# Runoff Reduction BMPs

## Real-time continuous monitoring captures episodic events

***By Christopher J. Heyer & Robert McClure***

Under proposed U.S. Environmental Protection Agency (EPA) storm water runoff guidelines, construction site operators will be required to actively monitor or sample storm water discharges daily. The enhanced effluent rules were set to take effect in August 2011 for construction sites that disturb 20 or more acres and February 2014 for sites that disturb 10 or more acres, and they may stipulate a strict numerical limit of less than 280 NTU for average turbidity on any day.

As site managers know, capturing runoff events with traditional water sampling methods can be challenging. Real-time continuous monitoring provides a solution for capturing episodic runoff events that sampling might miss. Additional benefits can include reduced project downtime, fine prevention and project incentives.

### Impact of Sediment Runoff

Sediment runoff occurs when storms wash sediment into streams, rivers, estuaries and oceans. Pollutants, including nutrients, hydrocarbons and heavy metals, also can be carried with the sediment. The amount of natural sediment runoff can be increased quickly by human activity such as construction and through landscape changes, including removal of natural buffer zones, agricultural activities and use of impervious surfaces.

Several small sources of sediment runoff can add up to a larger, cumulative issue. Ultimately, the increased sediment/pollution load can result in negative impacts to water and ecological health by causing:

- Decreased light attenuation, which can kill submerged aquatic plants;
- Siltation of benthic habitat;
- Initiation of algal blooms, some of which may be harmful; and
- Decreased dissolved oxygen (DO), which can be stressful or deadly to aquatic organisms.

### Construction Monitoring

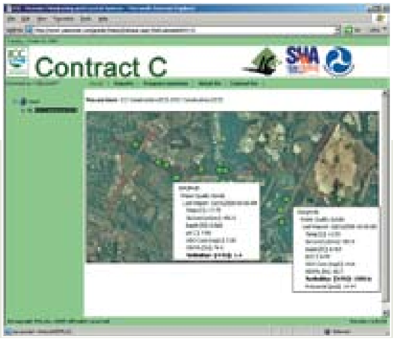
Monitoring sediment runoff during construction projects can be challenging. Storm events, which often create the largest amount of sedimentation, are episodic and largely unpredictable. Episodes can occur in a span of a few hours and often at inopportune times—the middle of the night, for instance. Timing a water sample-collection response can be problematic.

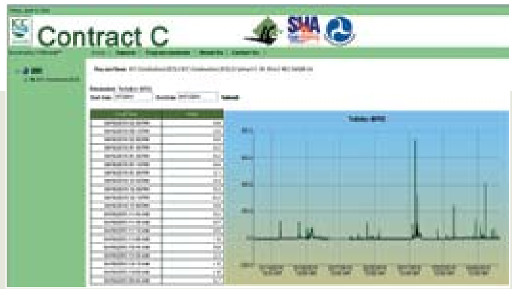
Continuous monitoring, rather than sampling, may capture the episodic events more effectively. The method provides automated, around-the-clock data collection to identify whether water quality problems are occurring as a result of construction activities. Real-time monitoring with alarms and alerts can serve as an early-warning tool for potential erosion sedimentation control (ESC) and best management practice (BMP) failures. Ultimately, the continuous monitoring can prevent project downtime and regulatory fines—up to $32,500 per day—and in some cases can lead to incentives.

### Building the Maryland Intercounty Connector

The Intercounty Connector (ICC) is a major highway construction project

Small sources of sediment runoff can add up to a slew of serious problems, including algal blooms and decreased DO. Continuous monitoring is key to helping prevent these and other detrimental issues that arise from construction projects.




The ICC project implemented real-time continuous monitoring at multiple stream crossings.

in Maryland that has successfully implemented real-time continuous monitoring at multiple stream crossings throughout the construction area. The ICC links existing and proposed development areas between the I-270, I-370 and I-95 corridors in Montgomery and Prince George's counties with an 18.8-mile-long east/west highway, limiting access and accommodating the efficient movement of passengers and goods across six lanes.

The highway's design helps restore the natural environment from past development impacts. One of the most sensitive issues was the potential impact of construction on streams and on stream dwellers, such as the eastern box turtle and brown trout. In response, the Maryland Department of the Environment established standards for several water quality parameters for each stream. The ICC project has tight turbidity thresholds that must not be exceeded: an instantaneous maximum of 150 NTU and a maximum monthly average of 50 NTU.

## ICC Turbidity Monitoring

The ICC project traverses eight watersheds, including three special protection areas. Sixty-three real-time, continuous water quality monitoring stations have been established upstream and downstream of construction activities throughout the entire area. For a portion of the ICC (Contract C), constructor design/build provider Skelly & Loy selected YSI Inc. equipment and installation expertise to meet the rigid water quality monitoring and data reporting requirements.

Each monitoring station in Contract C consists of a multiparameter water quality sonde and telemetry. The sonde has sensors that measure turbidity, pH, DO, temperature, conductivity and water level. The instrument meets the standard methods set by the EPA for National Pollutant Discharge Elimination System monitoring. An

EcoNet telemetry unit delivers data from the remote monitoring sites to project partners, who have immediate access to the water quality data via the Internet. Real-time alarms are programmed to notify key personnel of potential ESC and BMP issues.

Real-time continuous monitoring saved Skelly & Loy time and money in April 2010, for example, during an intense four-hour rain event. High turbidity levels (400-plus NTU) were recorded at one monitoring station that was close to the construction site at I-95. This station was situated upstream, near a private development with large areas of impervious surface. Key personnel were notified by e-mail of the increased turbidity levels and directed to investigate specific locations, saving them time.

Once on site, the responders observed that the turbidity levels outside the limit of disturbance were greater than levels downstream of the construction area (less than 10 NTU). The continuous monitoring data indicated that the turbidity was not caused by construction activities but instead by runoff from the developed area outside the construction zone.

Real-time monitoring during this storm helped the construction managers verify that the site BMPs were working properly. Skelly & Loy avoided a notice of violation fine by demonstrating that the increase in sediment was not caused by its work but by an environmental factor outside its control. In other situations, real-time monitoring and alerts can help managers quickly troubleshoot inadequate erosion control measures, such as silt screens or buffers, to control sediment load during storm events. SWS

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## TSS & Turbidity

Total suspended solids (TSS) concentrations and turbidity measurements both indicate the amount of solid particles suspended in water, whether mineral (e.g., soil or clay particles) or organic (e.g., algae). A TSS test measures an actual weight of solids per volume of water, while turbidity measures the amount of light scattered from a sample (more suspended solids cause greater scattering). Turbidity values can be obtained on site and in real time, but TSS values have to be calculated in a lab.