

River Catchment Study for Total Pollutant Load Calculation

Devon and Cornwall, UK
Case Study



Expertise in Sampling

Benefits of the 3700 Portable Automatic Sampler:

- Lightweight, compact, and robust
- Environmentally sealed controller (IP67)
- Powerful peristaltic pump (7.5 m)
- Non-contact liquid detector ensures accurate and repeatable sample volume
- Basic and extended programming modes:
 - Uniform time
 - Non-uniform time
 - Flow
 - Flow paced/time switched
 - STORM
- Sequential (24 bottle) or composite sampling bottle configurations
- Thick, foamed-in-place insulation and twin-wall design provide maximum performance in sample preservation.



3700 Full-Size Portable Automatic Sampler

"Your Source for Samplers!"

Six Teledyne Isco 3700 Portable Automatic Samplers and 2150 Area Velocity Flow Modules are deployed alongside five tributaries of the River Tamar in Devon and Cornwall, UK. The purpose of this study is to give a comprehensive understanding of how each sub-catchment area contributes to the total pollutant loads.



The 3700 Portable Automatic Sampler and the 2150 Area Velocity Flow module deployed together on the River Kensey

Background and Goals

South West Water enlisted the Westcountry Rivers Trust (WRT) to help with a major catchment management project called Upstream Thinking. The overall goal of the project is to improve the quality of the raw surface water in the River Tamar long before it reaches the drinking water treatment plant at Plymouth. Cleaner water in the Tamar will benefit wildlife and fish along the river corridor and will also lead to significantly reduced treatment costs.

The main water quality issue of the River Tamar is high levels of suspended sediment via surface runoff and land use practices. Risk assessments and modeling have been undertaken to predict which sub-catchments areas are likely to be contributing the highest loads in order to target the most effective place to apply mitigation measures. To ensure assessments and models are correct, it is important to gather real field data during storm events. Therefore, the WRT needed to monitor both the water quality and quantity of the five main tributaries of the River Tamar over a temporary period of time.

Site Requirements

The WRT needed fully portable equipment that could be deployed easily at sites with no permanent infrastructure. As the rivers here were very flashy, there was a risk that the instrumentation could be submerged – so it had to be fully water proof.

RS Hydro, a Teledyne Isco distributor in UK, recommended the use of the ISCO 2150 Area Velocity Flow Modules to measure flow in tandem with the 3700 Portable Automatic Sampler. This combination not only provides accurate flow measurement and robust, reliable sampling, but importantly is portable and can be deployed at each of the six sites chosen without needing specialized hardware. For this study, the flow sensor and sample intake were fixed to a paving slab that was pinned to the river bed. The sampler unit was chained to a nearby tree and the 2150 battery and flow module were secured in a vented Peli-Case.

Benefits of the 2150 Flow Module:

- Portable and flexible Area Velocity flow logging
- Rugged, sealed and submersible enclosure (IP68)
- Reliable, accurate and stable flow measurement for water levels up to 1500mm
- Digital sensor and communication
- Variable rate data storage lets you change the data storage interval when programmed conditions occur. This feature assures maximum information about an exceptional event – such as an overflow – while conserving power and data capacity during normal conditions
- The quick-connect sensor can be easily removed and interchanged in the field without requiring re-calibration.
- Flexible and modular system can stack up to four 2100 Series flow modules or communication modules like 2103G/ 2105G
- Secure data storage
- Flowlink 5 software for data analysis, graphs, editing and diagnostics



2150 Area Velocity Flow Module

Teledyne Isco 3700 Portable Automatic Sampler

The robust 3700 Portable Automatic Sampler (IP67) was ideal for this application as the WRT wanted reliable units that were easy to operate and maintain and designed with remote, portable deployment in mind. The 3700 Portable Automatic Sampler can collect sequential or composite samples based on time, flow rate, or storm events.

The durable peristaltic pump technology includes the exclusive non-contact LD90 liquid presence detector which gives automatic compensation for changes in head height, plus automatic suction line rinsing to prevent cross contamination. The liquid detector is not affected by changes in conductivity, viscosity, temperature, or liquid composition.

Teledyne Isco 2150 Area Velocity Flow Module

Teledyne Isco Area Velocity Flow Modules use continuous wave Doppler technology to measure mean velocity. The sensor continuously transmits an ultrasonic signal and measures the frequency shift of the returned signal reflected by air bubbles and particles in the flow. A differential pressure transducer in the sensor measures liquid depth to determine flow area. Flow rate is then calculated by multiplying the area of the flow stream by its average velocity. For this application the 2150 was ideal as it could provide accurate flow information from a temporary installation without needing alterations to the river channel such as V-notch weirs or flumes.

Customer feedback

Nick Paling from Westcountry Rivers Trust was pleased that the Teledyne Isco monitoring equipment obtained from RS Hydro in UK was tough, reliable, and flexible.

“The compact samplers and flow modules are perfectly suited to our need and we have captured good and useful results from storm events during the monitoring campaign. It is a kit that can be deployed rapidly and flexibly into almost any riparian corridor, while placing minimal demands on our limited field-based resources and, importantly, having the minimum visual impact at the monitoring sites. The samplers have also proved to be robust and reliable when deployed and have withstood all of the occasionally extreme conditions that the Westcountry’s rivers have had to throw at them!”



3700 Portable Automatic Sampler in action on the River Inny

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