all these functions plus display graphical data and correlate barometric pressure data. All 3 software programs are included with the Level Scout.

*ETFE is more chemically resistant than polyethylene. Select ETFE for use in contaminated deployment sites.

Down-well sampling & monitoring



Parameters

Dissolved Oxygen (polarographic, galvanic, optical), pH, ORP, conductivity, salinity, temperature, total dissolved solids, turbidity, ammonium, nitrate, chloride

Single, dual and multiparameter handheld sampling

Sampling Single Parameter Sampling

Professional Plus* offers many measurement possibilities including single-parameter options for conductivity, salinity (60530), DO (60520), ISEs (60510) and temperature.

Pro20 is a basic handheld for DO and temperature.

ProODO® measures DO using optical technology.



Pro Plus

Pro20

ProODO

Dual Parameter Sampling

Professional Plus* offers extreme versatility with dual parameter cables for ISE/ISE (6051010), ISE/Conductivity (6051030), ISE/DO (6051020) or DO/Conductivity (6052030).



1030 or 2030 cable**

1010 or 1020 cable**

Multiparameter Sampling

Professional Plus* with the multiparameter Quatro cable measures dissolved oxygen, conductivity, salinity, temperature and any two (pH, ORP, ammonium, nitrate, or chloride.) Compatible with flow cell 606850.



605790 Quatro cable**

606850 Quatro flow cell

6820 V2 Sonde is a sampling system that can measure up to 15 parameters. Ideal for multiparameter sampling with turbidity. Choose between 1 and 2 optical ports. (Not shown)

The EC300 being used to check for saltwater intrusion in drinking water wells in tsunami-affected areas



*The Pro Plus instrument can accommodate various cables: 60510 (ISE), 60520 (DO), 60530 (conductivity), 6051010 (ISE/ISE), 6051020 (ISE/DO), 6051030 (ISE/conductivity), 6052030 (DO/conductivity), and 605790 Quatro (ISE/ISE/DO/conductivity). Visit YouTube.com/YSInc to view a Pro Plus ordering guide.

**Cable and bulkheads shown without sensors. Order sensors separately.

Quickly and conveniently capturing water quality data through spot sampling can provide immediate knowledge of the condition of local groundwater parameters.

Long-term monitoring provides a broad understanding of monitoring well conditions during all phases of ground water fluctuations. Plume delineation and

pollutant transport are best understood through long-term data analysis.

Monitoring

Parameters

Dissolved oxygen (polarographic, optical), pH, ORP, conductivity, salinity, temperature, total dissolved solids, turbidity, level

Worry-free long-term monitoring

Unattended, long-term monitoring is the most effective way to provide valuable ground water data. Understanding variations in groundwater fluctuations and characteristics allows for

more effective trending and modeling analysis. YSI instruments log data at user-selectable intervals providing users with the flexibility to gather worry-free unattended data.



Level Scout

ideal for long-term level monitoring. Connect a whole suite of Level Scouts to a remote data acquisition system for large scale monitoring or use units individually to log data internally. Field-replaceable batteries with 3-year battery life keeps units in the field. Access data without removing from the field.



600LS

sondes are ideal for salt water intrusion studies that require accurate level and conductivity measurements. The 600LS can be easily connected to data collection platforms or log and store 150,000 readings at user-selectable intervals.



600XLM

sondes are versatile and ideal for unattended data collection. Measure dissolved oxygen, conductivity, salinity, pH, ORP, vented level, and temperature.



6920 V2 Sonde is a 15-parameter logging system; battery powered for long-term, in situ monitoring. Choose between 1 and 2 optical ports.

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Comprehensive data on groundwater resources and pollution trends are not readily available at the global level.



Well Size Accommodation

	1"	2"	4"	6"
6600 V2				•
6920 V2			•	•
6820 V2			•	•
600XLM		•	•	•
600XL		•	•	•
600LS		•	•	•
Level Scout	•	•	•	•
ProODO		•	•	•
Pro20		•	•	•
10, 20, 30*		•	•	•
1030, 2030*		•	•	•
1010, 1020*			•	•
Quatro*			•	•

*Quatro, 10, 20, 30, 1030, 2030, 1010, and 1020 all refer to cables that would need to be connected to the Pro Plus. The 20 cable can also be used on the Pro20 which is also listed.

Parameters

Chromium, copper, hardness, iron, nitrate, nitrite, turbidity, zinc and more

Simple:
Insert blank.
Insert sample
with reagent.
Get data.

Photometer



How this helps you:

- Choose from 100+ test choices to give you an all-in-one portable lab
- Non-toxic reagents won't harm you or the environment
- Included carrying cases protect your investment
- USB connection lets you download data

A portable lab with full photometer capability that is waterproof and rugged for the field.

9500

On-screen instructions lead you through a selection of tests for a direct concentration reading. Stores 500 sets. USB. User-options.

9300

This durable unit is the simplest way to test your water samples.

Low-flow purging



Parameters

Dissolved oxygen (polarographic, galvanic, optical), pH, ORP, temperature, conductivity, salinity, turbidity, total dissolved solids, nitrate, ammonium, chloride

Parameter stabilization monitoring above ground ensures representative sample collection

Generally, water in the well casing is not representative of the formation water and typically needs to be purged prior to the collection of water samples.

Low-flow purging has the advantage of minimizing the mixing between overlying stagnant water and water within the screened interval.

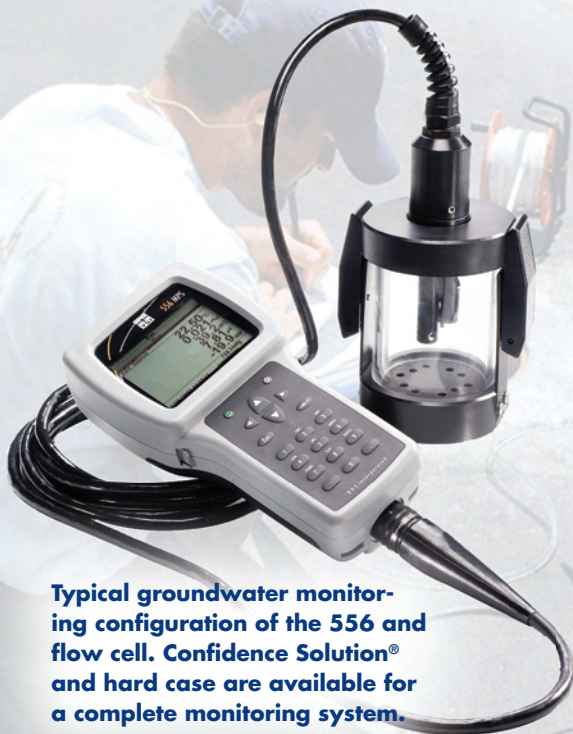
Low-flow advantages include:

- minimal disturbance
- minimal drawdown
- better sample consistency
- representative samples of the mobile load of contaminants
- decreased water waste
- reduced filtration need requiring less field time



605000 Pro Plus

Professional Plus and 556



Typical groundwater monitoring configuration of the 556 and flow cell. Confidence Solution® and hard case are available for a complete monitoring system.



605790 Quatro Cable
This multiparameter cable for the Pro Plus instrument allows you to measure temperature, conductivity, salinity, dissolved oxygen and your choice of any two ISEs - pH, ORP, ammonium, nitrate or chloride.



606850 Quatro Cable Flow Cell



3074 Hard-Sided Carrying Case

The overall goal of any groundwater monitoring program is to collect unaltered water samples to provide the highest quality data possible. In order to achieve this objective, the

collection of data must be truly representative of the site conditions. The use of low-flow purging and its methodology provides the least disturbance possible to meet this goal.

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The United States uses 83.2 billion gallons per day of fresh ground water from approximately 15.9 million water wells.

Flow Cell Guide

Instrument	Parameters	Flow Cell	Displaced Volume (mL)*
Pro Plus w/ Quatro	DO, Temp, Cond, pH, ORP	6850	165
Pro Plus w/ various cables**	Dependent on cable	3059	185 or 195
556 MPS	DO, Temp, Cond, pH, ORP	5083 or 3059	475 or 200
600XL/XLM	DO, Temp, Cond, pH, ORP	5083 or 3059	470 or 185
600XL/XLM V2	Optical DO, Temp, Cond, pH, ORP	3076	250
6920 V2	Optical DO, Turbidity, Temp, Cond, pH, ORP	6160	950
ProODO	Optical DO, Temp	3076	360

Sondes

All Version 2 (V2) sondes accept our V2 optical sensors and have a rugged design for harsh monitoring conditions. The optical dissolved oxygen and turbidity sensors have independent wipers to prevent sediment or bubbles from affecting data collection.

How this helps you:

- Wiped sensors ensure data accuracy during flow cell monitoring
- Multiparameter data collection quickly determines well stability of all necessary parameters without the need of a second instrument

6920 V2 Sonde (shown at right) is a 15-parameter system with memory and wiped optical sensors for turbidity and dissolved oxygen. Choose between 1 and 2 optical ports.

6820 V2 Sonde (without memory) is also available.

600XLM sonde measures temperature, dissolved oxygen, pH, ORP, and salinity and can be programmed to log data at any interval or send data in real-time to the handheld Model 650 display.



Wiped fouling protection for DO, pH, ORP, and turbidity sensors ensures accurate data collection.

* Displaced volumes are given with the sensors installed.

** Single port cables require the 3078 adapter kit.

Low-flow purging (cont.)



Application Note

USEPA Office of Research and Development, Office of Solid Waste and Emergency Response developed and published a document entitled Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures (Publication EPA540/S-95/504). Since then, the use of low-flow sampling in ground water has increasingly been used to support site assessment and remedial performance monitoring objectives.

Low-flow sampling is conducted by setting the intake velocity of the sampling pump to a flow rate that limits drawdown inside the well casing. Sampling at the prescribed (low) flow rate has three primary benefits:

- It **minimizes disturbance of sediment in the bottom of the well**, thereby producing a sample with low turbidity. Typically, this saves time and analytical costs by eliminating the need for collecting and analyzing an additional filtered sample from the same well.
- This procedure **minimizes aeration of the groundwater** during sample collection, which improves the sample quality for VOCs.
- The procedure significantly **reduces the volume of groundwater purged from a well** and the costs associated with its proper treatment and disposal.

Many state agencies encourage the use of low-flow sampling because it's designed to collect a sample that most truly represents the water in the screened section of the aquifer surrounding the monitoring well. It does not come from water that is mixed within the well by a bailer or internal sampler, nor does it come from an average of water that flowed the full length of a long screened interval.

In summary, low-flow sampling reduces the physical and chemical stresses, reduces the variability in sample procedures, increases the ability to determine well stabilization by continuously monitoring water quality parameters, and reduces the chance that changes in chemical concentrations are induced by the sampling technique.

Many state agencies encourage the use of low-flow sampling because it's designed to collect a sample that most truly represents the water in the...aquifer...



Examples of flow cell monitoring for groundwater contamination reporting purposes both indoors and outdoors.

Remote data acquisition

More than 1 billion people in Asian cities and 150 million in Latin American cities rely on groundwater.

Parameters

Dissolved oxygen (polarographic, optical), conductivity, salinity, pH, ORP, temperature, total dissolved solids, level, and meteorological sensors

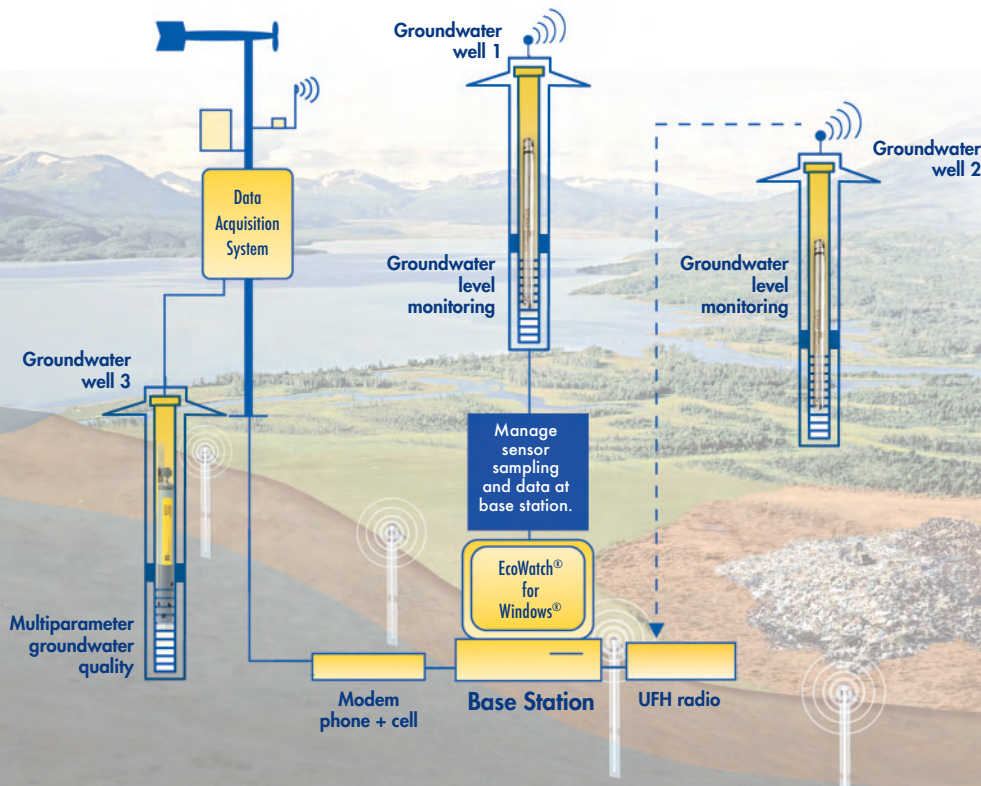
Virtually eliminate site visits

Unattended Monitoring and Data Acquisition



With radio telemetry and web-enabled YSI EcoNet, you can make instant, meaningful decisions without the need for additional costly resources or time-consuming trips to the field. Instruments throughout

your system send a continuous stream of data to YSI EcoNet hardware, which automatically transmits the information to a secure server and posts the data directly to a customizable website.





Who's Minding the Planet?[®]

Visit our web site to request a quote or find more information
www.yei.com/groundwater
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Or contact our customer and technical support teams

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ISO **9001**
ISO **14001**
(Yellow Springs, OH facility)

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Mixed Sources
Product group from well-managed forests, controlled sources and recycled wood or fiber
Cert no. SW-COC-000897
www.fsc.org
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Application Notes

visit yei.com/applications

- A579 - Guarding the Guardian: YSI Level Scouts Help Protect the Sphinx
- A572 - Miami Conservancy District Conjunctive Water Management
- A562 - YSI Equipment Monitors Groundwater Remediation Project
- A518 - Landfill Monitoring with YSI Instruments



Videos

visit youtube.com/ysiinc

View product demos, ordering guides, instrument installations and much more.



Community

visit companies.to/ysi/ or search

YSI on Facebook and become a fan

Be part of the conversation and enjoy information not available on the web site.



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visit twitter.com/ysiinc

ECO CALCULATIONS REPORT

YSI, Inc. saved the following resources by using New Leaf Opaque made with 100% post-consumer recovered fiber.

trees	energy	greenhouse gas	waste water	solid waste
3	1 million BTUs	241 lbs CO ₂	1,159 gal	70 lbs

www.newleafpaper.com