TREATMENT ON THE BELTLINE

Large-scale project uses green technology to treat road construction runoff

By John Meland & Rick Roark

Top: A sediment pond with pump and treatment system.
Bottom: A dual manifold system.

In February 2014, the Alabama Department of Transportation (ALDOT) began construction on the first phase of the Birmingham Northern Beltline, a 52-mile, six-lane corridor that will stretch from Interstate 59 in northeast Jefferson County to the Interstate 459 interchange with Interstate 20/59 near Bessemer. The prime contractor, executing the first phase of the large-scale project, chose to employ green, cost-effective storm water treatment for the construction site runoff. In addition to controlling costs, the system setup has a minimal footprint and utilizes an eco-friendly flocculant to meet the project's environmental regulations.

Grand Scope

The Birmingham Northern Beltline Project is part of the Appalachian Development Highway System, which was made a high priority by Congress. The entire project is expected to take more than 25 years to complete.

This initial portion of the project, between state Route 79 and state Route 75, was started in February 2014 and is expected to be completed by the fall of 2016. The estimated total cost for the first phase is $40 to $45 million. Tennessee-based Wright Brothers Construction Co. won the bid for the first phase of the project and is doing the required grading and excavation work. The first phase of the project includes 16 sediment treatment ponds that have an average capacity of 500,000 gal and range in size from 8,800 to 276,000 cu ft. The entire capacity of each pond can be treated on a daily basis by using a 600-gal-per-minute or larger pump for each basin. The amount treated daily is dependent on rainfall emptying into the basins. During dry conditions, treatment is necessary only when water accumulates in the basins.

The project design and specifications require that all storm water be diverted to sediment basins for treatment before discharge. Wright Brothers, along with erosion contractor Erosion Solutions of Athens, Tenn., worked with specialty storm water firm Erosion Pros of Auburn, Ala., and local construction material supplier Midwest Construction Products to create a customized solution to treat the storm water runoff. The treatment system is keeping the discharged water well below the required turbidity limits and has helped the contractor remain in compliance with regulations and permit conditions during construction.

Site Operations

Large grading projects that require treatment of thousands of gallons of water may use large, fixed, active systems that involve the use of a weir tank and large sand filters for storm water treatment. These systems can be costly.

Midwest Construction Products worked with Erosion Solutions to create a manifold treatment system that uses PVC pipe, a pump and the HaloKlear Dual Polymer System (DPS) as the flocculant. The system is an all-natural storm water treatment solution. It uses biodegradable polymers that is effective on an array of soil types and pH ranges. The DPS creates dense flocs with high sheer strength and low water content that settle quickly. Solids can be removed from the water column, increasing performance and productivity while keeping costs low. In addition, the system is flexible, and can be implemented in active passive and semi-passive deployments.

The HaloKlear manifold system uses a treatment manifold with pumps placed at each pond, providing a smaller footprint with greater flexibility and control. These systems reduce the space needed for treatment and allow adjustment of treatment as needed.

The system also can be modified to adapt to different treatment situations. For this large project, with 16 separate sediment basins, the small footprint was essential for the limited treatment area. Additionally, storm water flowing to the sediment basins is pretreated in passive applications using smaller DPS socks, designed and sold by Midwest Construction Products.

Initial Testing

Initial onsite testing was producing marginal turbidity reductions, so HaloKlear provided technical support to adjust inputs for more efficient treatment. The trial ran approximately three hours using the DPS in the manifold recirculation approach. During the site visit, technicians selected four monitoring locations within the basin. Samples were taken and readings recorded every 30 minutes. The trial concluded that a recirculation approach using the DPS was able to achieve a 97% ntu reduction within three hours.

Other flocculants, including alum and other metal coagulants, have residual metals, which create bio-accumulation concerns and can produce eco-toxicity from pH fluctuations. During the trial, residual biopolymer tests were conducted at each collection point three

hours post-treatment using a residual test kit on site.

Whole effluent toxicity tests conducted by third-party labs verified that the DPS (HaloKlear DBP-2100 and GelFloc) when dosed together, as in this case, shows no eco-toxicity. The results were non-detectable at a detection limit of 0.1 mg/L on each of the post-treatment samples.

Additional findings showed that dissolved oxygen (DO) levels within the basins were low. However, through recirculation, DO was restored back to healthy levels before discharging the water.

Monitoring the System

Erosion Solutions worked with HaloKlear to tailor a system to effectively treat the storm water and lower the turbidity to acceptable levels. Per project specifications, water samples are collected from the adjacent stream (upstream and downstream of the discharge locations) each time a rain event of 0.75 in. or more occurs and each time water is discharged from the basins.

The downstream sample is limited to 50 ntu over background. The individual storm water basins are routinely monitored before and after treatment using LaMotte 20/20 turbidity meters. Engineers carefully monitor the turbidity levels and coordinate the treatment and release of the treated water. Personnel have been pleased with the performance of the systems and low turbidity of the effluent water that is discharged from the basins.

The initial phase of this project involves significant grading and removal of almost 2.5 million cu yd of soil. Bridges will be built in additional phases. Environmental impact is always a concern for ALDOT; therefore multiple parties are closely monitoring erosion control and storm water treatment. The inspectors are pleased with the results of this treatment system thus far.

The contractors and engineers have not had to worry about residue accumulation. Once the turbidity in the water is removed, the water can be discharged into the adjacent stream without concern about bioaccumulation or other effects to local wildlife and vegetation. SWS

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