Case Study: City of Aiken Downtown Stormwater

Sand River Headwaters Green Infrastructure Project – Aiken, South Carolina

Site

Aiken, South Carolina drains into Hitchcock Woods, a 2,100-acre urban forest, Home of the Sand River. The Sand River is an ephemeral stream system which are highly sensitive to peak discharge and sediment loading.

Problem / Reason Restoration Was Necessary

Conventional Stormwater infrastructure installed in the 1950s and impervious cover directed increasing amounts of high velocity water to a single outfall into the Sand River. This eroded a 70 FT canyon, destabilized banks, filled wetlands, and severely impacted local ecology.

The Sand River has been listed as impaired since 1998 for fecal coliform bacteria. Stormwater being a contributing source.

Clemson University Intelligent River®

Exhibit 23. Stormwater has eroded a deep canyon in the banks of the Sand River.

Entity Responsible

Owner: City of Aiken
Engineering: Clemson University Center for Watershed Excellence and Woolpert, Inc.

After estimating $16–18 million for canyon stabilization, the City chose to reduce upstream runoff instead. The Clean Water State Revolving Fund (ARRA) allocated $3.34 million and the infrastructure is maintained through a stormwater utility fee.

Goal of Restoration

The strategy focused on distributed green infrastructure rather than solely stabilizing erosion.

Goals:

- Reduce peak discharge
- Improve water quality
- Decrease erosive energy at the outfall
- Preserve historic downtown aesthetics

Ecologically, the project sought to restore watershed hydrologic function.

Restoration Techniques

Green infrastructure was integrated into streetscapes near Park Avenue and Newberry Street, including rain gardens, bioswales, porous pavement, permeable pavers, and underground cisterns.

Design standards required the typical 1 in first-flush capture and peak flow control for 2- and 10-year storms. They also designed to infiltrate the 2 year storm (3.7 in) in 72 hours

Monitoring demonstrated strong infiltration performance at individual sites, but sufficient improvements were limited because only 0.4% of the watershed was treated. This example reveals that the scale of restoration is critical, as treating only a tiny fraction of the watershed limits the potential for widespread ecological improvement.

Difficulties and Future Improvements

The small total treatment area limited the impact this project could have, public concern about streetscape changes, and concentration continues to be high flow at culvert outfalls.

Erosive energy remains concentrated during large storms. Upstream green infrastructure reduces runoff, but costs and lack of return implies we should investigate other routes.

Future improvements could include:

- **Outfall energy dissipation:** apron/stilling basin, plunge- or step-pool “hydraulic airbag.”
- **Grade + transition control:** riffle/step transitions to prevent scour and headcutting.
- **Extend treatment after the pipe:** forebay + level spreader to sheet flow across a vegetated buffer/wet meadow.
- **More upstream capacity:** expanded distributed detention/infiltration higher in the watershed.

Watershed Stewardship requires both more capacity and enhanced outlet control at discharge points.