

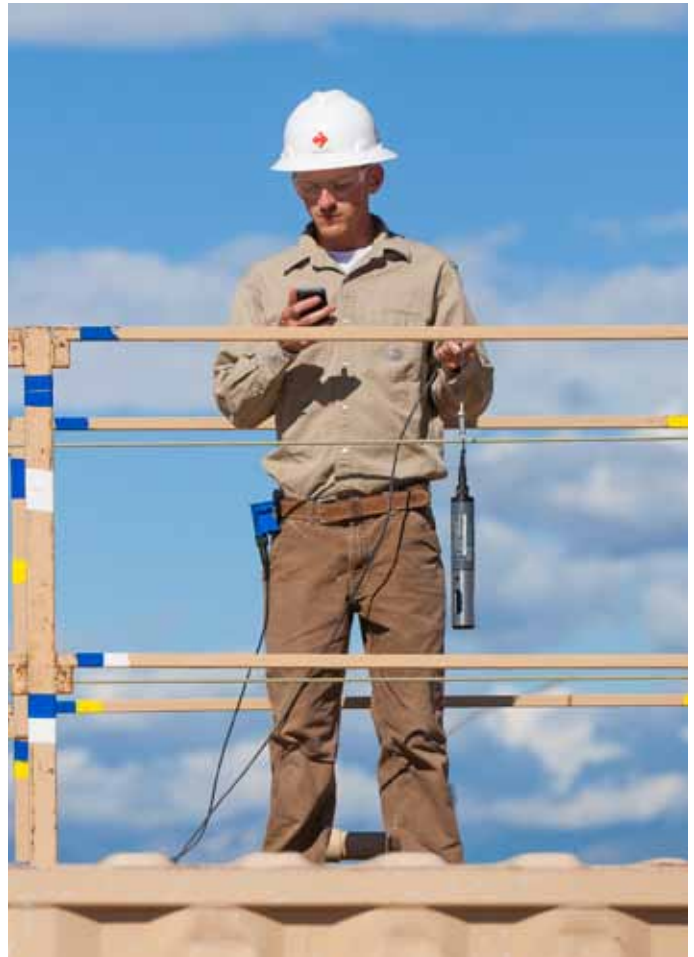
Instrument Selection Guide

Advanced Technologies and Best Practices Improve Operational Efficiencies and Regulatory Compliance

With recent innovations in hydraulic fracturing and horizontal drilling, the U.S. is experiencing an energy renaissance. The U.S. Energy Information Administration predicts that shale gas production will rise from 23 percent of U.S. natural gas production in 2010 to 49 percent in 2035 and that tight oil production will rise from just over 1.2 million barrels per day in 2011 to 2.8 million by 2020.¹

Whether regulations or public pressure are at play, operators are under intense pressure to: measure water use; safeguard the quality and quantity of regional water resources; and recycle water for reuse. By proactively sampling and monitoring water chemistry and quantity, operators, consultants, and other stakeholders can more effectively:

- Characterize and monitor ground- and surface-water resources for withdrawal permits.
- Establish baselines and monitor water quality changes in ground- and surface-water sources near facing sites pre-drill and post-completion for greater regulatory compliance.
- Assess hydrogeologic properties for use in the design of wastewater/completion pits and leak detection systems.
- Monitor chemistry and levels in storage systems containing produced fluids to optimize completion schedules. Real-time systems (telemetry with alarming capabilities) improve decision-making and response time.
- Detect methane and stimulation fluids in groundwater with real-time surrogate monitoring.
- Monitor reservoir pressure and pump performance.
- Evaluate long-term impacts to watersheds.



In-Situ Inc. offers solutions for managing water resources at critical points throughout the life cycle of a hydraulically stimulated well. Real-time monitoring allows you to collect decision-quality data for efficient process control.

With In-Situ equipment, you can comply with regulations, shorten completion times, optimize operations, reduce risks, improve production outcomes, and lower costs. In addition to efficiency gains, greater transparency through disclosure of information about the quality and disposition of water resources can improve your performance, reputation, and social license to operate.

¹ U.S. Energy Information Administration, EIA Annual Energy Outlook 2013

In-Situ® Inc.'s Solution Selection Guide

Application	DO	EC, TDS	pH, ORP	Temp	Turbidity, TSS	Water Level	Barometric Pressure	Recommended In-Situ Solution
Development Phase—Resource Appraisals and Hydrogeological Assessments								
Aquifer Characterization Using Zonal Isolation				✓		✓		Vented Level TROLL® 700 with packer system
Baseline Water Quality Sampling	✓	✓	✓	✓	✓	✓	✓	Low-Flow Groundwater Sampling System: 1. SMARTROLL™ Multiparameter Handheld with mobile interface and turbidimeter 2. TROLL 9500 Water Quality Instrument with turbidity sensor
Depth to Water Measurements						✓		Rugged Water Level Tape
Slug Tests						✓		Vented or non-vented Level TROLL Data Logger
Pumping Tests						✓	✓	Virtual HERMIT® Aquifer Test Kit with Level TROLL 700 and BaroTROLL® Data Loggers
Production Phase								
Leak Detection System		✓		✓		✓		Aqua TROLL 200 Data Logger
Stream Gages—Pass-by Flow Limits				✓		✓		Level TROLL 700H Data Logger meets OSW specification of ±0.01 foot
Storage Systems—Freshwater Level Monitoring				✓		✓		Level TROLL 500 Data Logger
Storage Systems—Produced Fluid Level Monitoring		✓		✓		✓		Vented Aqua TROLL 200 Data Logger with dynamic density correction for high-accuracy fluid level measurements when blending source water
Supply Well Monitoring		✓		✓		✓		Freshwater: Level TROLL 500 Data Logger Brackish Water: Vented Aqua TROLL 200 Data Logger with TDS derived from EC
Long-Term Monitoring								
Groundwater Quality Sampling	✓	✓	✓	✓	✓	✓	✓	Low-Flow Groundwater Sampling System: 1. SMARTROLL Multiparameter Handheld with mobile interface and turbidimeter 2. TROLL 9500 Water Quality Instrument with turbidity sensor
Long-Term Groundwater Quality Monitoring	✓	✓	✓	✓	✓	✓	✓	TROLL 9500 Water Quality Instrument
Long-Term Groundwater Level Monitoring				✓		✓	✓	Economical, Non-Vented System: Rugged TROLL 200 and Rugged BaroTROLL Data Loggers, >1" OD High-Accuracy, Vented System: Level TROLL 500 Data Logger, <1" OD
Reuse and Treatment System Monitoring		✓	✓	✓		✓*		Aqua TROLL 400 Multiparameter Instrument
Surrogate Monitoring for Stimulant Fluids or Methane	✓	✓	✓	✓		✓*		Aqua TROLL 400 Multiparameter Instrument



In-Situ water level loggers with built-in 4-20 mA and RS485/Modbus integrate into telemetry, SCADA/PLC, or controllers.

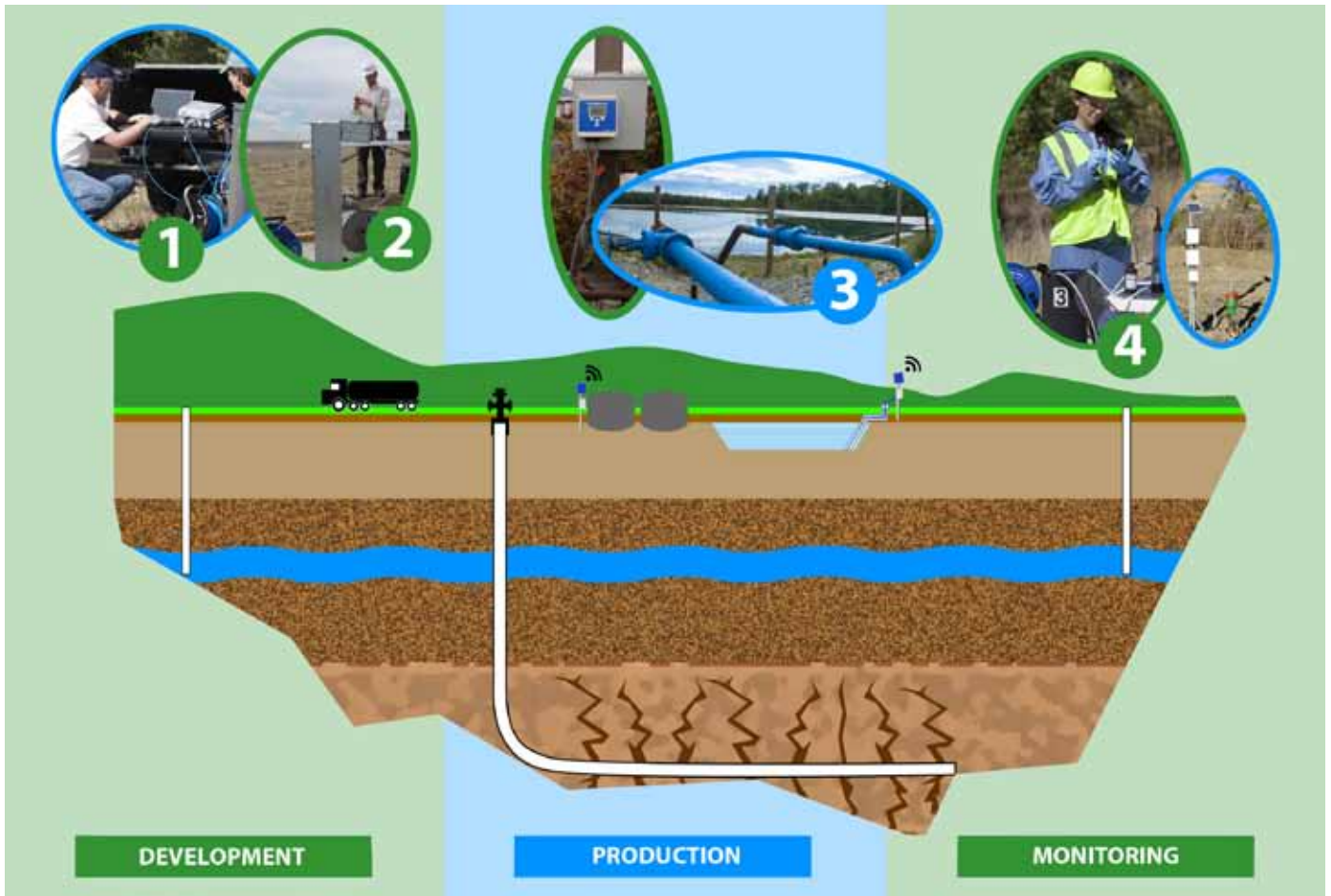


For continuous water quality and level monitoring, integrate an Aqua TROLL 400 Multiparameter Instrument into telemetry, SCADA/PLC, or controllers. Real-time process control reduces chemical costs for treatment and alarms notify you of changing conditions.



Use the SMARTROLL Handheld for baseline groundwater sampling and routine spot checking. Mobile interface eliminates training time.

Stay informed 24/7. Choose from in-well, compact solar, and multi-instrument telemetry systems.



Key water monitoring points at a resource extraction site: 1) source water characterization and watershed monitoring; 2) baseline groundwater quality sampling; 3) real-time level and chemistry monitoring of production water and leak detection; 4) routine water quality sampling and reservoir pressure monitoring.



Monitor an entire well field with the Virtual HERMIT® Aquifer Testing Kit and reduce post-processing time.



Eliminate training time with the SMARTROLL™ Low-Flow Sampling System. Email reports from the field to your office.



For more information, contact In-Situ Inc.

221 East Lincoln Avenue, Fort Collins, CO 80524
 1-800-446-7488 (toll-free in U.S. & Canada)
 1-970-498-1500 (international & domestic)

www.in-situ.com

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