City of Atlanta Department of Watershed Management's Innovative Use of Permeable Roadways to Solve Flooding

By Cory Rayburn

The City of Atlanta has embraced the use of green infrastructure on multiple fronts as a means of water quality improvement, flood reduction, and combined sewer capacity relief. Early adoption of runoff reduction standards for private development has led to over 5,500 sites installing green infrastructure practices such as bioretention, permeable pavement, and infiltration systems. On the planning level, the Department of Watershed Management's (DWM) *Green Infrastructure Strategic Action Plan* has provided a roadmap for integrating green infrastructure strategies into decision-making processes. Environmental Impact Bonds (EIB) have been incorporated into the City's funding efforts for implementing both natural and engineered green infrastructure within historically impacted watersheds. Much of the City's recent successes in green infrastructure implementation is rooted in decisions made in 2012 that led to one of the largest regional green infrastructure projects in North America.

Mid-summer 2012 brought intense storms to the historic neighborhoods in southeast Atlanta that are served by the City's combined sewer system. Much of downtown Atlanta, including a major intersection of interstates, Georgia State Stadium (formerly Turner Field), and a sea of parking lots, drains down through these residential areas. In July of 2012, back-to-back rain events (10-yr and 25-yr storms) wreaked havoc on the neighborhood called Peoplestown. These rain events caused major surface flooding and combined sewer surcharges in low areas.

City leadership responded to the impacted citizens immediately and committed resources to develop innovative solutions that would reduce the chances of future flooding. As a result, the City formerly developed the *Southeast Atlanta Green Infrastructure Initiative*, a combination of both gray and green solutions to provide sewer capacity relief and localized flood reduction. This catalytic strategy focused on developing projects to mimic the natural hydrology in this now built-out watershed. Knowing the extent of the problem and the City's commitment to a rapid response, the City phased the initiative.

Phase 1 involved constructing eight small-to-medium scale projects that utilized common green infrastructure practices such as bioretention areas and stormwater planters. DWM staff and design consultants focused primarily on publicly-owned land in parks and within the Right-of-Way (ROW) to avoid any lengthy acquisition processes.

Phase 2 of the initiative required more time to plan and design; however, it resulted in the largest retrofit of existing streets using permeable interlocking concrete pavers (PICP) known. All in all, over 570,000 square feet of pavers coupled with 32 stormwater planters were installed across the southeast neighborhoods of Peoplestown, Mechanicsville, and Summerhill. Collectively, these green streets provide over four million gallons of combined sewer capacity relief along four miles of existing roadways. Completed in September 2016, these permeable roadways have proven to be an

effective way of taking the pressure off the combined sewers by reducing the volumes, velocities, and rates of stormwater runoff at a critical junction in the system. The gray component of Phase 2 involved constructing a 5.9-million-gallon concrete vault to add capacity to one of the larger trunk lines that serves downtown Atlanta.

The permeable paver roadways were designed to detain the 25-year, 4-hour storm event (3.68 inches), mirroring the type of quick and heavy rainfall that caused the detrimental flooding in 2012. Traditionally, paver systems are sized for the first one-inch of rainfall (first flush) and roadways are generally avoided; however, the magnitude of the issue prompted the City to maximize the design within the given space.

The construction of the roadways involved three main phases, 1) demolition/excavation, 2) stone aggregate placement, and 3) PICP installation. It was quickly determined that the excavation phase would be the most difficult due to the number and condition of the utilities encountered. Some of the utilities and service connections required excavation using hand tools to prevent damage and many had to be repaired or replaced all together. The city allocated $1M for utility work in the contract, but by the end of the project, nearly $3M was spent.

Public involvement, during construction, was paramount and required a combined effort of the communication teams from both the City and the contractor (Southeastern Site Development). Due to the nature of the work, whole blocks needed to be closed for weeks at a time, directly impacting day-to-day activities of residents. Early on, the contractor committed resources and staff to ensure these impacts would be minimized. Prior to roads being closed, the contractor proactively engaged affected homeowners of the imminent work and identified any special needs during construction. Although not directly specified in their contract, their crews rolled residents' trash cans to the end of the block weekly and returned them once solid waste pickups were made. These actions helped to minimize the public's reaction to not being able to access their driveways for extended periods. City staff also assisted by coordinating messaging, hosting community meetings, and posting notifications on DWM's social media platforms.

All in all, the paver roadway project took 19 months to complete. Moreover, green infrastructure has shown to be a cost-effective means of solving regional drainage issues in historic neighborhoods. When comparing the cost per gallon of capacity relief provided in Phase 2, the green and gray solutions were comparable; however, green infrastructure provides an aesthetically pleasing solution for the community, results in more tree canopy and green space and can manage surface runoff in built-out neighborhoods with limited public space. Gray solutions, such as vaults, have a real and direct benefit to aging infrastructure systems within the City; however, they can be difficult to construct and generally do not result in the same types of benefits (social, economic, and environmental) which green infrastructure can provide.

With the nearly $40 million spent on Phases 1 and 2, localized flooding still occurs at the known choke points of the system. Modelling and recent rain events show a reduction

in surface flooding based on the projects installed to date; however, the City is looking to move forward with Phase 3 of the initiative, which will include an additional vault for capacity relief and a series of regional stormwater ponds to manage surface flooding.

The Southeast Atlanta Green Infrastructure Initiative highlights Mayor Keisha Lance Bottoms' commitment "to advancing green infrastructure that improves the quality of life and resilience of Atlanta's communities."

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