

# Troublesome Turbidity

By Dominic O'Donnell

Non-contact turbidimeters tackle wet weather flows & reduce maintenance work

**T**he Greer Commission of Public Works (CPW) water treatment plant in Greenville County, South Carolina, stands on top of the south bank of the South Tyger River, downstream from the Lake Cunningham recreation area. The natural beauty of the area combined with solid economic growth over recent years has placed increasing demands on CPW.

From 2000 to 2016, the population grew 58%. With the population now at more than 31,000, it is projected to reach 33,500 by 2024. For the Greer CPW plant, that means serving a total population of more than 50,000 with greater than 18,000 service connections and an average of 9 million gallons a day (mgd) of flow with seasonal fluctuations increasing demand.



**Top:** The settled water tanks at the Greer Commission of Public Works water treatment plant in South Carolina. **Left:** New sensors and electronics helped the water treatment plant address turbidity issues.

mgd to 24 mgd through the use of "high-rate" filtration and upgrades in technology. Computerized controls using data from a full range of analyzers allowed conventional sand filters to operate at a throughput of 6 gallons per minute per square foot, 50% higher than industry standards.

The plant pulls water from Lake Cunningham, seeing variations in incoming

water quality, especially during wet weather events. Using conventional treatment, the first step is oxidizing iron and manganese using potassium permanganate. The water then goes to rapid mix with polymer based coagulant, along with caustic soda or chlorine as needed for flocculation and sedimentation. The water is chlorinated at the prefilter stage and is followed by filtration through 12 rapid sand filters feeding a 5 million gallon clear well tank



Top: Non-contact turbidimeters reduced the maintenance burden for Greer CPW.  
Right: A SCADA system screen displays plant conditions with graphical elements.

to add polyphosphate, fluoride, and caustic, before feeding a 3 million gallon storage tank.

### Improving Turbidity Measurement Accuracy

In 2016, the plant evaluated operations to look for added efficiency. One of the most critical aspects of the operation of the filters was accurate turbidity measurement. Accurate turbidity measurement in turn rested on maintenance and verification of the analyzers in place.

The plant found that the turbidity analyzers initially installed required extensive cleaning and time consuming verification processes. The turbidimeters utilized submerged sensors that resulted in cleaning issues and reduced reliability. In addition, the units used incandescent bulbs that required periodic replacement.

At that point, the plant evaluated non-contact turbidimeters offered by Swan Analytical USA. The non-contact sensor design eliminated coating issues and provided simple cleaning in place. In addition, these analyzers

featured long-life LEDs with an expected life of 10 years.

### Wet Weather Woes

While initially the new instruments were installed only in filters and settled water, plant management then reviewed its raw water system. Typically, raw water is fairly low in turbidity. After wet weather events, especially extended or severe rainstorms resulting in ground saturation, runoff would cause 40 to 60 NTUs and as high as 125 NTUs.

Previously, such events hit five times per year or fewer, but recently, they have been more prevalent. The raw water turbidity analyzer in place often did not match lab readings. While some variance is expected based on sampling and delays versus online measurements, the variances seen were enough to cause concern. Even with monthly cleaning, operators had to rely on lab readings.

Typically pH adjustment is not needed as



alkalinity is between 12 and 16 mg/L. Wet weather events would cause the alkalinity to drop to 9 mg/L, requiring caustic feed to improve coagulation efficiency.

Raw water would occasionally clog the feed lines. The auto drain capabilities of the new instrument flushes the flow chamber daily, which reduced cleaning needs, even with weather events. Months can go by with no service requirement. One flush with iron-ox to remove manganese every six months ensures that the analyzer remains clean. **WWD**

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