STORMWATER AND URBAN DESIGN

Fall 2012
DESIGN + RESEARCH

Urban Design Strategies for Four Sites on the Atlanta BeltLine

Maddox Park, Boone Blvd and Proctor Creek
Ansley Mall and the Clear Creek Greenway
Colonial Homes, Bobby Jones Golf Course and Peachtree Creek
University Avenue, Pittsburgh and McDaniel Creek

A project of the
Georgia Conservancy, Fall 2012

BLUEPRINTS
for successful communities

STORMWATER AND URBAN DESIGN

Urban Design Strategies for Four Sites on the Atlanta BeltLine

Georgia Conservancy *Blueprints* Partners

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The Home Depot Foundation
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THIS REPORT WAS CREATED IN PARTNERSHIP WITH

The Master of Science in Urban Design Program
The School of City and Regional Planning
The School of Architecture
College of Architecture
Georgia Institute of Technology
245 4th St. NW Atlanta, GA 30332

Our mission is to protect Georgia's natural resources for present and future generations by advocating sound environmental policies, advancing sustainable growth practices and facilitating common-ground solutions to environmental challenges.

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SUSTAINABLE GROWTH INITIATIVE

INTRODUCTION

The Atlanta flood of 2009 should have been a wake up call for municipalities across the state. In a matter of minutes, rain water swelled retention basins, sewers, creeks and rivers, eventually leading to the overflow of millions of cubic yards of surface runoff water into streets, backyards and structures. The devastating effects of the flash flood could have been mitigated through an increased focus on changes to runoff velocities and volumes, and proper urban growth planning.

The Georgia Conservancy's *Blueprints for Successful Communities* program, in partnership with graduate students from the College of Architecture at Georgia Institute of Technology, examined four different sites within metro Atlanta, adjacent to the Atlanta BeltLine (Ansley Mall - Peachtree Creek; Bobby Jones Golf Course/Colonial Homes - Peachtree and Clear Creeks; University Avenue - McDaniel Branch; and Boone Boulevard - Proctor Creek) and contrasted their development with existing drainage ordinances. These ordinances focus on controlling peak rates of runoff over more holistic, low impact development policies that could be adopted and implemented with great benefit to the community.

Each project focus is site and watershed specific, though is meant to demonstrate the creative stormwater management alternatives present in situations that are duplicated across the state and nation. The proposals all begin with an understanding of the site's position in its respective watershed, the hydrology, and its changing characteristics for the next generation, and the relationship of site conditions, stormwater management, and public spaces.

BLUEPRINTS PRINCIPLES

Maintain and enhance quality of life for residents of the community	Employ regional strategies for transportation, land use, and economic growth	Consider the effect of the built environment on the natural environment as well as history and culture	Employ efficient land uses

Blueprints for Successful Communities (Blueprints) is a 19-year-old sustainable community design effort within the Sustainable Growth program of the Georgia Conservancy. The *Blueprints* process uses a community-based approach to sustainable planning and design. It is unique in that it involves key stakeholders – including citizens, businesses, agency and institutional representatives, and elected and appointed officials – throughout the entire planning process of redeveloping a community to better incorporate and focus on natural resource protection, green space accessibility, sustainable land use, and live-work connectivity. The *Blueprints* process is one of the most highly respected planning processes in our state because of its inclusiveness, transparency and technical quality. This *Blueprints* project did not involve stakeholder engagement, beyond interactions with local experts knowledgeable about each site studied. Instead, this *Blueprints* served as a research endeavor whose results will inform future traditional *Blueprints*, as the stormwater management lessons learned can be applied to community design.

Water – quality, quantity and/or access to – is a central issue within the State of Georgia and globally. All program areas at the Georgia Conservancy are working to address water challenges - through statewide advocacy, education and research on coastal sea level rise, and advancing awareness through our stewardship trips and land conservation. Thus, it is a natural progression for the Sustainable Growth program to look at stormwater and how our built environment negatively and positively impacts our streams, rivers, and overall quality of life.

"Healthy watersheds are essential for providing clean drinking water, recreational activities and wildlife habitat. Traditionally, most water pollution control efforts addressed point source pollution commonly associated with industrial activities and sewage treatment plants. While these regulations have become effective at controlling point source pollution, we have come to learn that non-point source pollution (stormwater runoff) is the leading cause of water quality problems.

As land in a watershed is developed, natural areas are converted to impervious surfaces such as streets, sidewalks and parking lots. Stormwater that would normally soak into the ground becomes runoff. While some stormwater runoff is normal, the increased volume of runoff associated with impervious surfaces can cause streambank erosion, flooding, property damage and even the loss of life. Additionally, this runoff can pick up pollutants such as sediment and chemicals and dump them directly to the streams and rivers we depend on to sustain life.

Because land, and the water that runs over and through it are intimately connected, a watershed approach to managing water quality is important. A watershed approach considers all the activities within a landscape that affect watershed health. A watershed approach is essential to protecting, restoring and maintaining healthy ecosystems." (From the Atlanta Department of Watershed Management website – accessed April 2014).

The *Blueprints for Successful Communities* program adheres to values that protect communities and the environment, and it respects the link between health of our environment, our economic stability and the way we use land. The *Blueprints for Successful Communities* principles are shown at the top of the page.

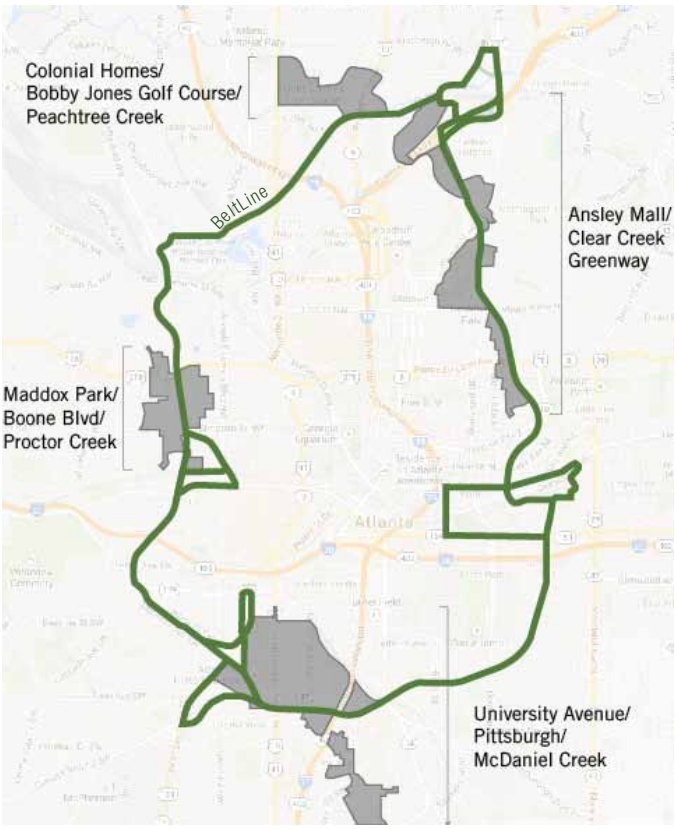
By following these principles, we raise public awareness in Georgia about alternative land use, transportation, and design development strategies that are good for the environment and good for the economy.

BLUEPRINTS PROCESS

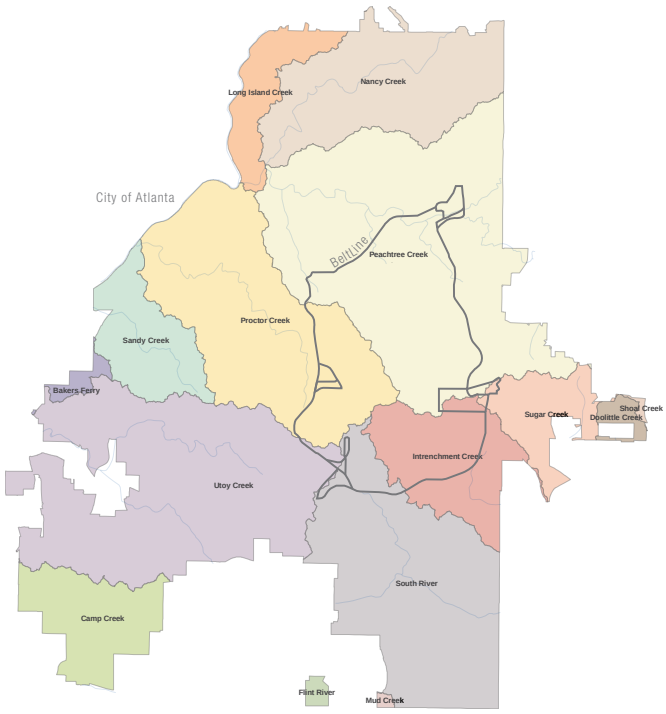
The *Blueprints* model (completed in 36 communities around the state) focuses on community needs, challenges and assets informed by stakeholder engagement. This *Design + Research Blueprints* concentrates on stormwater and built environment conditions through site specific analysis. Stakeholder engagement was not part of this study; the project focus was to reflect on typical development processes and identify creative ways to solve water issues on-site after understanding the site's placement within a watershed. The intent is to share these findings around the state, as well as for this work to influence future stakeholder-based *Blueprints* projects.

Over the course of a semester, the *Blueprints* team (composed of *Blueprints* staff, Professor Richard Dagenhart, Dr. Tom Debo and a Georgia Tech graduate urban design studio) conducted an urban design studio to look at four sites along the Atlanta BeltLine. These sites were chosen based on a combination of publicly known local flooding locations, sites easily accessed for evaluation and by suggestions from Ryan Gravel, Perkins+Will staff, BeltLine consultant and originator of the BeltLine concept. Each site has particular and varying struggles managing water, creating opportunities for creative site design to address these challenges. The studio involved multiple site visits, presentations, collected information and maps, hydrological analysis and calculations to help develop a set of draft recommendations for consideration. These recommendations are supported by technical advisors and form the basis of this report.

The studio members were required to take a one-hour stormwater course in addition to their studio hours to better understand water flow and effects on the watershed. Furthermore, there are four parts to the studio methodology.



Project sites and BeltLine context



Atlanta Watershed Sub-basins and BeltLine context

First, the research was collaborative across the studio. It is one project, with four teams participating, each with specific site and situation. Thus, certain deliverables, measures and evaluations and graphics will be common to the four studio products.

Second, each team prepared an urban design scheme, reflecting and improving upon existing plans for the selected sites. Following that, each team redesigned their site with three alternative approaches: (1) water capture and reuse, (2) water infiltration to minimize flow at the outlet, and (3) maximize water quality.

Third, each team measured the four proposals (urban design, water capture and reuse, water infiltration, and water quality) for direct comparisons among the four teams and the alternative approaches. This provides the metric for demonstrating the potentials for urban design approaches to stormwater management.

Fourth, each team prepared a final proposal, incorporating parts of their alternatives most appropriate for the site situations. The aim is to demonstrate that urban design can produce a project that is feasible and performs at the highest levels of urban design and stormwater management.

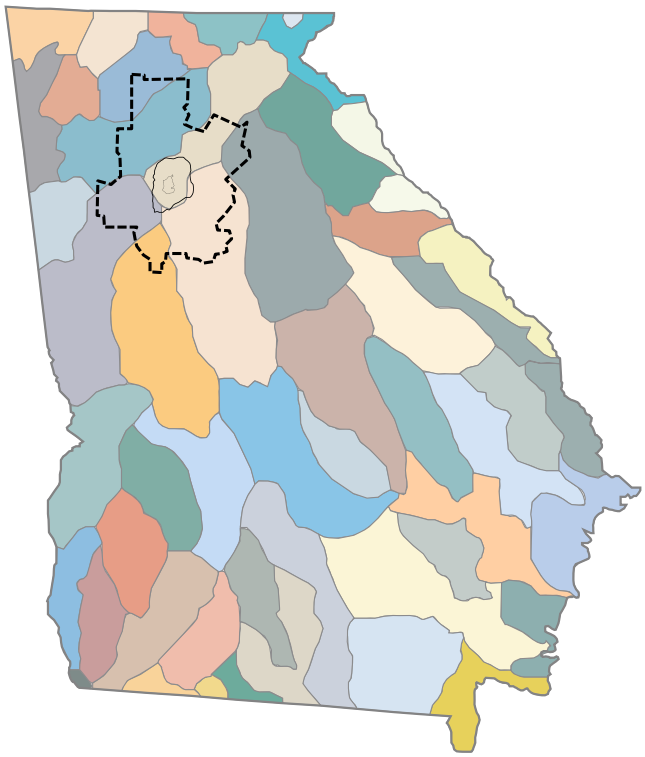
The *Blueprints* process was directed and managed by the Georgia Conservancy. Technical support for the project was provided by Professor Richard Dagenhart, R.A. of Georgia Tech's College of Architecture and Professor Emeritus Thomas Debo, PhD, P.E., of Georgia Tech's School of City and Regional Planning, along with a fall of 2012 urban design studio composed of graduate students studying urban design, city and regional planning, and/or architecture. Additional expertise was provided by professionals from our *Blueprints* Partners program, the City of Atlanta Department of Watershed Management, and professors in the College of Architecture at Georgia Tech.

Final recommendations found in this report reflect, as best as possible, the professional judgment of the *Blueprints* team – Georgia Conservancy staff, Richard Dagenhart, Dr. Tom Debo, participating graduate students and professional experts.

The Urban Design and Stormwater *Blueprints for Successful Communities* began in the summer of 2012 with data collection, site visits and assessments, and project preparation. From August to December of 2012, the analysis and studio work occurred, coinciding with the semester calendar of Georgia Tech. From May 2012 to March 2014, the Georgia Conservancy compiled, edited and added to the urban design studio's work to create this final report.

PARTNERSHIPS

Partner organizations and decision-makers will be instrumental with the implementation of the recommendations found in this *Blueprints* report in their own communities. As previously mentioned, this *Design + Research Blueprints* will have the greatest impact if the



State of Georgia Watersheds (with Atlanta region, I-285 and BeltLine outlined in black) www.brownsguides.com

ideas, techniques and process are shared statewide to influence smarter policy and decision-making. Thus, this will influence our partnerships as dissemination of the information is a critical component to the success of the project. The Sustainable Growth team hopes to share the project information in presentations and reports to various audiences including municipalities, planning departments, water management departments, developers, engineers, etc. As additional partner organizations are identified, they should be included in implementation discussions. Because water is a critical element for all of our communities, we see this report and outreach as impactful for anyone who would like to learn more about potential improvements that can be made through low impact development infrastructure.

EXECUTIVE SUMMARY
by Richard Dagenhart, R.A., Associate Professor

Stormwater Management and Urban Design

For the past several decades stormwater management policies, regulations and design practices focused on end-of-pipe solutions. The stormwater problem was defined simply as the control of peak rates of runoff from new urban development, and the primary aim was to control post-development peak runoff of specific storms (i.e., 5-, 10-, 100-year rainfall events) so they did not exceed pre-development runoff rates. However, this method addresses only the short-term impacts of a storm event by constructing detention basins at the site's drainage outlet. Other approaches have included regulating new development based on the percentage of impervious surfaces to reduce peak runoff. For many years, it has been clear that these stormwater management methods do not consider the hydrologic changes induced by new development nor do they address issues of stormwater quality, as water moves from individual development sites into public waterways or into groundwater.

Best Management Practices (BMP's) for stormwater control were introduced more recently to address some of these shortcomings. However, most BMP's were developed to supplement hardscape engineering end-of-pipe and pipe-and-pond practices. In addition, parcel-by-parcel applications ignore the larger water quantity and water quality problems in the new development site's associated hydrologic unit and watershed.

The U.S. Environmental Protection Agency (EPA) has more recently redefined BMP's as "a practice or combination of practices that are an effective, practicable means of preventing or reducing the amount of pollution generated by non-point sources." Thus, stormwater management practices are moving toward runoff quantity and quality by incorporating mechanical and biological processes. In addition, EPA has also begun to emphasize the importance of stormwater management practices combined with smart growth practices to escape the limitations of parcel-by-parcel regulations and only hard engineering solutions. These new directions from EPA are following research and demonstration projects known generally as Low Impact Development (LID).

The result of this expanded focus of stormwater management practices means that the design of the development site is central to accomplish both smart growth and stormwater management. The goal is to allow urban development to occur in many situations, but requires that the project be designed to limit hydrologic impacts. Thus, it is possible to have urban development with hydrologic characteristics of rural or undeveloped land. When this approach is broadened beyond a single parcel of land, the design challenge expands from site design to urban design – how the land is subdivided, how the public domain of the streets and parks and open space is organized and designed, and how private parcels and buildings are designed and constructed.

It is clear that the challenge of stormwater management extends from the building to the site to the street and public spaces and eventually to the network of surface water and groundwater. This means that knowledge of stormwater

hydrology and LID practices must be central to urban design practice, whether projects are re-inhabiting the urban core, retrofitting problem sites, or designing new development of vacant sites in existing urban areas or on the urban fringe.

Urban Design + Research

There is increasing evidence coming from the research community and the experiences of professionals within the urban stormwater arena that to efficiently and economically control the hydrologic impacts from urban development, factors other than peak flow and amount of impervious surfaces should be considered. Three factors that should receive consideration include:

1. Velocity of flow through the local drainage system.
2. Volume of flow increase from urbanization.
3. Time of Concentration, or the time it takes runoff to flow through the drainage system to some downstream exit point.

Instead of end-of-pipe calculations, these additional factors emphasize the manner in which the water flows from the building to site to street and park and finally to surface water and ground water. It is the design of this network of water flow – using the knowledge from LID strategies – that must be the focus of stormwater management. Simply stated, when considering these additional factors, stormwater management is a central urban design problem.

This *Blueprints* studio assignment is a design research effort to examine how urban design strategies can contribute to stormwater management and, further, provide evidence for future revisions of stormwater policy, regulations and ordinances.

SITES: THE ATLANTA BELTLINE

The Atlanta BeltLine was an obvious choice for four sites. All of the subarea plans have been completed by urban design firms, so the public has access to basic existing conditions as well as the adopted plans. Four sites stood out for their severe stormwater issues, for their north-south-east-west locations in the city, and the fact that none of the four had incorporated little, if any, stormwater concerns in their subarea plans.

Each of the sites has a separate chapter within this report that includes the team's analysis of the situation and their design proposals in detail. The four sites are:

(1) Proctor Creek Watershed: This site includes Maddox Park, and the vacant land and deteriorated buildings in the area between Boone Boulevard/Simpson Street and Donald Lee Hollowell Parkway, where the BeltLine, MARTA, and an active rail line cross.

(2) Peachtree Creek Watershed: This site includes the Colonial Homes condominiums, the Bobby Jones Golf Course, Atlanta Memorial Park, and the area around the future BeltLine stop for Piedmont Hospital and surroundings.

(3) McDaniel Creek Watershed: This focuses on a specific site – the larger vacant site between University Avenue and the BeltLine. This location also requires examination north of the site, in the Pittsburgh Neighborhood, as well as south along the creek.

(4) Clear Creek Watershed: This includes private and public developments along Clear Creek, including the Old Fourth Ward Park, Piedmont Park, and the North Woods area. The Ansley Mall property is included as a redevelopment example, due to its critical location within this watershed.


(1) Debris in Proctor Creek


(2) Peachtree Creek at the Bobby Jones Golf Course


(3) Pedestrian bridge over the McDaniel Branch

(4) Health Hazard sign on Clear Creek at Ansley Mall

Conclusions

During the semester, visiting critics joined the faculty for project reviews and technical assistance. These included Conservancy staff and *Blueprints* Partners, City of Atlanta Department of Watershed Management staff and experienced professionals from Atlanta architecture, landscape and urban design firms. Discussion continued throughout, focusing on possible conclusions from the four projects and examining the evidence to support such conclusions. In the final review, with all projects completed, five conclusions were evident.

WATERSHEDS ALWAYS COME FIRST.

The first conclusion is obvious and the most important of all, whether or not stormwater is the primary issue. The first step in assessing the existing situation of a project is to determine its watershed and the current stormwater situations in that watershed – it is as important as transportation, accessibility and other infrastructure issues. The design of every urban design project must begin with an understanding of the watershed.

A SITE'S POSITION IN THE WATERSHED YIELDS IMPORTANT CLUES FOR URBAN DESIGN STRATEGIES.

The University Avenue site is a perfect example of this conclusion. University Avenue, along with the Pittsburgh neighborhood, sits near the top of the McDaniel Creek Watershed. This led to the primary urban design strategy, focusing on increasing the runoff time of concentration in the upper part of the watershed and greatly decreasing the time of concentration downstream. This enabled the design of the University Avenue site to mitigate current downstream flooding and create an infrastructure landscape for the future development of the site along the BeltLine.

FLOODPLAINS ARE STORMWATER AND URBAN DESIGN RESOURCES.

Both the Colonial Homes and the Maddox Park sites are examples of how floodplains can be considered resources for combining stormwater management with urban design.

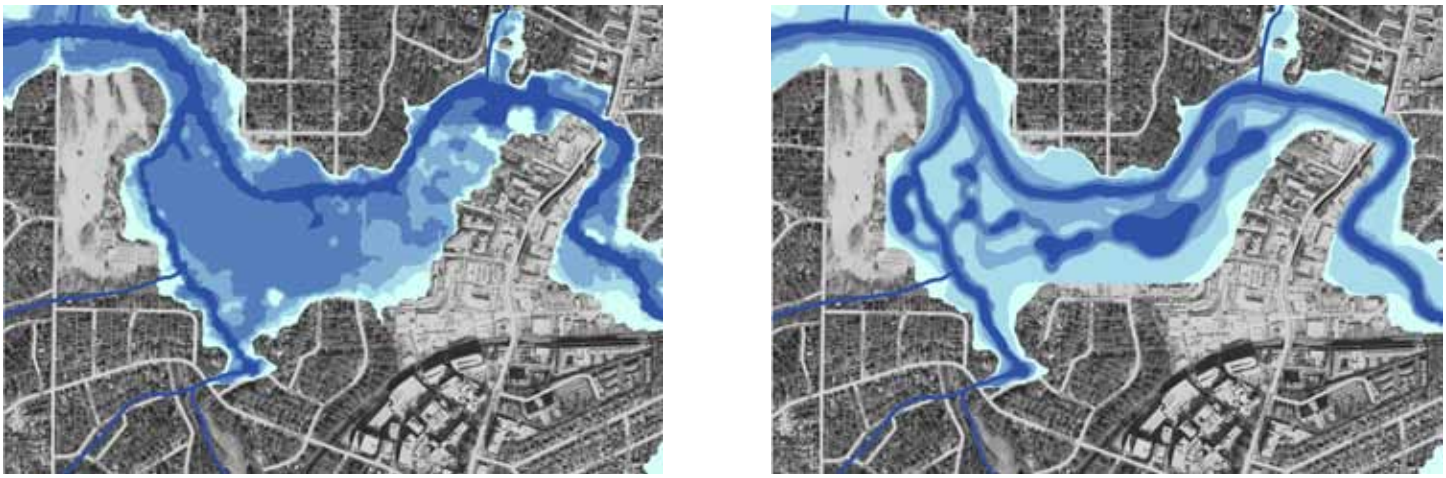
In both cases, land swaps between floodplain land and parcels outside the floodplain became the basis for the urban design proposals. Although both would be very controversial to the surrounding neighbors, the design research points to effective ways to manage complicated stormwater and floodplain issues and create expanded private urban development opportunities.

GREENWAYS ON STREAMBEDS ARE ESSENTIAL FOR STORMWATER AND URBAN DESIGN PERFORMANCE.

This conclusion seems too obvious, given the recent enthusiasm for creating greenways along streambeds in cities across the country. However, combining stormwater management with urban design can create both the public amenities of greenways with private development opportunities on adjacent land. The prospect of the redevelopment of Ansley Mall, with a larger coalition of property owners, could easily create a Clear Creek Greenway from the BeltLine to Peachtree Creek and beyond while expanding opportunities for new urban development on underutilized parcels, like Ansley Mall.

PUBLIC EDUCATION IS CRITICAL FOR ALL PROJECTS.

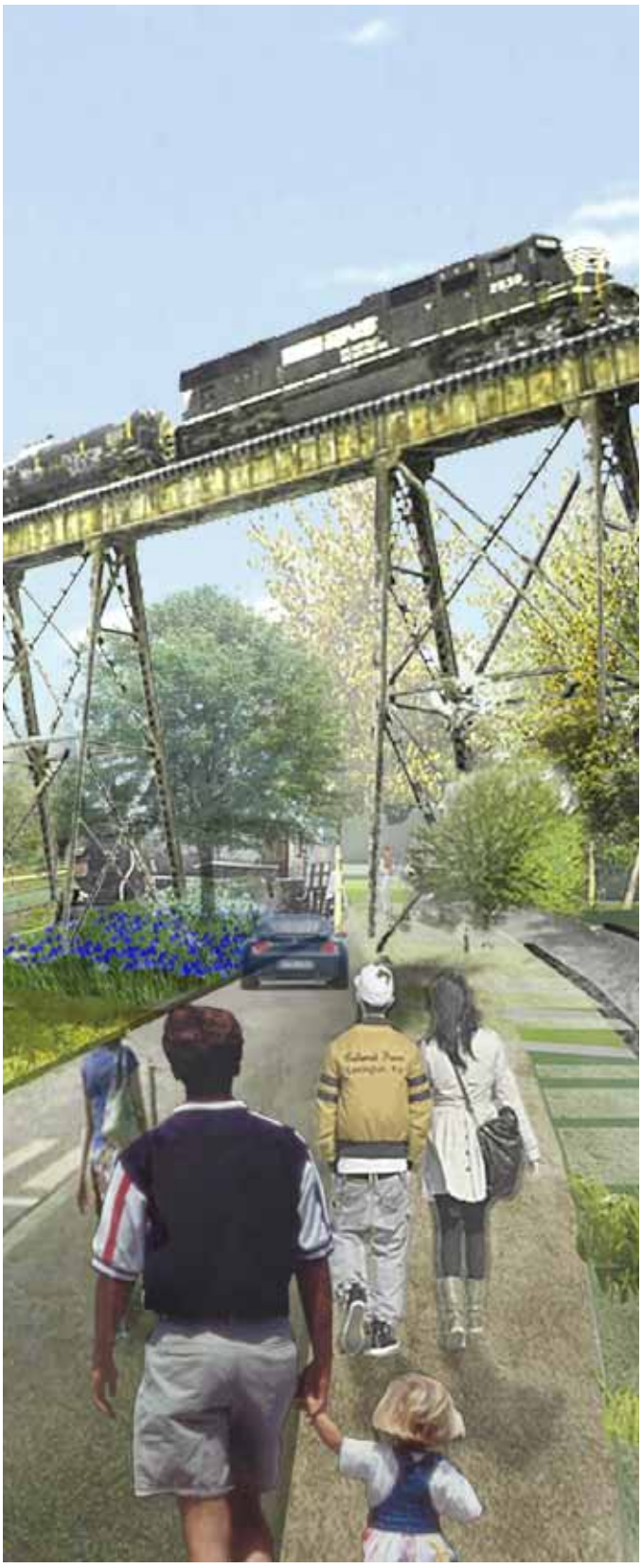
Each site's urban design proposals would likely produce resistance from neighborhood residents and property owners because the proposals are attempting to resolve complex issues which cross boundaries of neighborhoods, address the perception of public versus private interests;,and highlight different viewpoints of land use and density. This means that public education about the importance of stormwater solutions integrated into neighborhoods, public spaces, and private development needs to be expanded. Better stormwater management, more and better public spaces, and a more livable Georgia will depend on this public education. We hope that this *Design + Research Blueprints,* as part of the Georgia Conservancy's Sustainable Growth Program, can help to meet that objective.



Existing (left) and Proposed (right) flood plain at Colonial Homes/Bobby Jones Golf Course

Detention pond at University Avenue site

MADDOX PARK, BOONE BLVD & THE PROCTOR



CREEK WATERSHED

INTRODUCTION

The BeltLine Subarea 10 site lies within the 16 square mile Proctor Creek Watershed nested near the headwaters of the sub-continental Chattahoochee-Flint-Apalachicola Watershed extending to the Gulf of Mexico. Proctor Creek is nine miles long, with headwaters near Interstate 10 and its confluence with the Chattahoochee near Interstate 285.

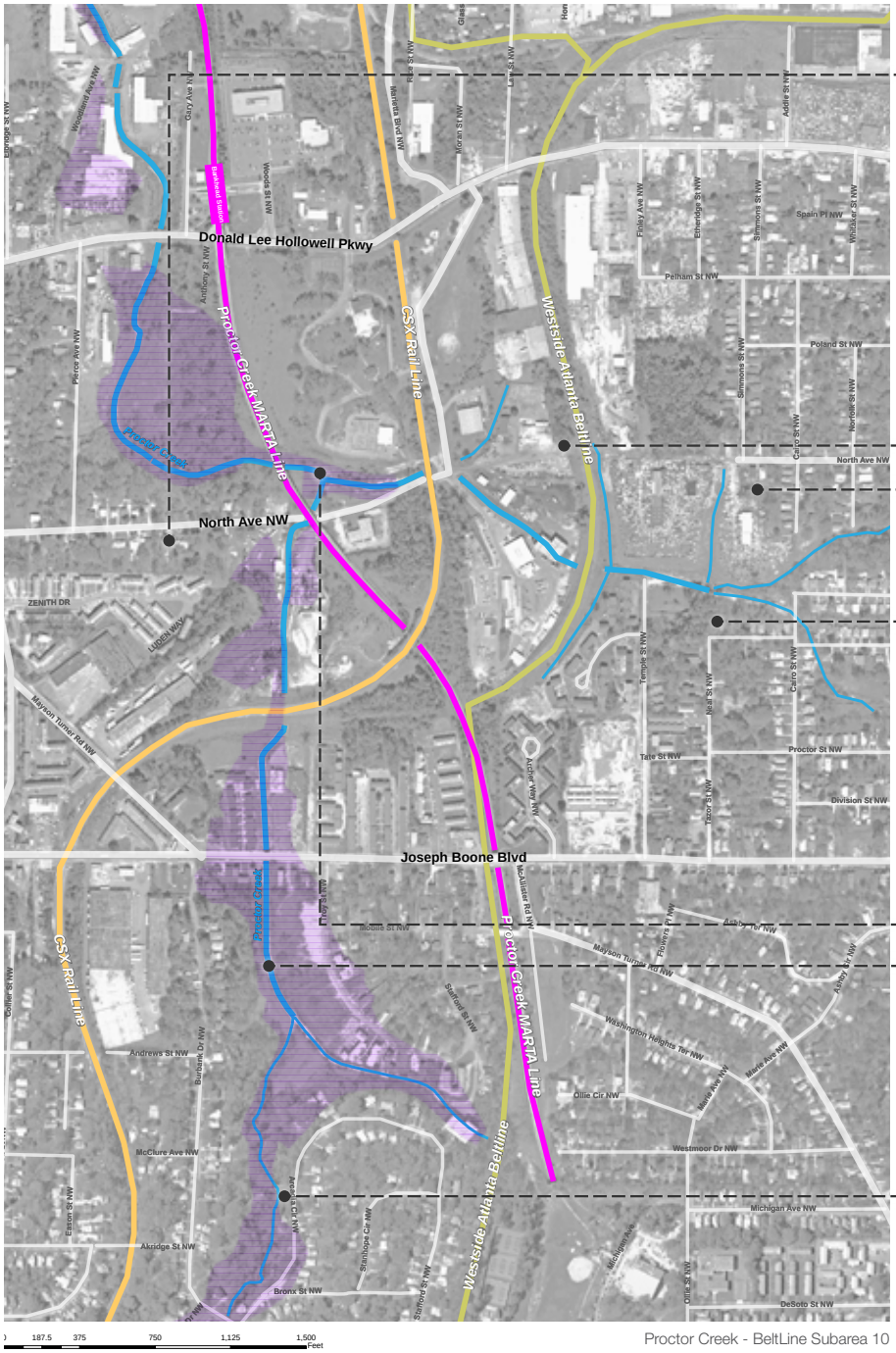
Significantly, BeltLine Subarea 10 sits at the confluence of the three drainage basins at the headwaters of the watershed. This is the most troubled part of the watershed, with combined sanitary and storm sewers, two combined sewer overflows (CFOs), frequent (although declining) sewage overflow events, a very high percentage of impermeable surfaces due to its location near downtown Atlanta, seriously compromised water quality, and a long history of neglected maintenance.

These problems will be slowly corrected as Atlanta conforms to Environmental Protection Agency (EPA) regulations and as the new City of Atlanta post-development stormwater ordinance is implemented. Flooding, which has steadily increased (and expanded flood plain boundaries) will decline. Water quality will improve to allow safe public access for the first time in more than 50 years. Multiple efforts are targeting Proctor Creek, including long range plans for creating a publicly accessible greenway along its entire length.

However, those improvements will take a generation or more to accomplish. Although Subarea 10 will continue to experience the negative problems from upstream for many years, the area can more effectively manage its stormwater quantity and quality, create opportunities for new development, and begin the implementation of the Proctor Creek greenway.

This proposal for BeltLine Subarea 10 begins with an understanding of the site's position in the Proctor Creek Watershed, the hydrology and its changing characteristics for the next generation, and the relationship of site conditions, stormwater management, and public spaces.

Existing Conditions



Proctor Creek - BeltLine Subarea 10

Terrain Problems

Rapid Change of Terrain

Urban Problems

Infrastructure Disruption

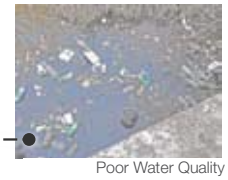
Abandoned Land

Ruins in Floodplain

Water Problems

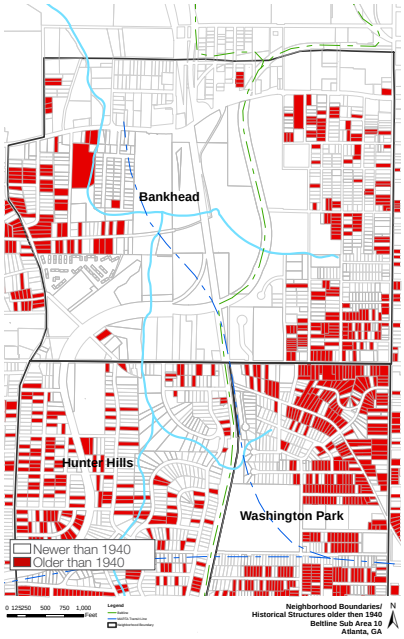
Water Bank Erosion

Concrete Channelization

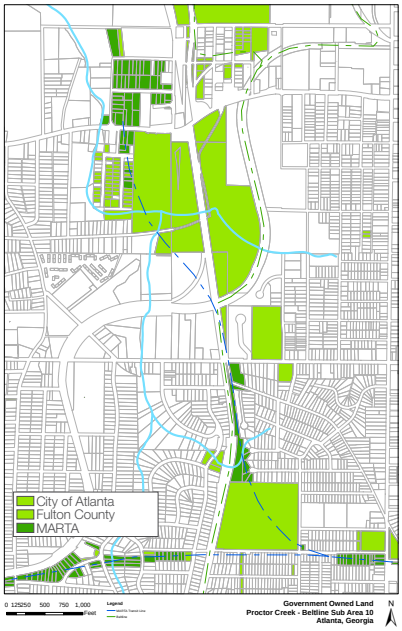


Poor Water Quality

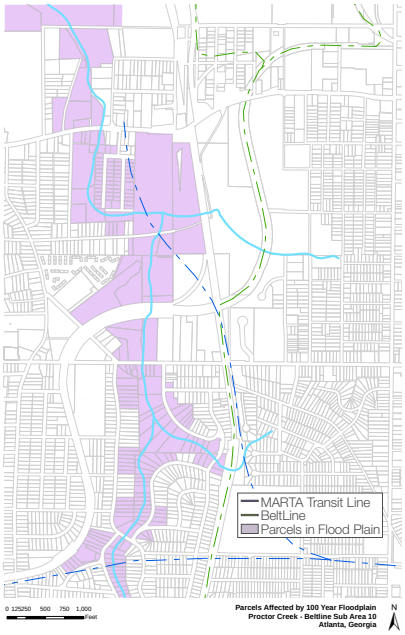
Susceptibility to Change



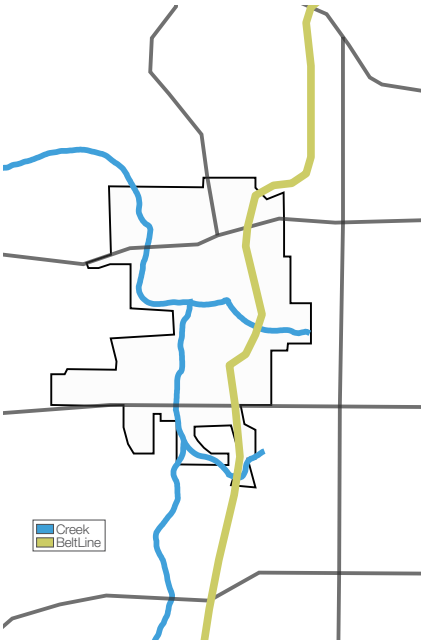
Historic Structures (older than 1940)



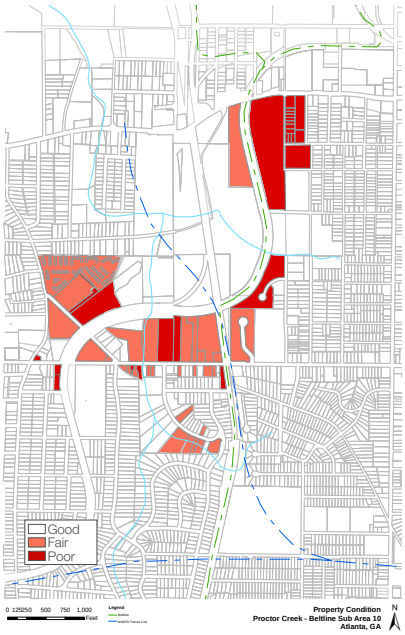
Existing Publicly Owned Parcels



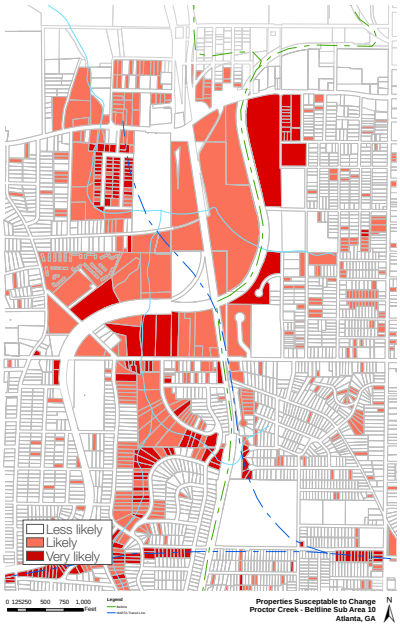
Parcels Affected by Flood Plain



Site Boundary

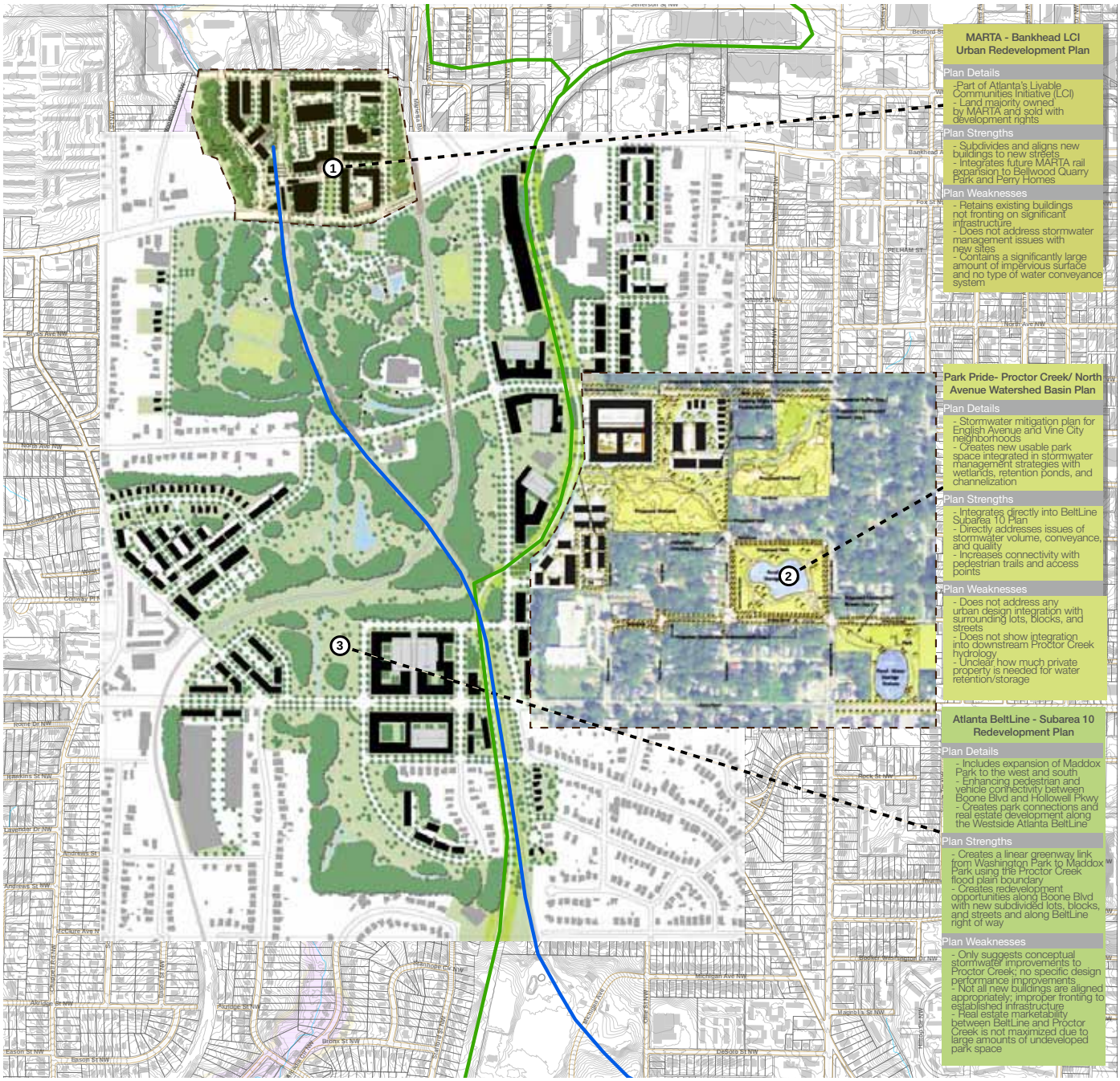


Property Conditions



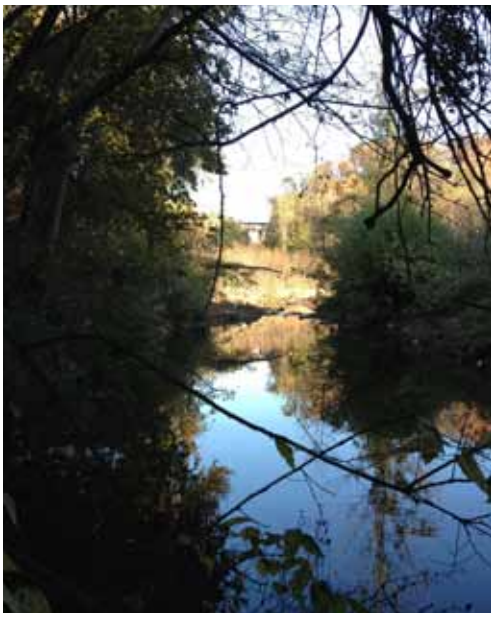
Parcels Most Susceptible to Change

Existing Site Plans



BeltLine Subarea 10 Redevelopment Plan + Marta - Bankhead LCI
+ Park Pride - Proctor Creek/North Avenue Watershed Basin Plan

Existing Conditions



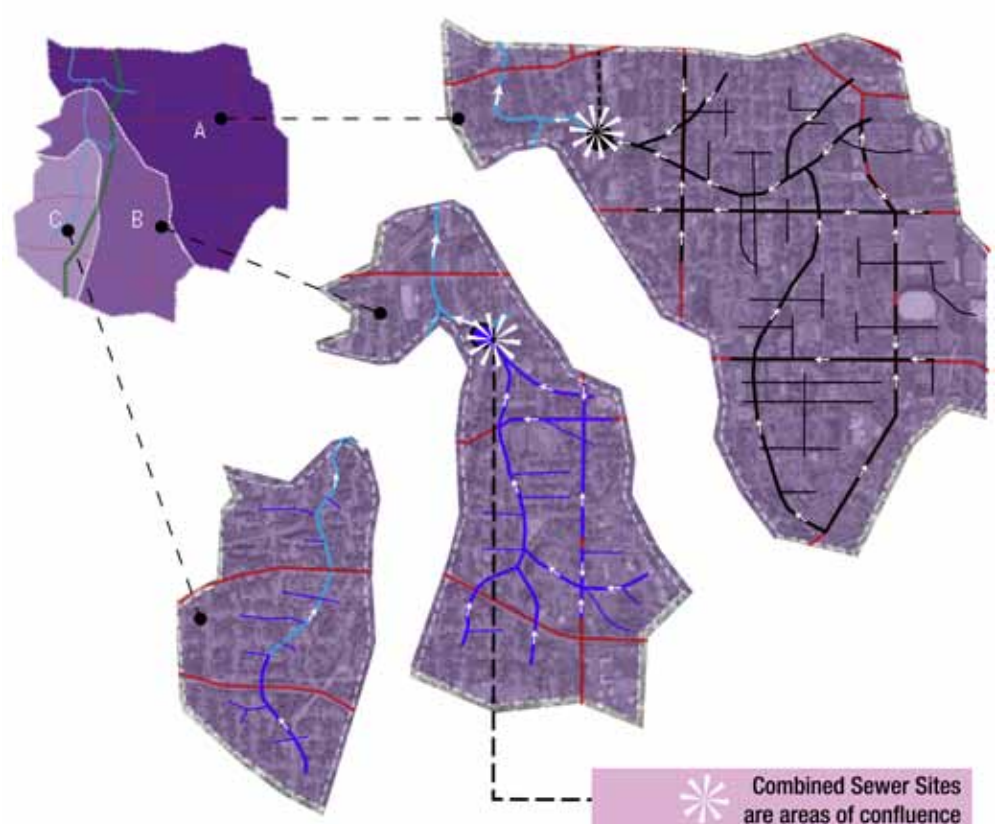
Hydrology

Site Orientation
South East Regional Watersheds
(Source: epa.gov)

Site Orientation
Atlanta Creek Watersheds
(Source: usgs.gov)

Site Orientation
Proctor Creek Watershed
(Source: epa.gov)

Stormwater Drainage System

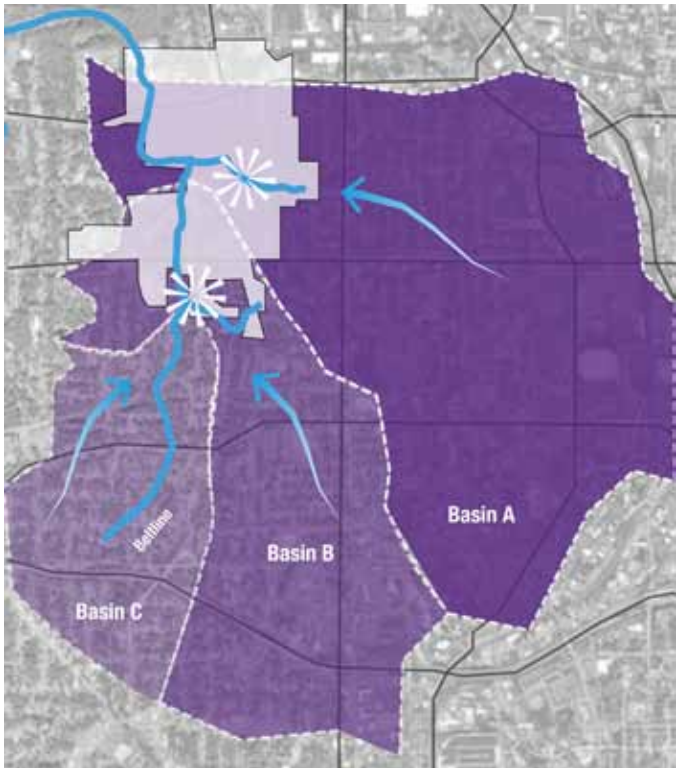


Combined Sewer Sites are areas of confluence

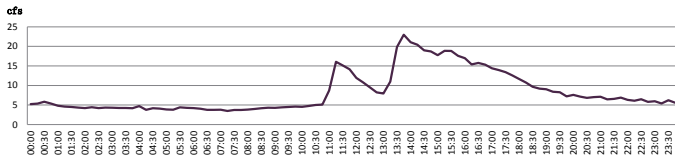
What is a C.S.O.?

Combined Sewer Overflows (CSOs) are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Many of the CSO sites may be redesigned as a public amenity in the Proctor Creek Greenway.

Watershed Boundaries

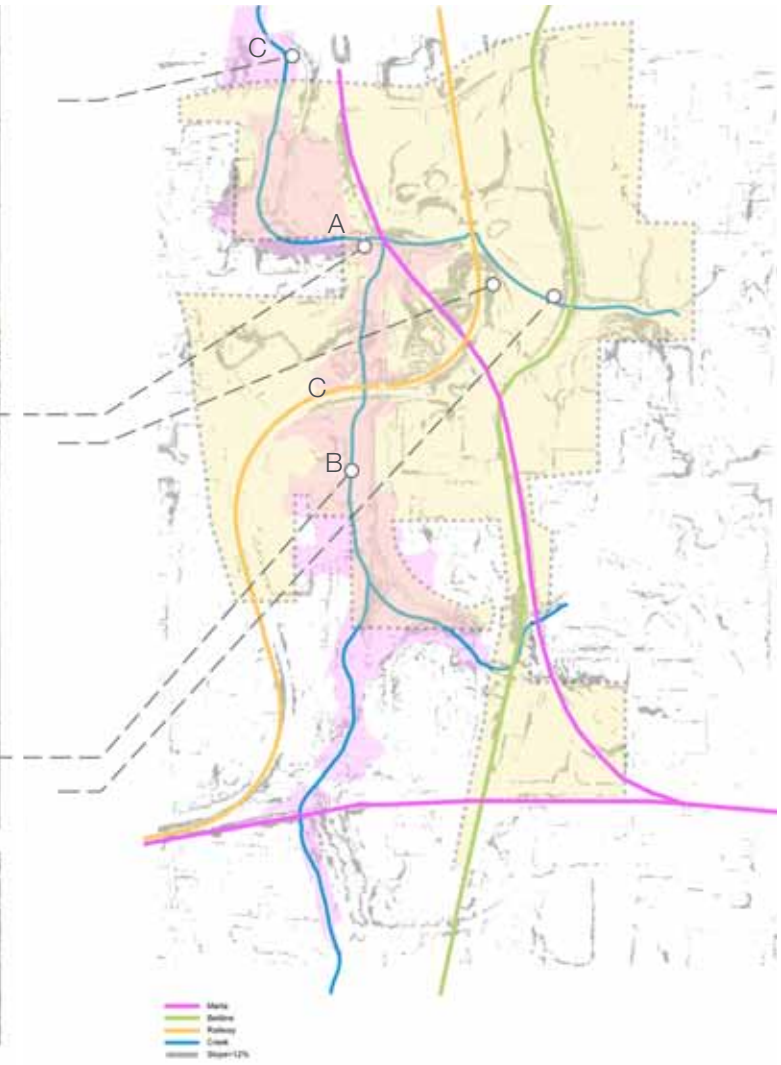


Daily Flow Rate
(cubic feet per second)



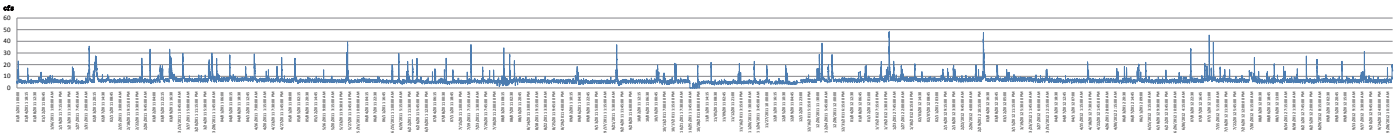
Historic Flow Rates and Current Flood Plain Boundaries

Topography



Existing Transportation Routes

Flow Rate Data (2011 to 2012)
(cubic feet per second)



Performance Strategies: Advantages

1. Reclaim Flood Plain Land
Contains stormwater volume inside flood plain boundaries, guides stormwater conveyance, and improves water quality with wetland development; enhances real estate value of surrounding development with new linear park amenity; maintains water flow performance within the flood plain without endangering surrounding private property.

2. City Stormwater Ordinance
Currently requires all new urban development in the City of Atlanta to retain the first 1.2 inches of rainfall from any given rain event on site; significant redevelopment will make a difference in the short-term, while the remaining built environment will phase in over time with continuing redevelopment; alleviates strains on city stormwater and sewer capacity.

3. Land Ownership Shifting
Creates a new Maddox Park within a connecting linear park from the Bellwood Quarry/Grove Park area to Washington Park in the low-lying flood lands as a natural part amenity; utilizes higher elevated lands in the current Maddox Park area for prime real estate development; within close proximity to the BeltLine and MARTA stations.

4. Land Subdivision
Provides an urban framework with stormwater mitigation as a subdividing driver; integrates a sustainable, easy maintenance stormwater system; establishes a model set of rules for future subdivision developments to integrate green stormwater practices and promote them as valued amenities.

5. Bioengineering
Increases water flow efficiency and capacity of Proctor Creek; keeps the flood plain defined boundaries from increasing in size with more uncontrolled development; creates multiple real estate enhancement opportunities for developing park leisure space within the flood plain, once water is re-channeled.

6. Infiltrate
Retains small quantities of water locally, alleviating large storm runoff flows into the city stormwater system and Proctor Creek; integrates green stormwater infrastructure in established street right-of-ways for easy construction and maintenance; slows down water velocity with ground absorption.

7. Retention
Retention ponds delay water flow velocity, slowing down large amounts of water flowing downstream, releasing only a portion of input flow; re-directed conveyance channels increase distance of flow and therefore slow down timing of water flow downstream and increase volume capacity over more land coverage.

8. Collection
Retains small to large quantities of water domestically and limits storm water runoff flow into the city storm water system and Proctor Creek; water infiltrated and collected on individual sites can be reused for local work functions by private landowners and public entities; uses include - irrigation, park land maintenance, indoor 'grey water' plumbing, and servicing amenity water features.

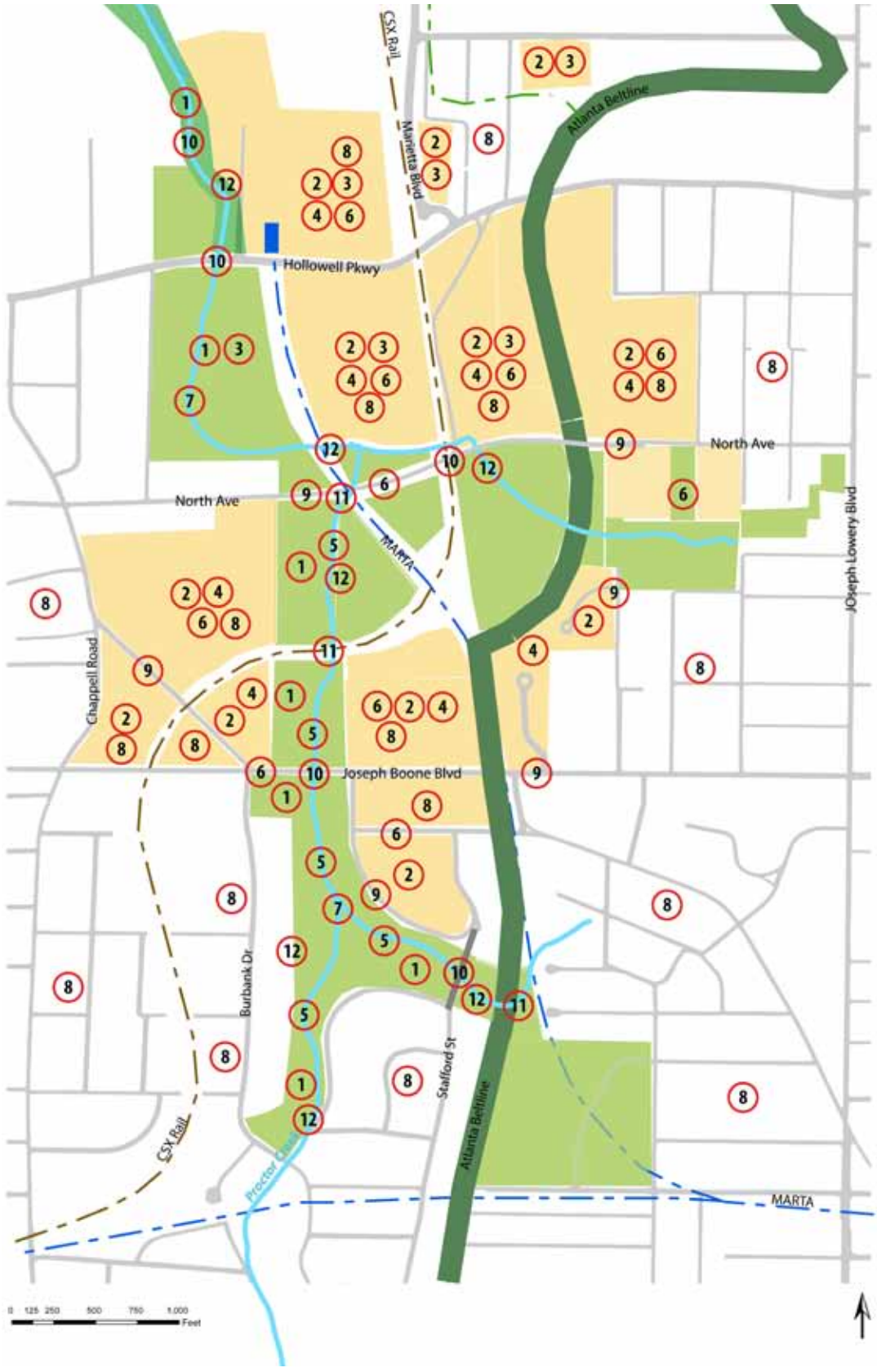
9. Street Redesign
Integrating green streets collects, re-conveys, and improves the quality of stormwater right off the street and property before it pours into creeks; less dependence on underground stormwater piping; allows for some water to be infiltrated into the ground.

10. Bridge Redesign
Updated bridges with pedestrian railings increases safety from above; enhances creek as an amenity with scenic pathway under bridge and over creek water flow; creates a monumental amenity with bridge's conceptual design and nature framing view.

11. Culvert Redesign
Converting current culvert to larger culvert or bridge allows for increased water flow; increases daylighting inside tunnel/ bridge; creates pedestrian access along creek to maintain full connectivity in the linear greenway park.

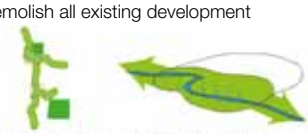
12. Pipe-End Redesign
Terminating the pipe before the creek allows water to infiltrate in the ground, decreasing velocity; thick grass wetlands can improve water quality by filtering impurities before it is poured into the creek; enhances real estate value as a park amenity.

Performance Strategy Locations



① Reclaim Flood Plain Land

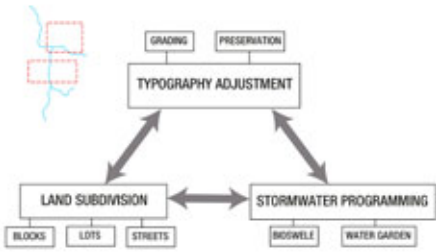
Acquire properties inside the flood plain and demolish all existing development

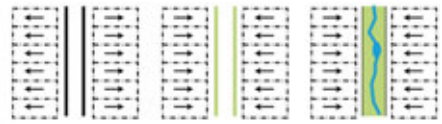


Designate the entire flood plain as a new continuous linear park

Build new development fronting the flood plain fringes as new park amenity and manage new stormwater runoff generated with new development

④ Land Subdivision





Lot/Parcel Frontage Alignment

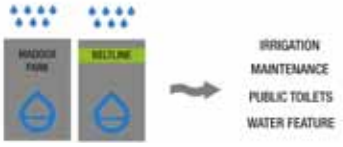
⑤ Bioengineering

Deepen concrete channel to efficiently increase volume capacity and enhance conveyance

Utilize new design of deepened concrete channel to create new greenway development opportunities adjacent to Proctor Creek

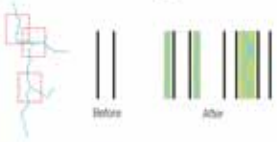
⑧ Collection

Water Collection and Reuse Opportunities on Private Property



Water Collection and Reuse Opportunities

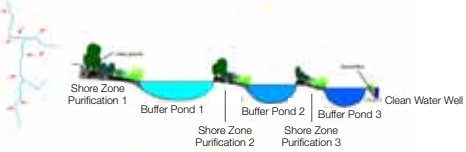
⑨ Street Redesign



Before

After

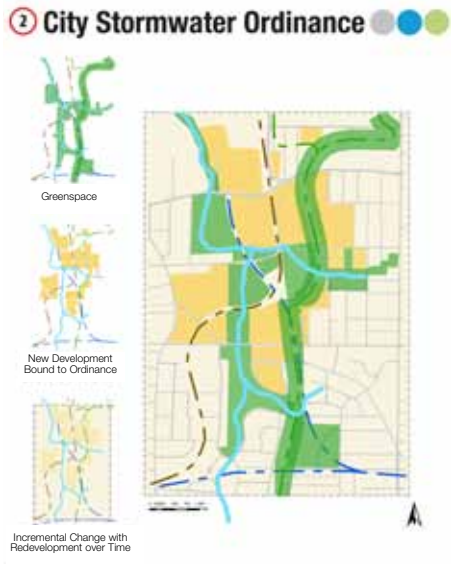
⑫ Pipe-End Redesign

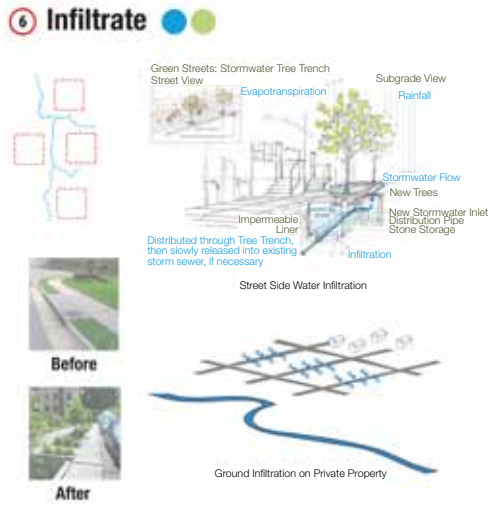


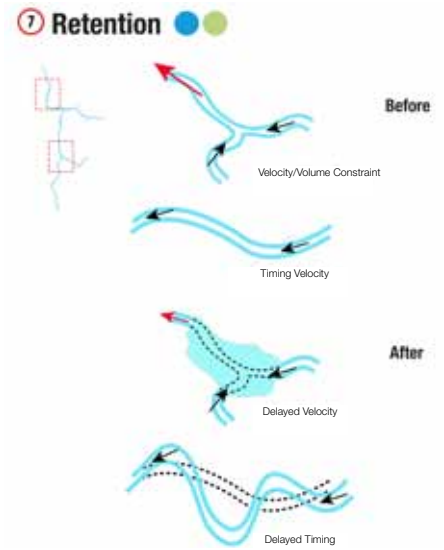
Before

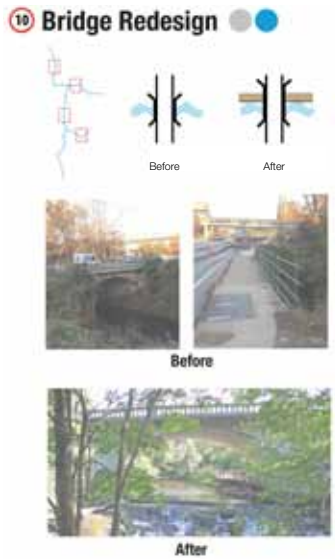
After

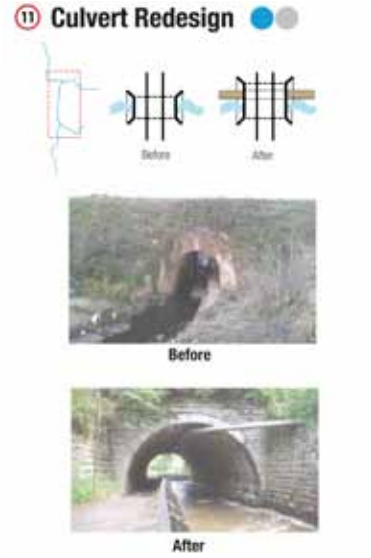
Performance Strategies ● Water Performance ● Land Performance











Urban Performance

Illustrative Plan

Greenway and Subdivision Plan

COLONIAL HOMES, BOBBY JONES GOLF COURSE

INTRODUCTION

The BeltLine Subarea 7 site lies within the Peachtree Creek Watershed within the larger Upper Chattahoochee Watershed. Peachtree Creek flows for 7.5 miles west into the Chattahoochee River just south of Vinings, Georgia. Its two major tributaries are the North Fork and South Fork; the northern fork begins at the edge of Gwinnett County and flows southwest, ending at its confluence with the southern fork, next to where Interstate 75/85 meets Georgia 400.

This site is located off Northside Drive NW near Woodward Way NW, near a heavily built out area of the Peachtree Street corridor. In close proximity is the Bobby Jones Golf Course, Atlanta Memorial Park, the Colonial Homes neighborhood and the Northside BeltLine Park. Many properties in this area are built on low elevations and because of this they observe frequent flooding during storm events. The Colonial Homes site lies within the floodplain and future development related to the BeltLine will potentially increase the effects of flooding.

The current BeltLine Subarea 7 master plan excludes the Colonial Homes area because it is outside of the designated Tax Allocation District (TAD). This proposal recommends reevaluating this decision to include Colonial Homes in the TAD. Displacement of existing residents is not an option, yet the site will continue to flood if actions are not taken. A solution that looks at the larger area alternatives for development is proposed – looking at how urban design can manage stormwater when flooding cannot be eliminated.

This proposal for BeltLine Subarea 7 begins with an understanding of the site's position in the Peachtree Creek Watershed, the hydrology and its changing characteristics for the next generation, and the relationship of site conditions, stormwater management, and public/private spaces.

& THE PEACHTREE CREEK WATERSHED

Site Complications

September 21, 2009 flooding at Colonial Homes

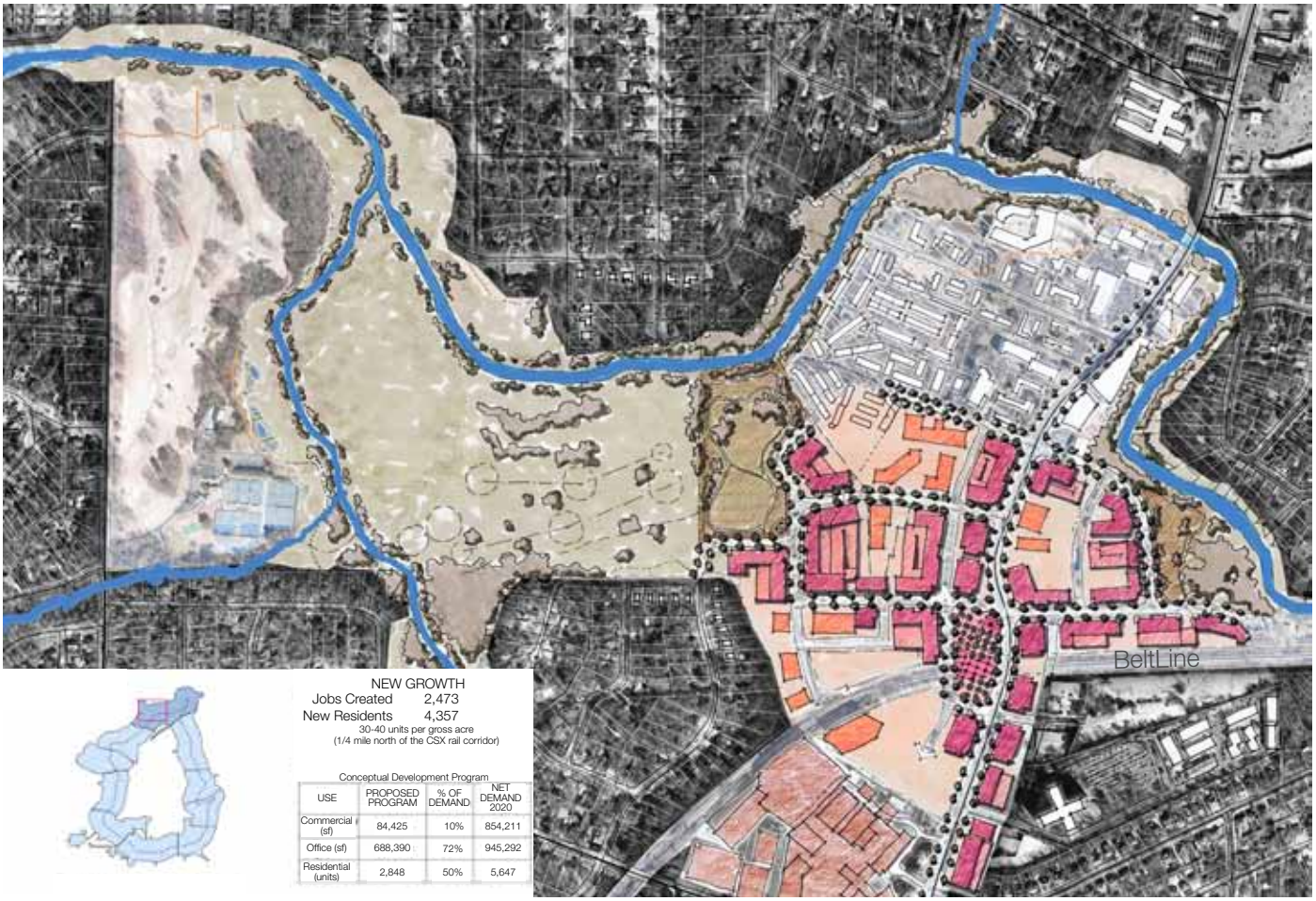
Peachtree Creek Watershed in Atlanta

Site Location

Colonial Homes Site

Colonial Homes Figure Ground

BeltLine Subarea 7 Master Plan and Analysis



NEW GROWTH

Jobs Created 2,473

New Residents 4,357

30-40 units per gross acre
(1/4 mile north of the CSX rail corridor)

Conceptual Development Program

USE	PROPOSED PROGRAM	% OF DEMAND	NET DEMAND 2020
Commercial (sf)	84,425	10%	854,211
Office (sf)	688,390	72%	945,292
Residential (units)	2,848	50%	5,647

Critique 1:
Tax Allocation District Boundary

Focuses on redevelopment wtihin the TAD boundary, but does not pay attention to the adjacent areas, especially the large area north of Colonial Homes that is subject to flooding.

Recommendation to include these areas in the TAD boundary.

Critique 2:
Stormwater Management

Subarea 7 plan does not address the entirety of flooding issues. Also removes the residential from the floodplain and turns the remaining land into new public open space.

Lacks concrete stormwater management tactics to mitigate flooding such as green streets, detention ponds and bio-swales.

Critique 3:
Transit Plaza

The transit plaza over the BeltLine transit stop has a good location and significant function. However, the crude slab overhead will probably reduce the spatial quality of the BeltLine underneath.

This design should be reconsidered.

Critique 4:
Northside Dr - Peachtree Rd

There is no direct east/west connection between these two main roads bordering the site within a 10,000 foot radius of the proposed BeltLine plaza and commercial center.

Critique 5:
BeltLine - Peachtree Creek

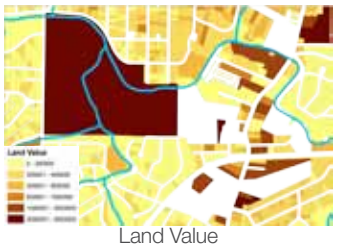
The connection between the BeltLine transit stop and the green space beside Peachtree Creek should be enhanced.

Critique 6:
Peachtree Rd - Open Space

The stretch between Peachtree Rd and open space is long in distance and poor in quality.

There should be more agreeable connections between Peachtree Road and the green open space associated with the development.

Hydrology


Land Value

Static and Elastic Tissues


Site Contours


Water Pollutants

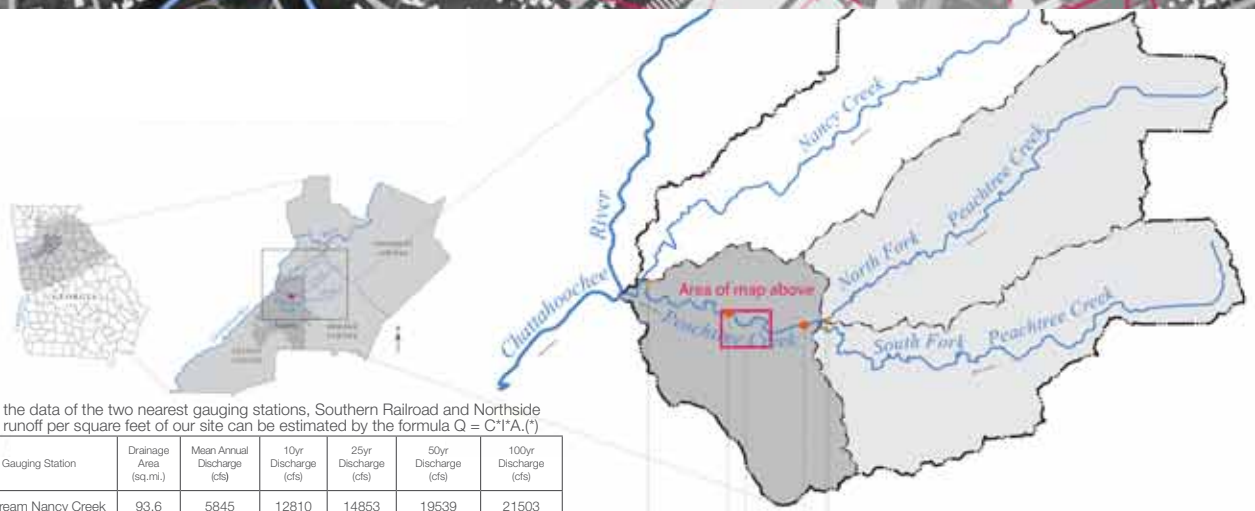

Paths


Intersections


Water Outlets


Water Outlets

Stormwater Runoff System



Using the data of the two nearest gauging stations, Southern Railroad and Northside Drive, runoff per square feet of our site can be estimated by the formula Q = C*I*A.(*)

Gauging Station	Drainage Area (sq.mi.)	Mean Annual Discharge (cfs)	10yr Discharge (cfs)	25yr Discharge (cfs)	50yr Discharge (cfs)	100yr Discharge (cfs)
Upstream Nancy Creek	93.6	5845	12810	14853	19539	21503
Northside Drive	**86.8**	**5593**	**13005**	**15139**	**19745**	**21827**
Southern Railroad	**69.8**	**5368**	**11891**	**13778**	**17783**	**19548**
Mouth of South Fork	30.5	2996	6383	7335	9504	10301
Mouth of North Fork	38.6	3632	8486	9965	12831	13988
Difference of the Two Nearest Stations	**17**	**225**	**1114**	**1361**	**1962**	**2279**

Runoff per sqft (feet/ second)	Mean Annual	10yr	25yr	50yr	100yr
	4.7×10^{-7}	23.5×10^{-7}	28.7×10^{-7}	41.4×10^{-7}	48.1×10^{-7}

Stormwater Runoff Estimation

*The Rational Method Equation is the simplest method to determine peak discharge from drainage basin runoff.
Q = Peak discharge, cfs
c = Rational method runoff coefficient
i = Rainfall intensity, inch/hour
A = Drainage area (acres)

Peachtree Creek Watershed

Peachtree Creek Basin boundary

Sub-basin boundary

Urban Design Strategy

Existing Parcels

1 inch = 800 ft

Existing		
Retail (sf)	Office (sf)	Residential (units)
201,355	7,000	332
BeltLine Proposed New Development		
Retail (sf)	Office (sf)	Residential (units)
205,750	436,800	1,977
Net Gain		
Retail (sf)	Office (sf)	Residential (units)
4,395	429,800	1,645

Proposed Parcels

1 inch = 800 ft

BeltLine Proposal		
Single Family	Townhomes	Condos/Apts
0	0	1,977
Studio Proposal		
Single Family	Townhomes	Condos/Apts
36	296	2,642

Tactic 1:
Relocation and Enhancement of Residential Units

All homes have been removed from the floodplain. To replace and increase residential unit quantities, homes have been proposed on higher land with increased values. The proposed net gain of residential units directly leads to a higher tax base for the TAD.

Tactic 2:
Eco-Conscious Golf Course & Park

The existing 18-hole golf course is proposed to be transformed into an ecologically-friendly 9-hole course in concert with its urban context. The proposed park reduces issues of flooding while providing the public educational opportunities about flood mitigation and the importance of protecting water resources.

Tactic 3:
Capitalizing on Land Value Potential

A total of 2% of condominiums overlook the golf course's west end. Four stories each, these buildings are still agreeable with the context on adjacent uses.

2486 high-value condominiums and apartments overlook the park and rest above a commercial center and office space along Peachtree Road.

Tactic 4:
Northside Dr - Peachtree Rd Connection

A grand boulevard experience provides increased connectivity on the site without disruption to any residential areas, existing or proposed.

Tactic 5:
BeltLine - Peachtree Creek

Four direct connections are offered for BeltLine users to find Peachtree Creek. The first is the park on the east side of the Peachtree Rd. The second and third link the BeltLine plaza through green streets to the large park. The fourth is a greenway connecting the BeltLine to the large park. A greenway is proposed for the length of the creek.

Tactic 6:
Green Streets

All proposed streets should adopt green street standards to better handle the issues of water quantity and quality running through and falling on the site.

GOALS

Increase efficiency of floodplain to mitigate volume
Clean the water on the site
Preserve and enhance economic value of adjacent land
Improve quality of life for residents
Develop BeltLine - Peachtree Creek connection
Create a permanent solution

TACTICS

Remove buildings from floodplain
Re-examine design of golf course to better utilize floodplain
Provide opportunities to stimulate economic growth through real estate development
Design mutually beneficial interrelationships among BeltLine, Colonial Homes site, Peachtree Street and golf course
Design for walkability and active lifestyles

Existing land use masses

Development on high ground

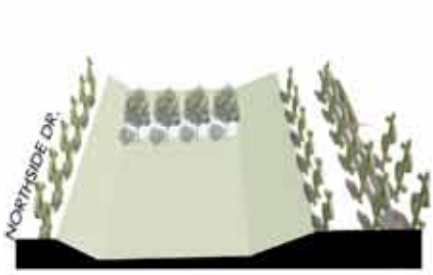
9-hole golf course and public park

Studio Proposed Master Plan

Expand Tax Allocation District

Build Green Streets

Typical Green Street plant material



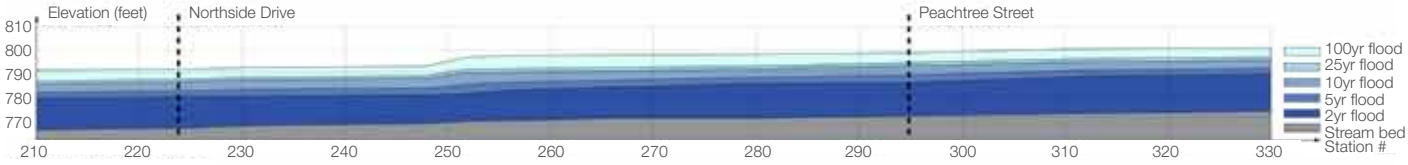
Capitalize potential real estate value

Relocate BeltLine plaza

Connect BeltLine and Creek

Hydrology Design Strategy

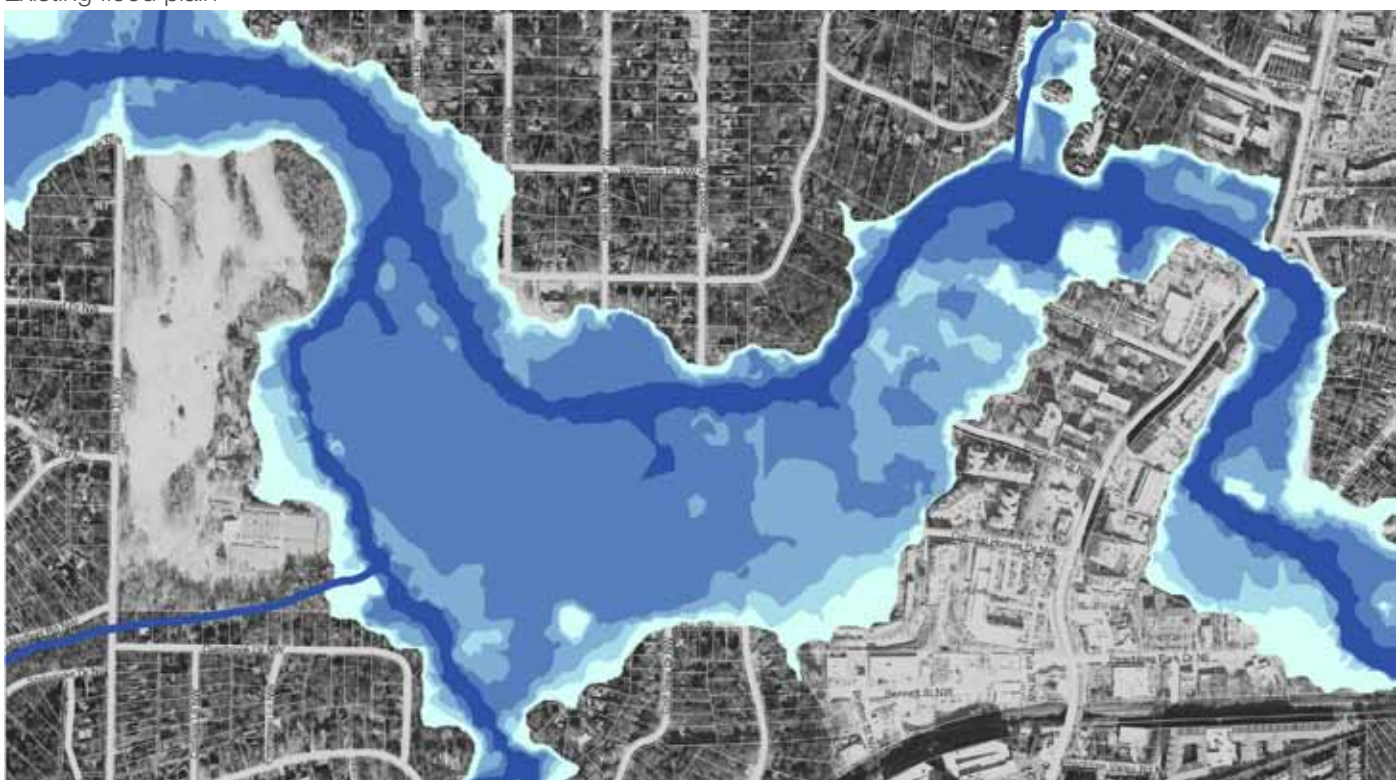
2 Year Flood Plan 5 Year Flood Plan 10 Year Flood Plan 25 Year Flood Plan



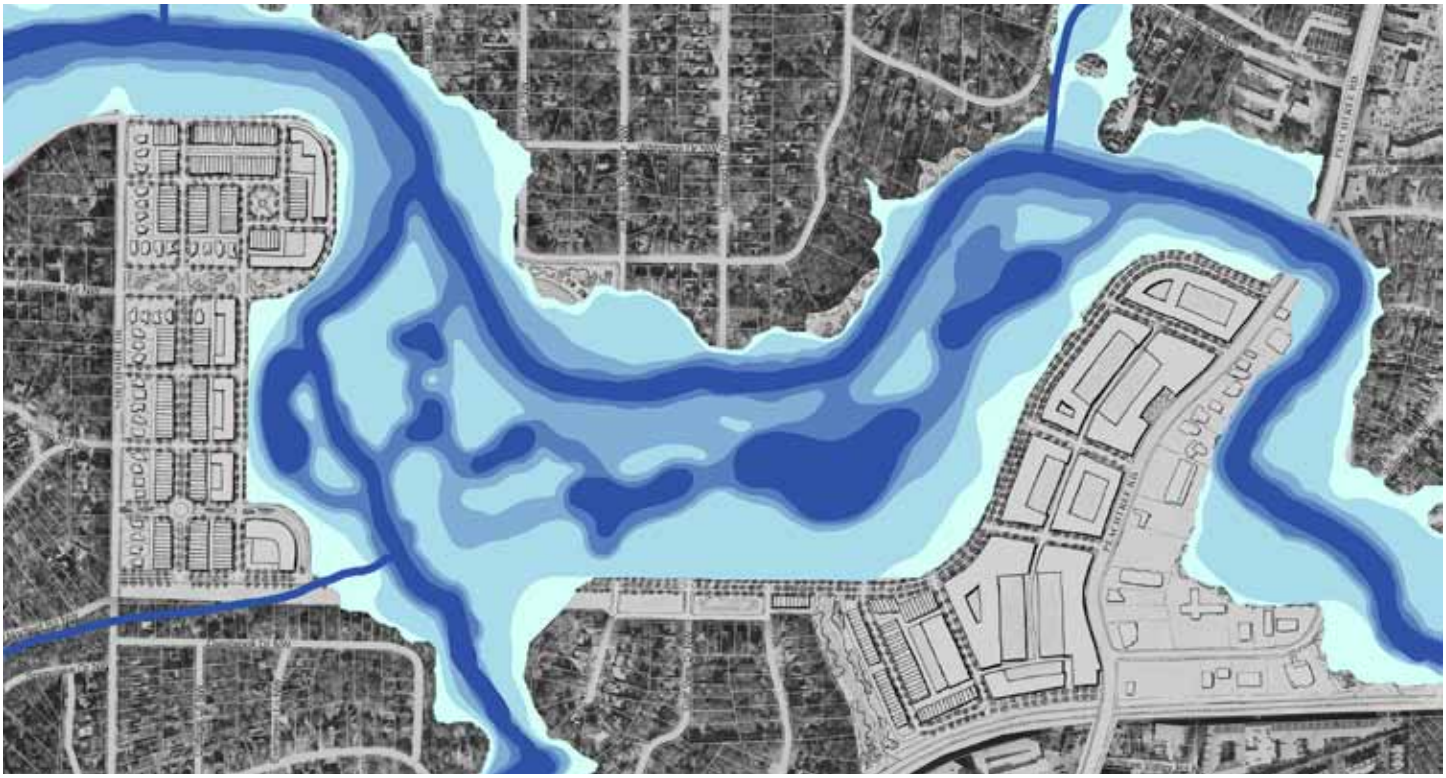
Peachtree Creek Profile

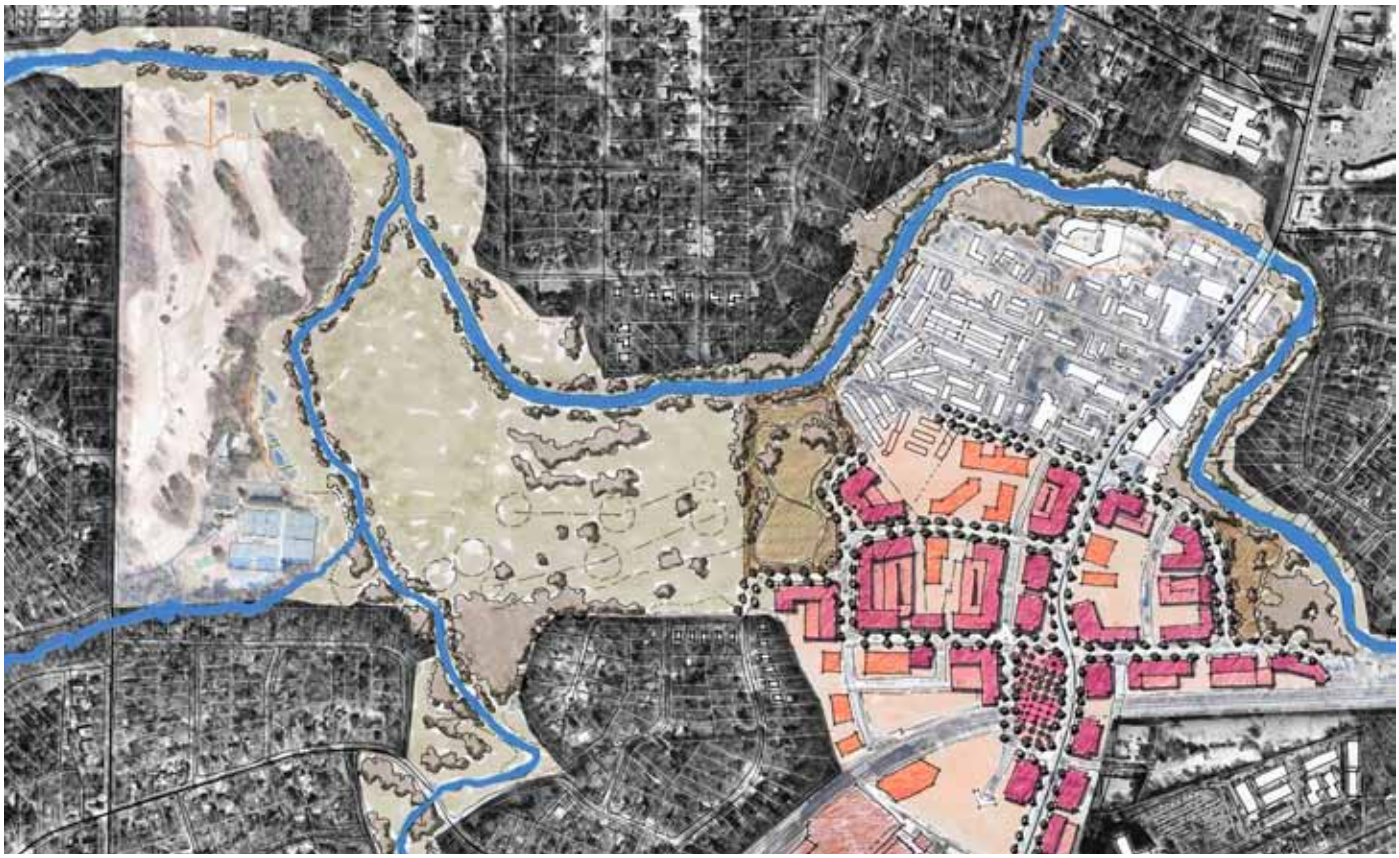
Retention Detention BMP Infiltration

Existing flood plain



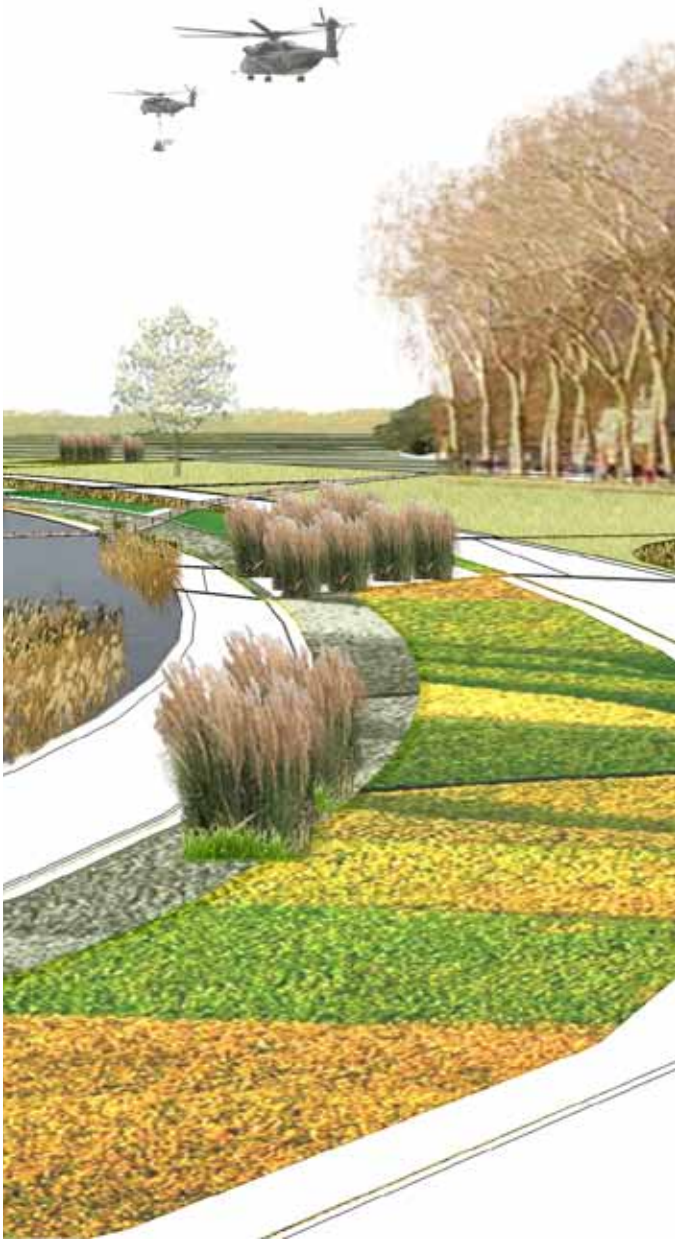
25-year flood event in public park and golf course
Design + Research Studio Proposed 25-year flood plain





Existing BeltLine Subarea 6 Master Plan (above) and Design + Research Studio Proposed Master Plan (below)

UNIVERSITY AVE., PITTSBURGH NEIGHBORHOOD



INTRODUCTION

The BeltLine Subarea 2 site lies within the South River Watershed, in the upper portion of the Ocmulgee River Basin, draining eventually into the Atlantic Ocean. The McDaniel Branch (also referred to as the North Branch of the South River) has been designated as impaired by the Environmental Protection Division (EPD) of the Georgia Department of Natural Resources.

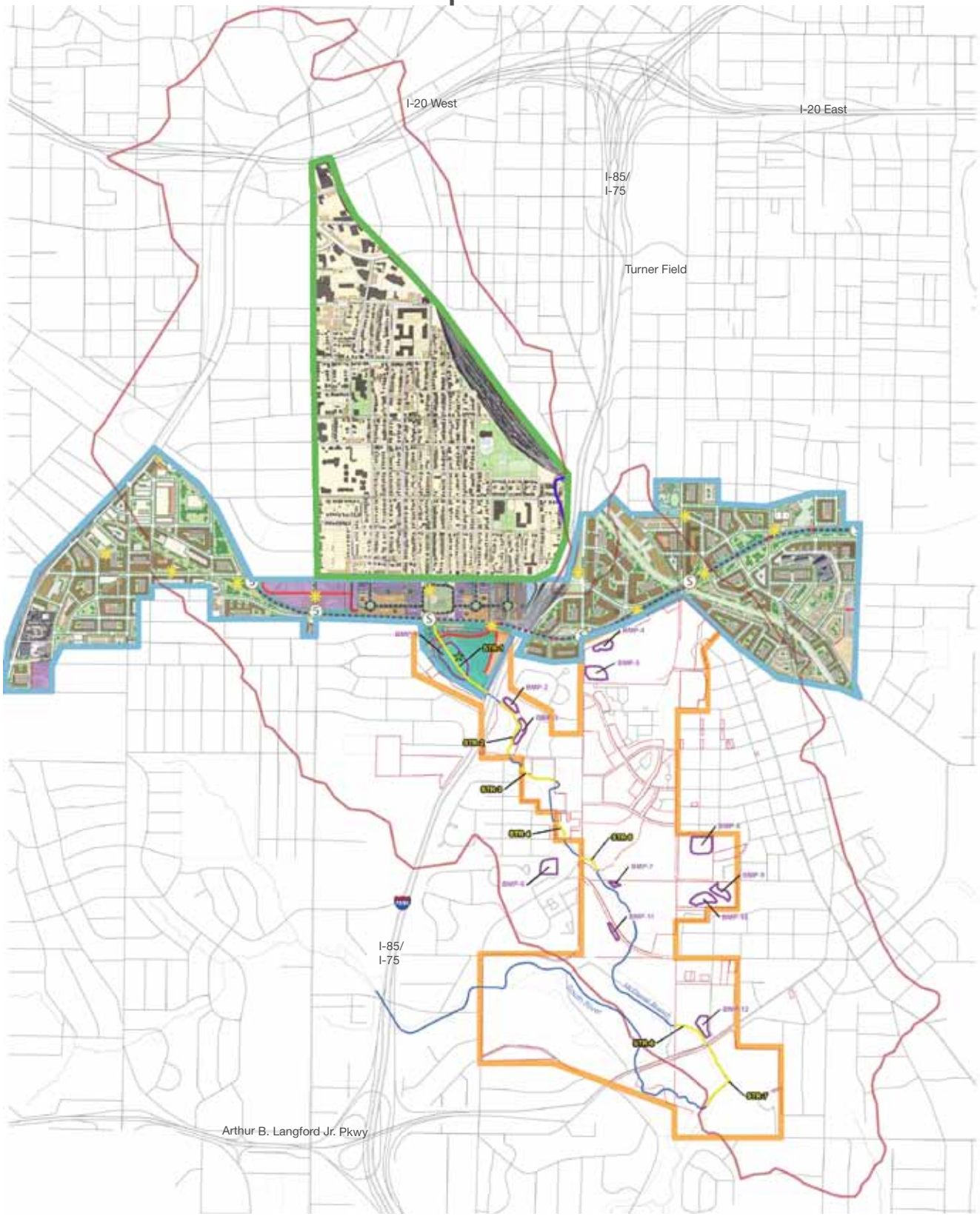
The site is located on University Avenue SW between the Downtown Connector and Metropolitan Parkway SW. The site is located within the Pittsburgh neighborhood, which, despite sitting above the 100-year flood plain, experiences occasional localized flooding due to inadequate and insufficient stormwater infrastructure. The McDaniel Branch was impacted by several stormwater outfalls and past development on the site and in the watershed, resulting in an overly wide channel with vertical eroding banks. While the previous combined sewer overflow in this area was separated, there is not enough capacity for what is required of the pipes.

The Department of Watershed Management completed a Watershed Improvement Plan for the McDaniel Branch in 2008, and implementation of this plan is anticipated to be completed in Spring of 2014. The City of Atlanta has prioritized this watershed improvement project because of its location high in the watershed and because the city owns property on both sides of the stream as part of the green corridor. Other plans for the area include the BeltLine Subarea 2 master plan, which includes both proposed mixed-use development and new park spaces. The Preservation of Pittsburgh Neighborhood Master Plan Report, completed in 2012 aims at creating a diverse, mixed-income neighborhood that is environmentally sound.

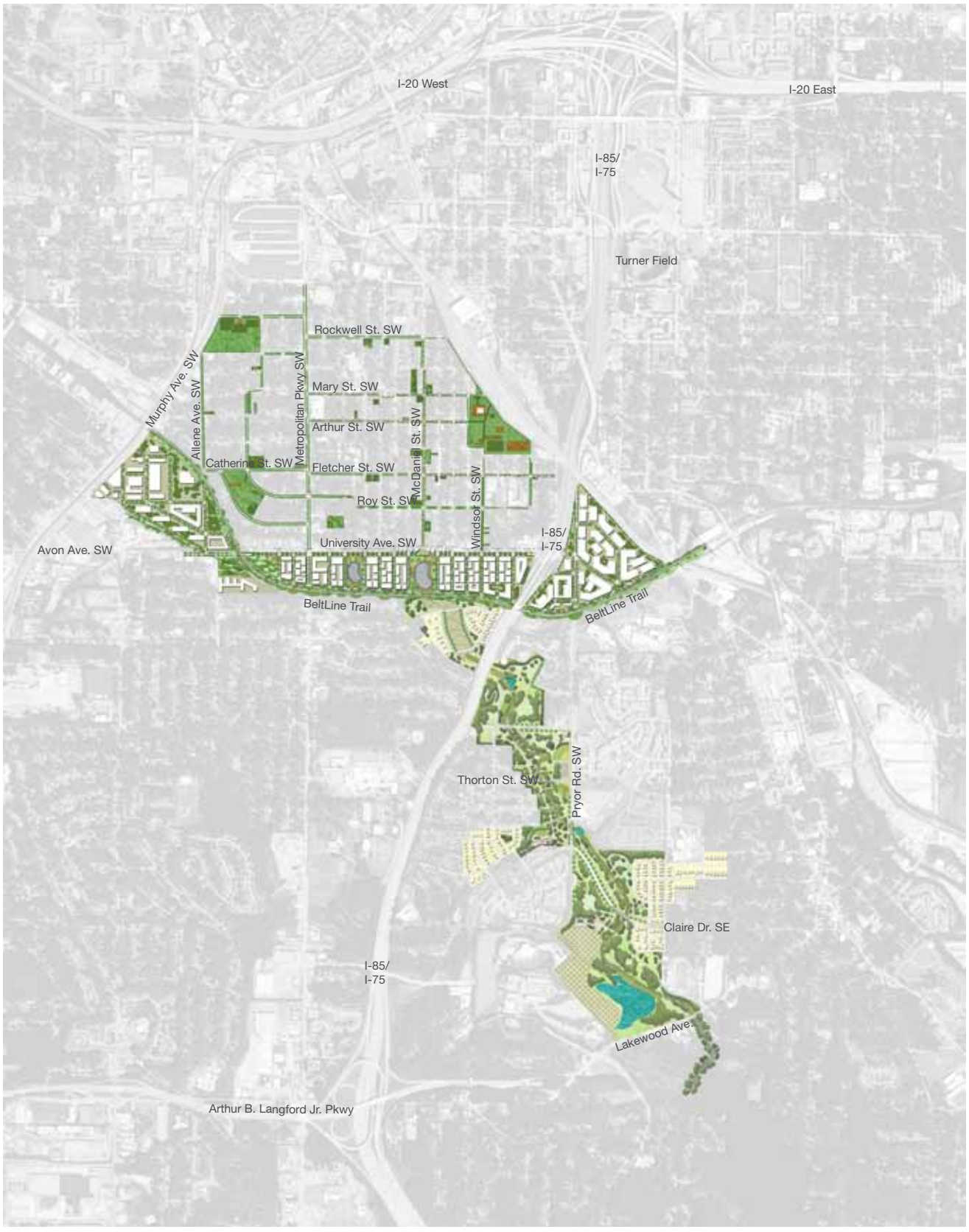
This proposal for BeltLine Subarea 2 begins with an understanding of the site's position in the South River Watershed, the hydrology and its changing characteristics for the next generation, and the relationship of site conditions, stormwater management, and public spaces.

AND THE MCDANIEL CREEK WATERSHED

BeltLine Subarea 2, Pittsburgh Neighborhood Plan, and McDaniel Creek Watershed Improvement Plan



Soft Infrastructure Master Plan



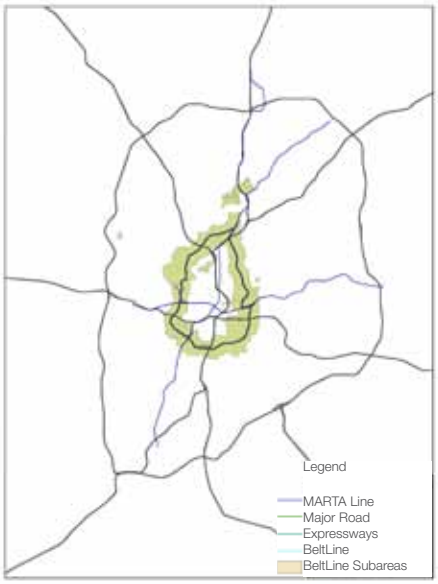
Existing Site Conditions

Topography

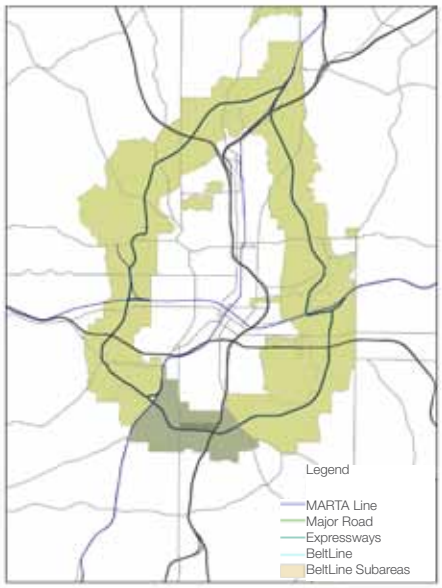
100 year floodplain

Impervious surfaces

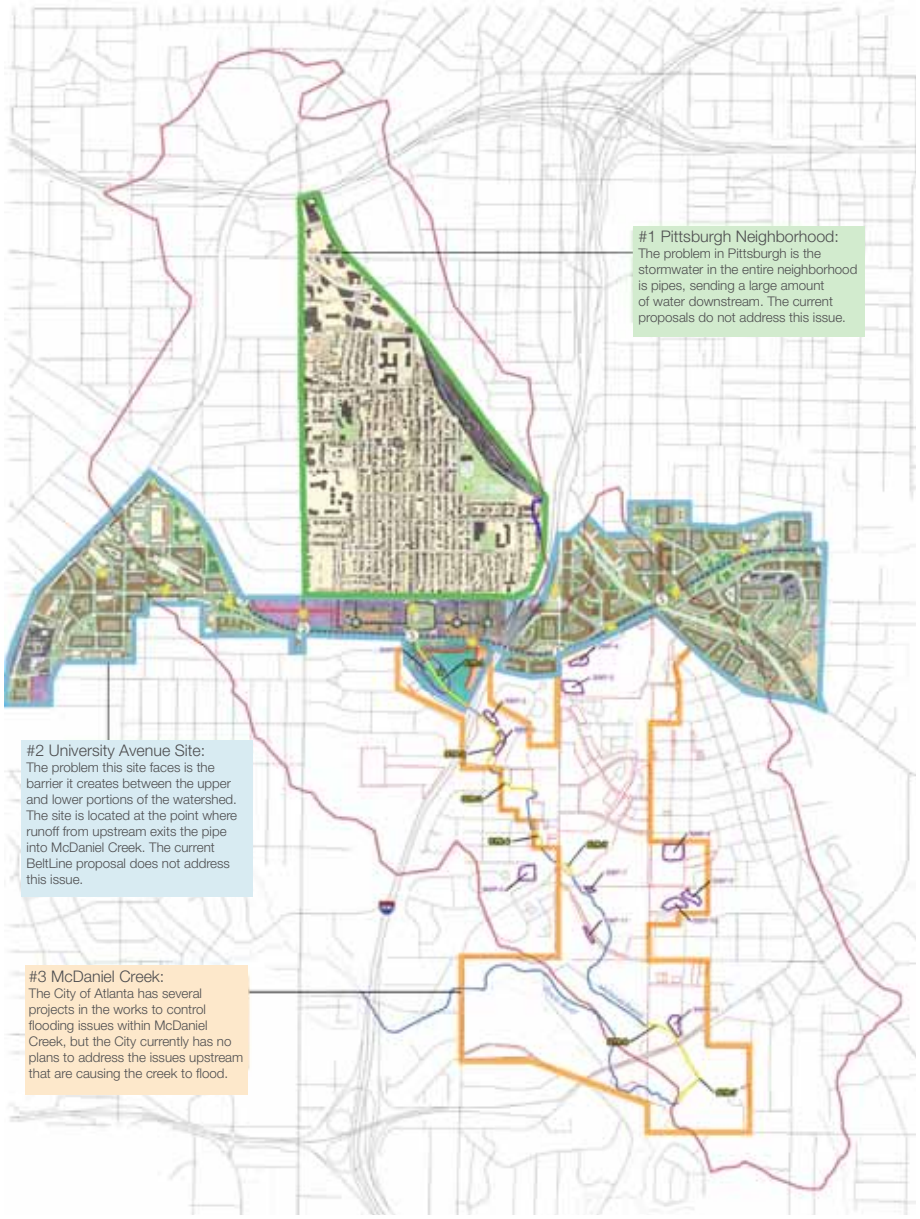
Existing Project Site Conditions



Within the Region

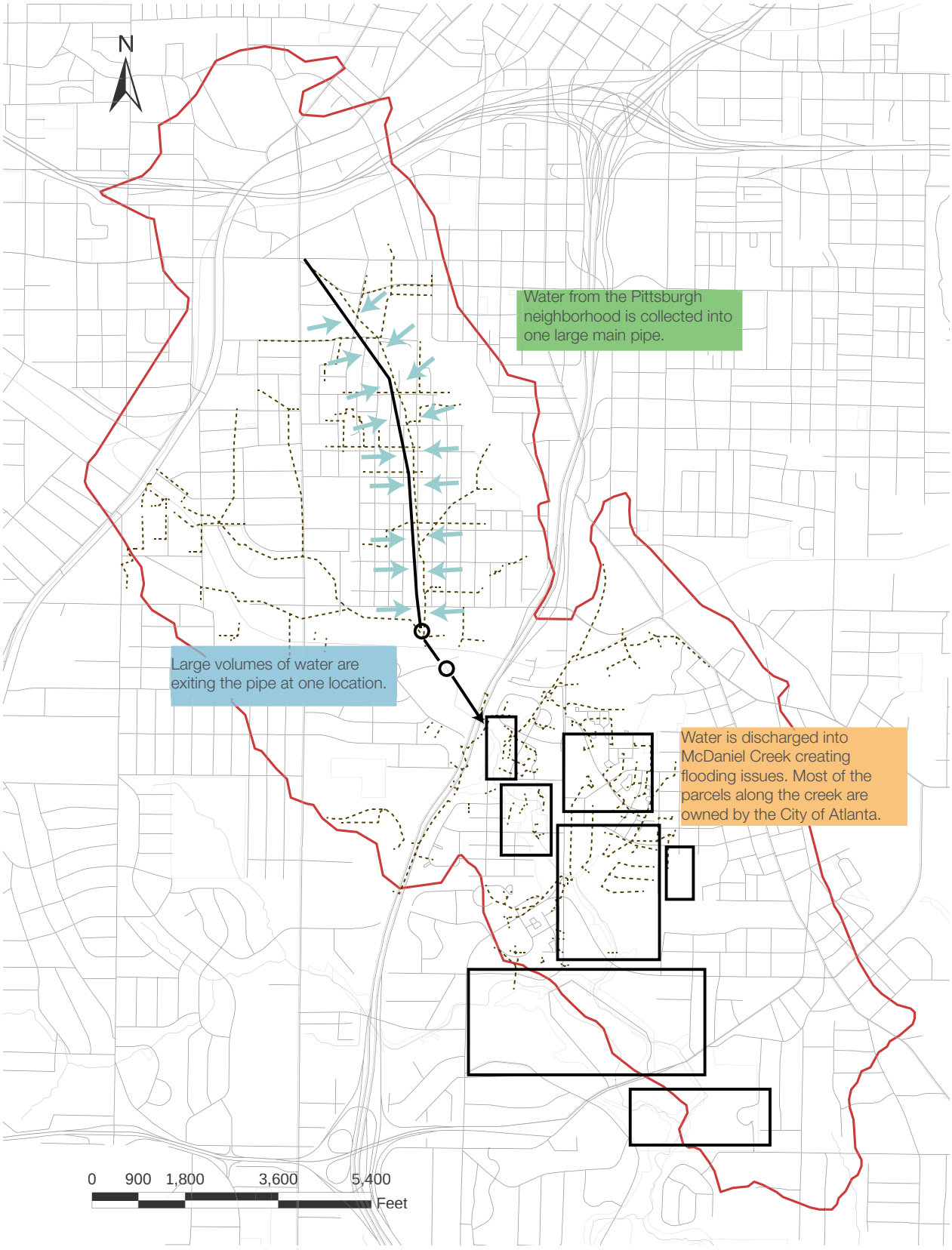


Within the BeltLine

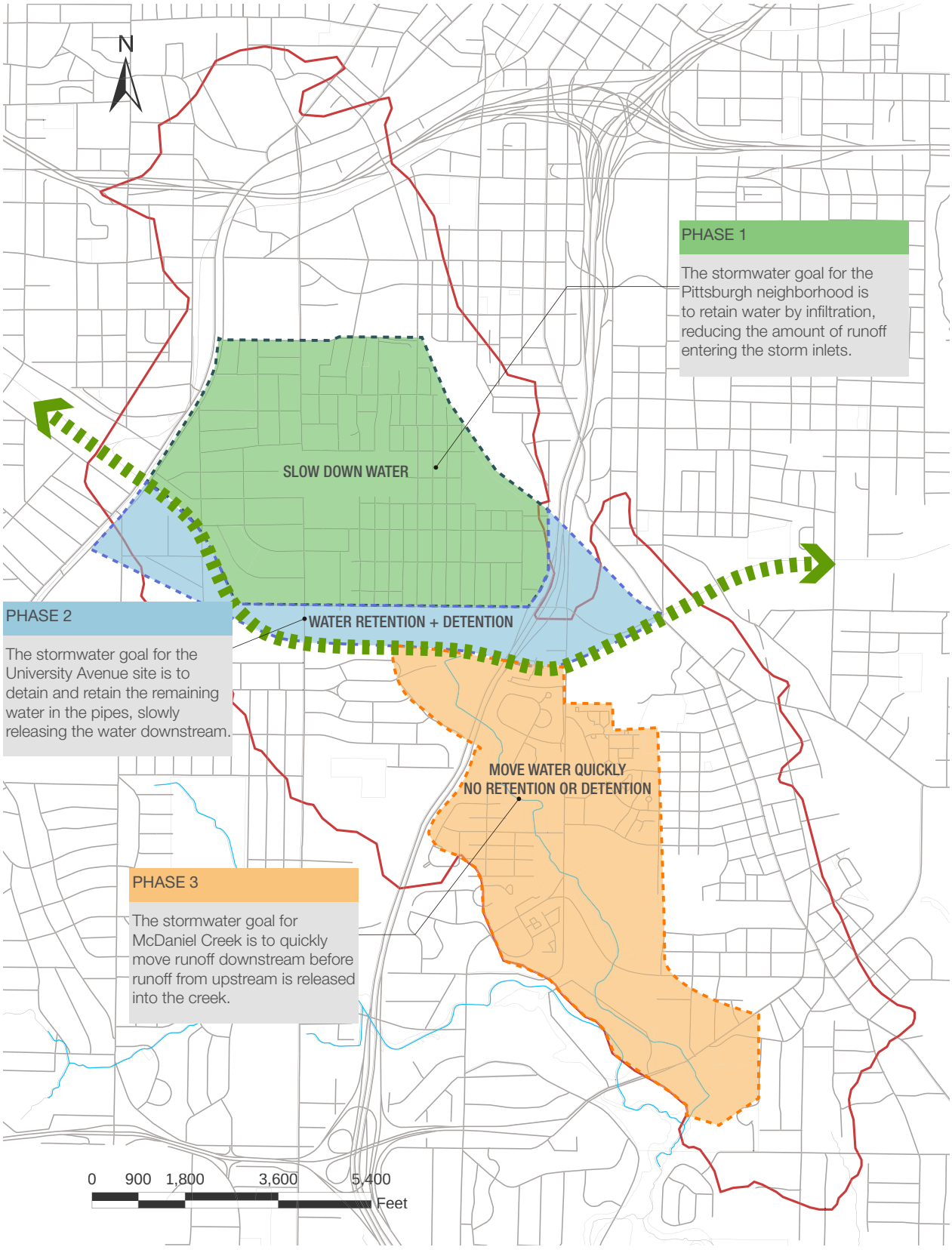


Current Plans

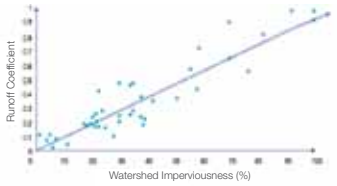
Existing Stormwater Conditions



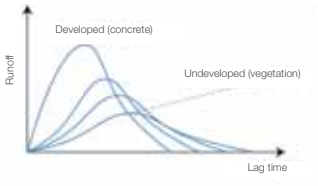
Proposed Stormwater Strategies



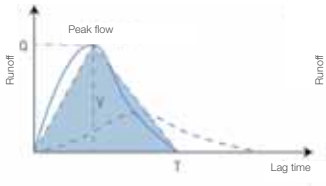
Pittsburgh Neighborhood Soft Infrastructure Strategy



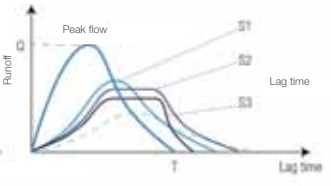
The coefficient relationship between runoff and imperviousness. We know that the runoff coefficient goes up when imperviousness increases. According to peak flow calculation, the higher the imperviousness, the higher the peak flow rate. When imperviousness is greater than 10%, water quality will decrease. This watershed is approximately 46% impervious.



The volumes of runoff for different impervious conditions within the watershed. The goal is to decrease the amount of impervious surfaces to minimize the runoff into McDaniel Creek.



By increasing the lag time, the peak flow is reduced and the volume of water generated during a storm reduces. Currently, the site generates 60 acre feet in a 100 year storm event, 34 acre feet in a 5 year storm event, and 12 acre feet during a 2 year storm event.



Strategy 1: Increase infiltration of water to decrease runoff by 40%

Strategy 2: Retain water in ponds and parks to reduce runoff by 30%

Strategy 3: Move water out of the lower portion of the watershed before the water reaches McDaniel Creek.

Street Type

Vacancy

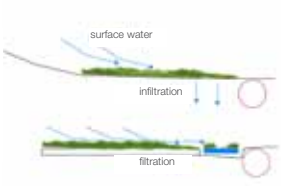
System

Inlets Pipes

Street Retrofits

Vacant Lots Reuse

Slowing down surface water before it enters the pipe



Parks

Trees

Vegetation

Pervious Paving

Daylighting Pipes in Streets

Slowing down water without pipes

Retention

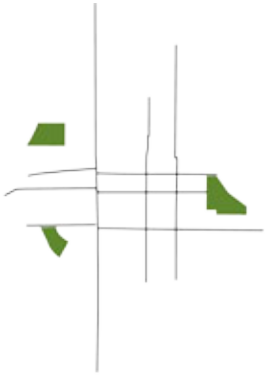
Inlets disuse

Swales

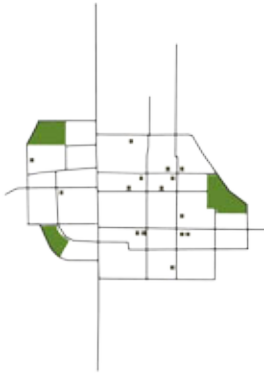
Rain Garden

An outer system collecting water

An inner system collecting water



A grid that connects the systems

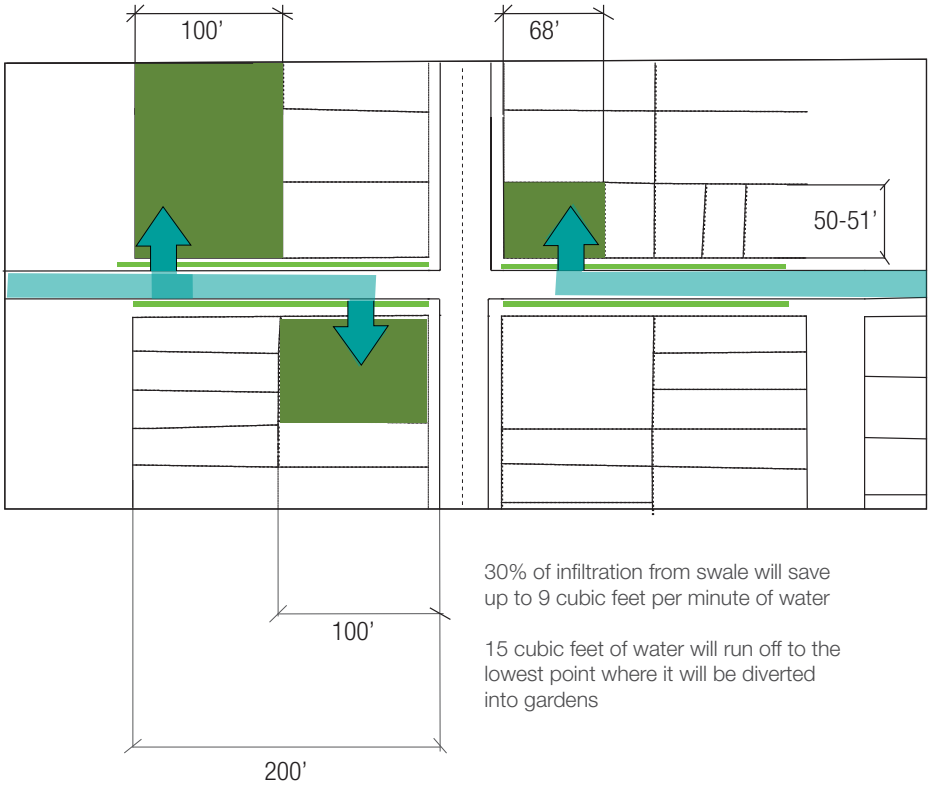


Vacant lots become stormwater mini parks along the grid

Pittsburgh Neighborhood Soft Infrastructure Strategy

Conversion of vacant lot to stormwater mini park

Strategy for water retention within one block
Mary and McDaniel Street



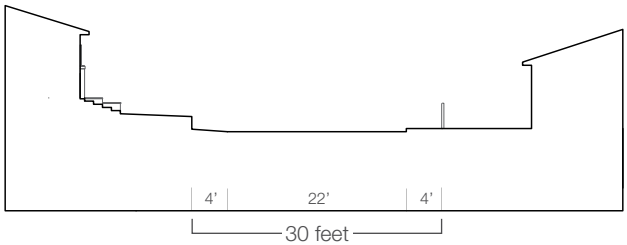
30% of infiltration from swale will save up to 9 cubic feet per minute of water

15 cubic feet of water will run off to the lowest point where it will be diverted into gardens

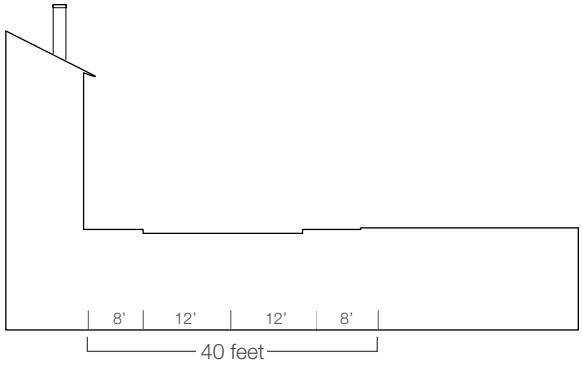
Mary and McDaniel Street

EXISTING STREET DIMENSIONS

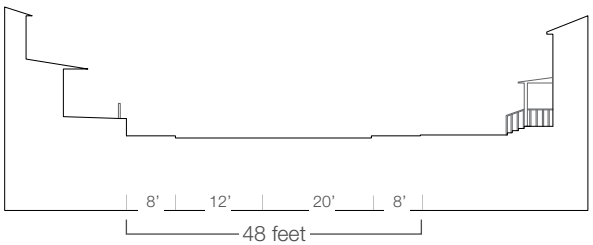
Hubbart Street



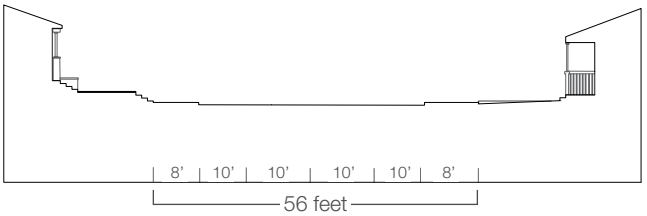
Mary Street



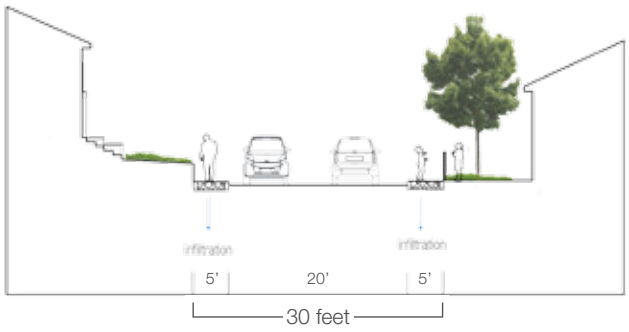
McDaniel Street

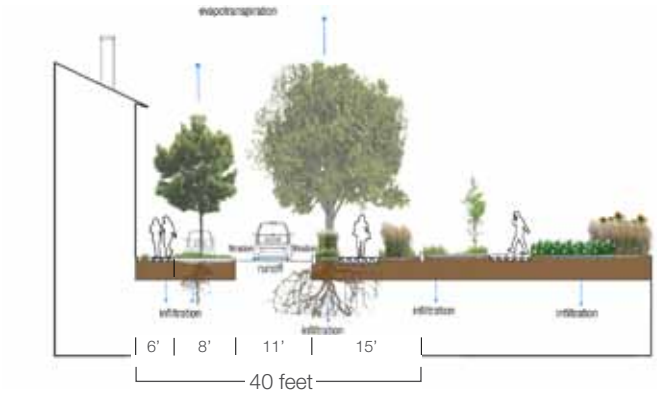


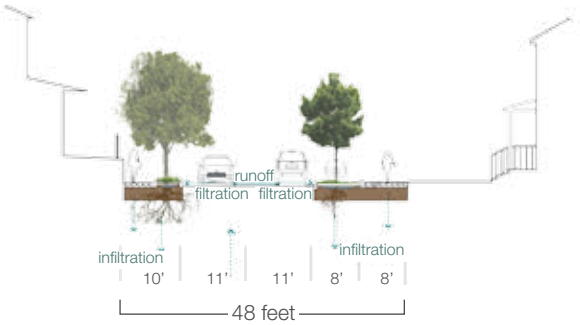
Metropolitan Parkway

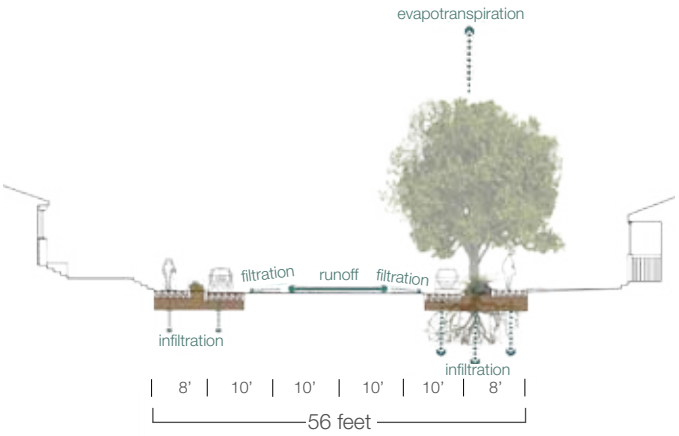


PROPOSED STREET DIMENSIONS

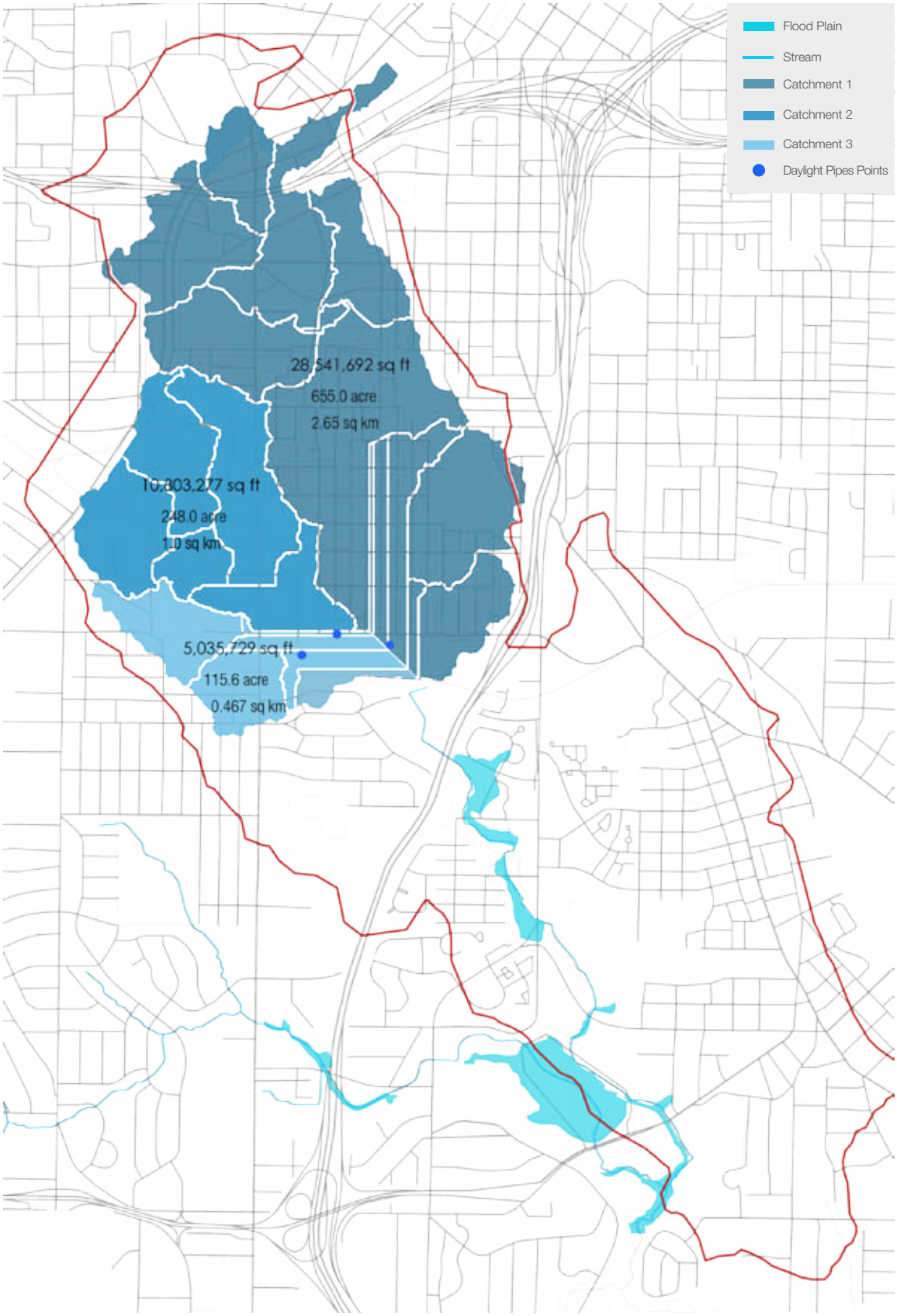


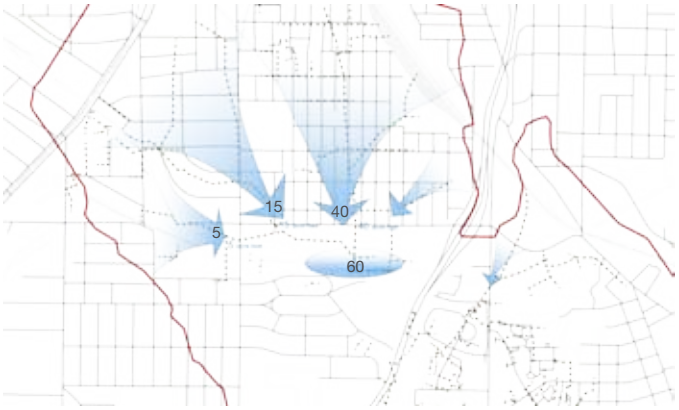






Upper McDaniel Creek Catchment Areas





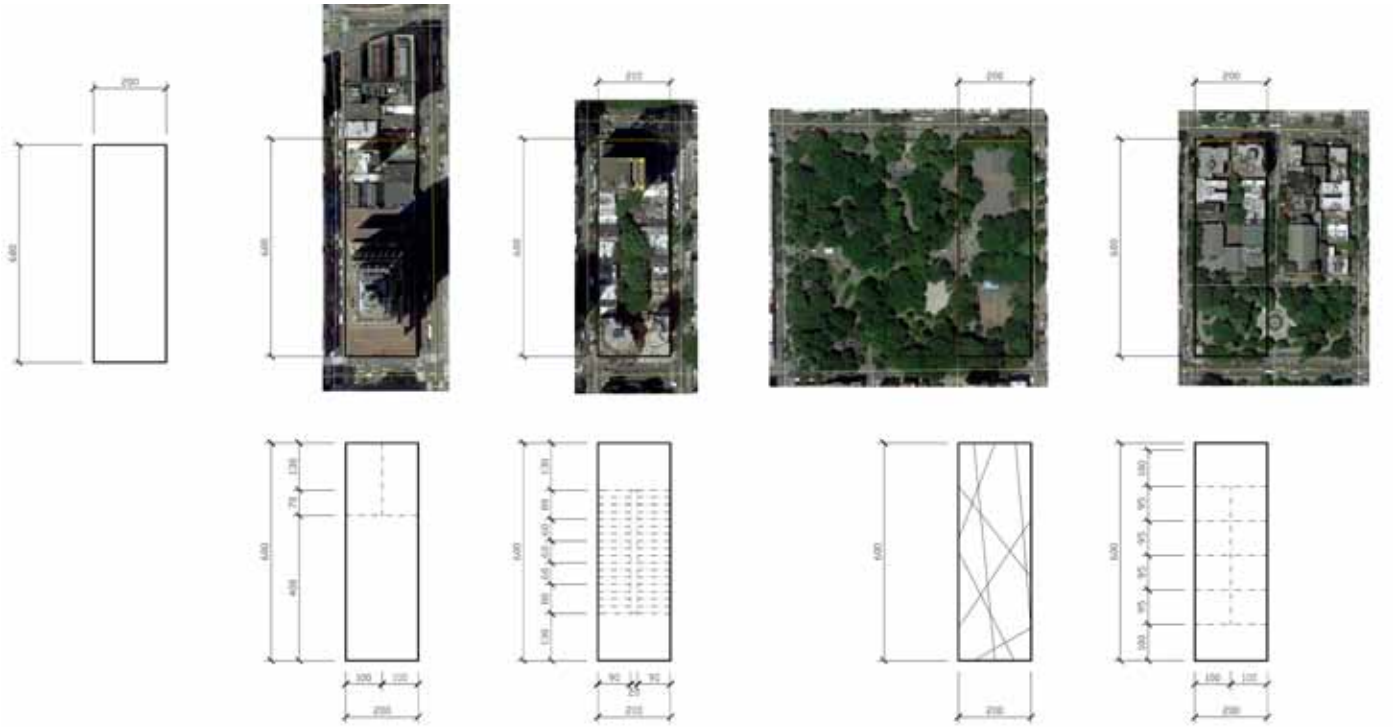
Water Flow and Volume (in acre feet)

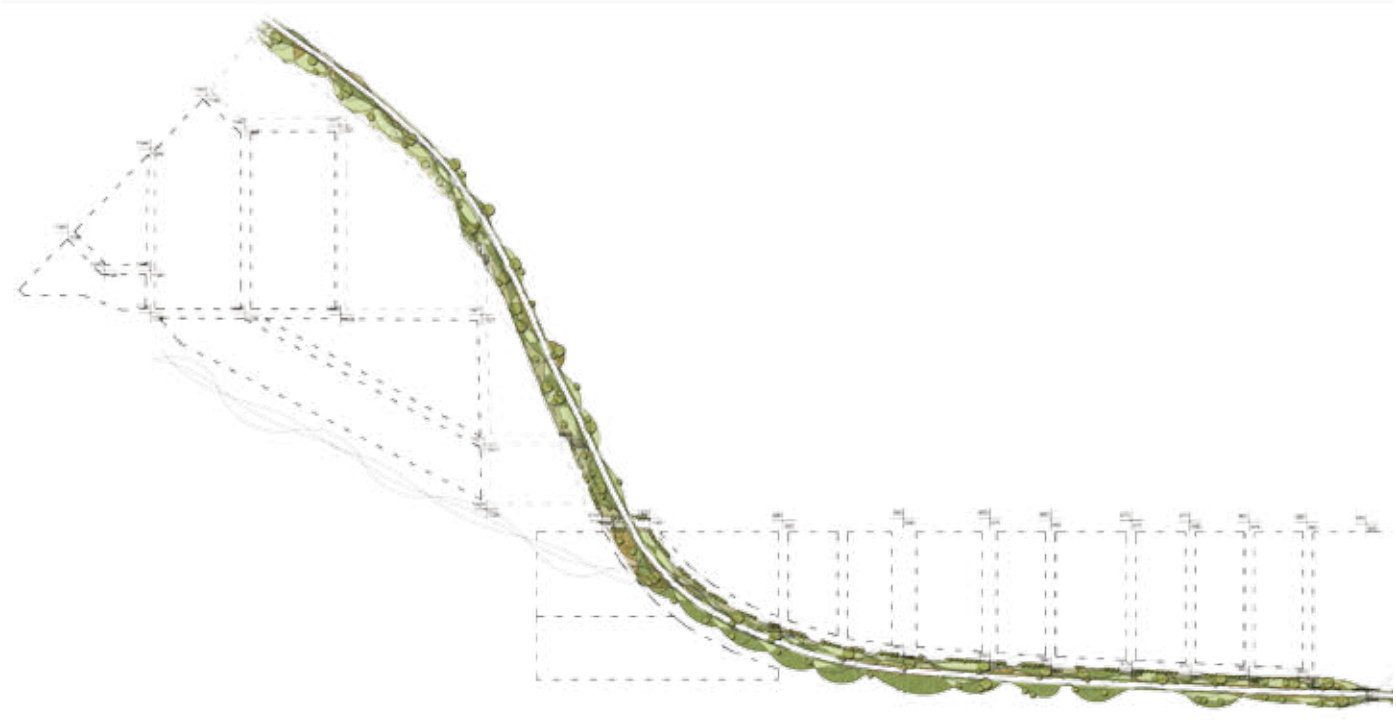
Stormwater Pipes

Existing University Avenue Site

Existing University Avenue Site at Intersection of University Avenue and McDaniel Street

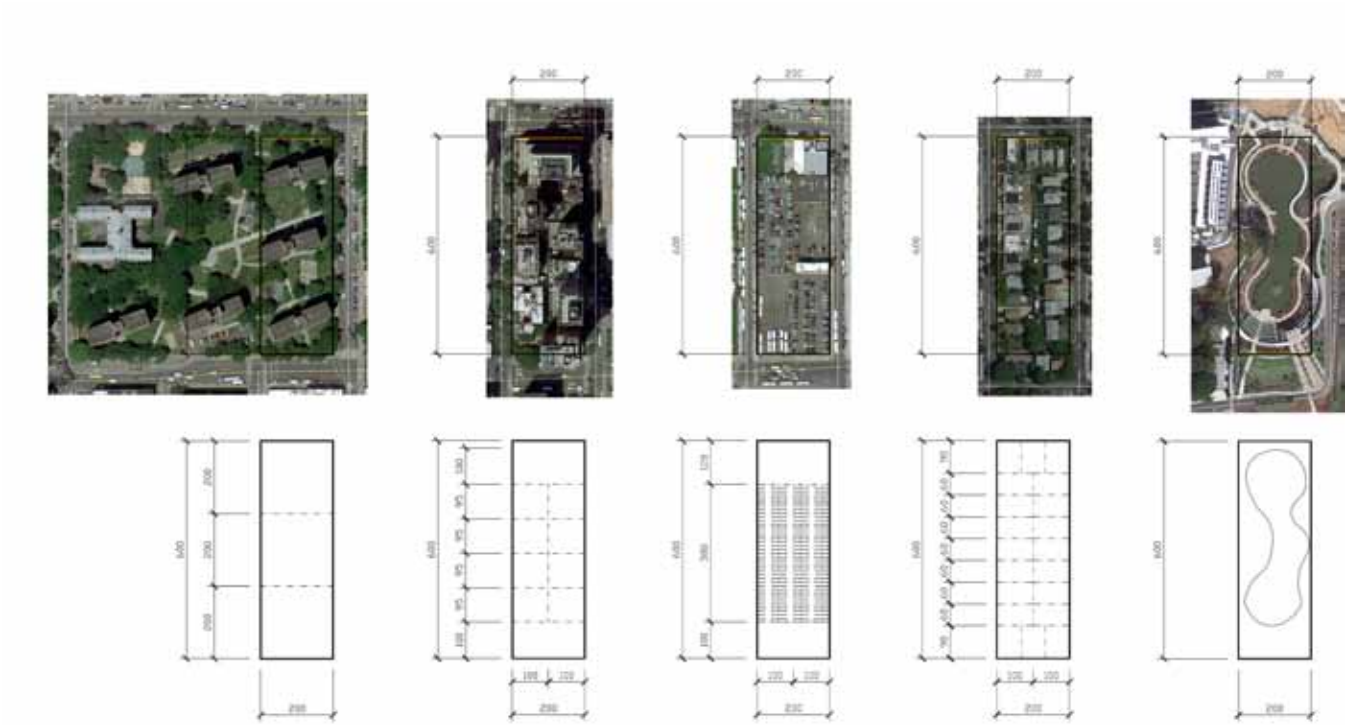
Subdivision Using Manhattan Street Block Dimensions

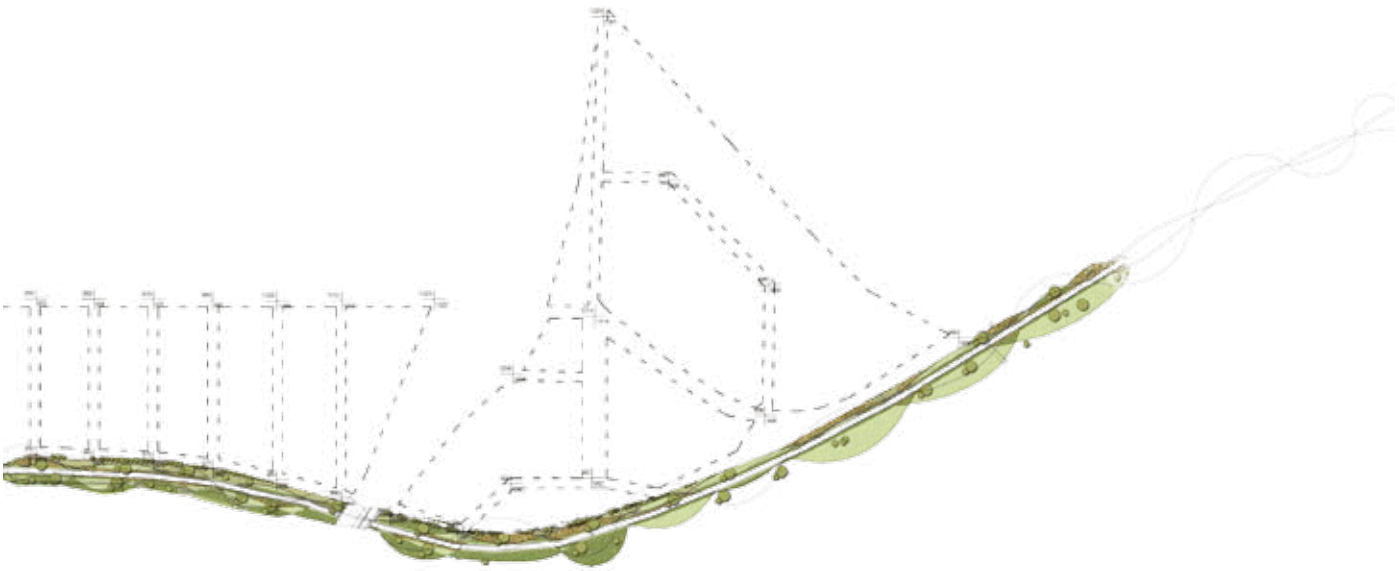




Subdivision Diagram of University Avenue Site

Demonstrating Density and Land Use Flexibility

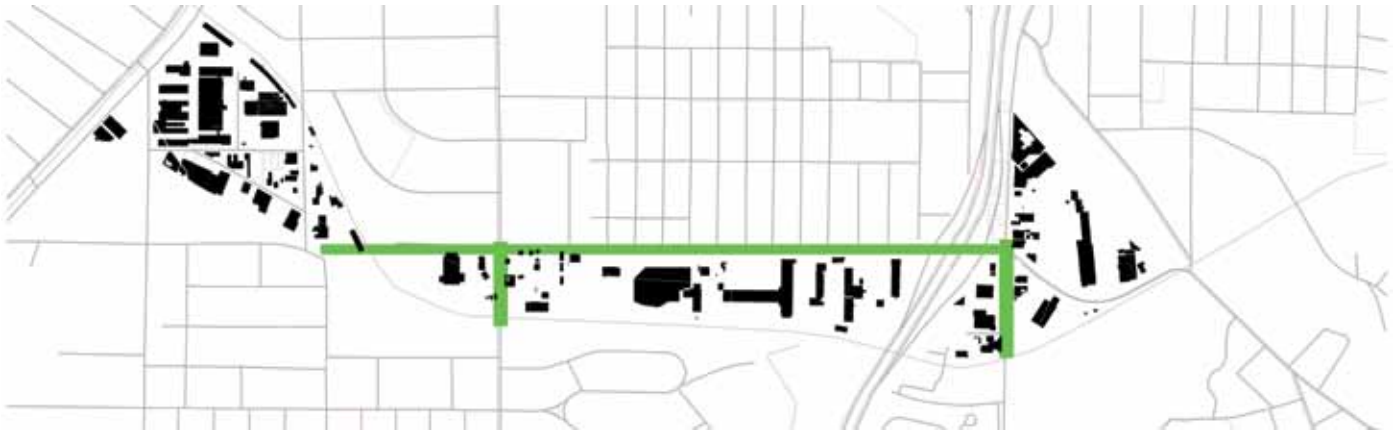




Strategies for University Avenue Site

Daylight Existing Stormwater Pipes

Build Green Streets

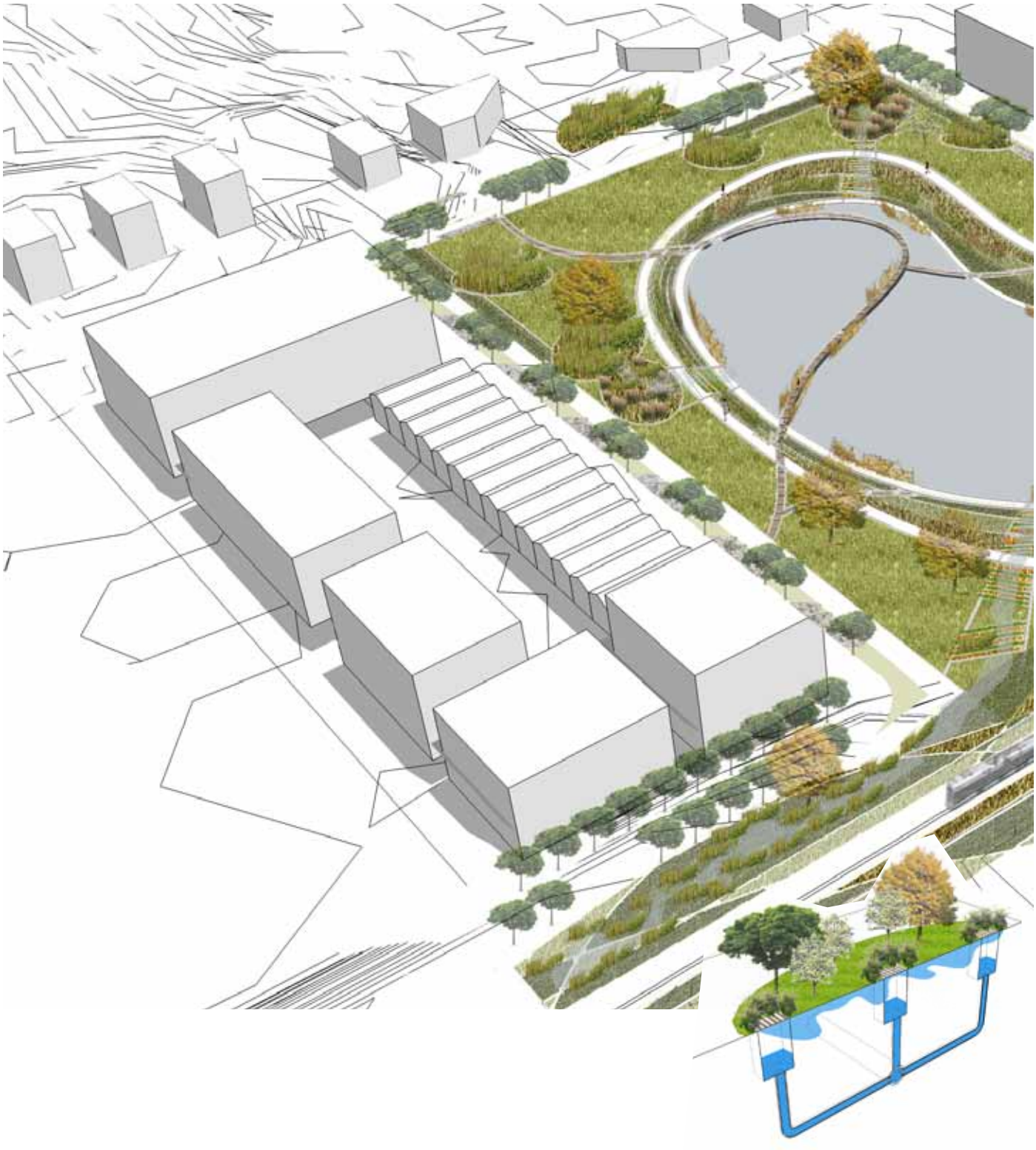


Terrace the BeltLine for Stormwater Infrastructure

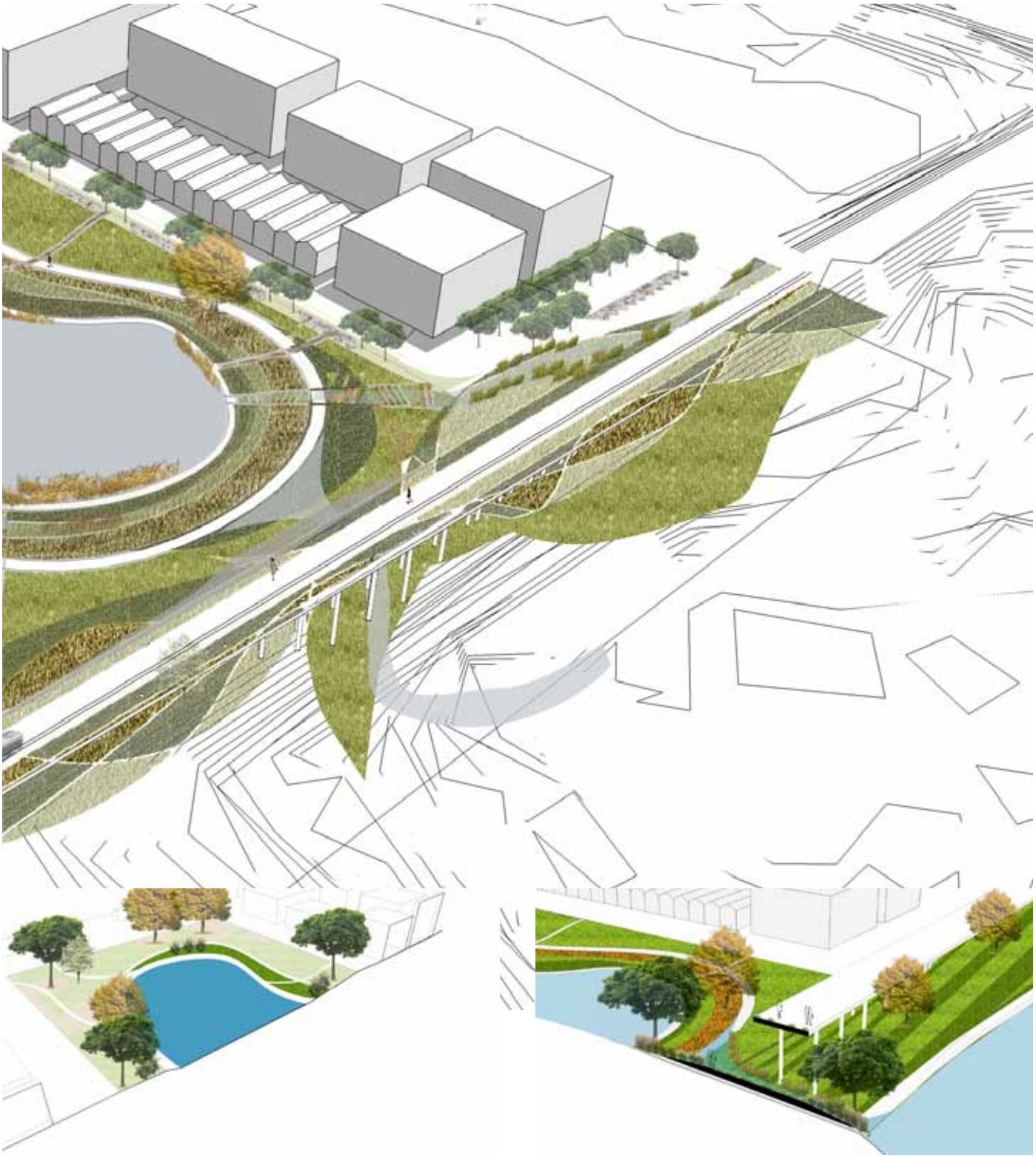
Create Retention and Detention Ponds

Create New Parks

University Avenue Master Plan



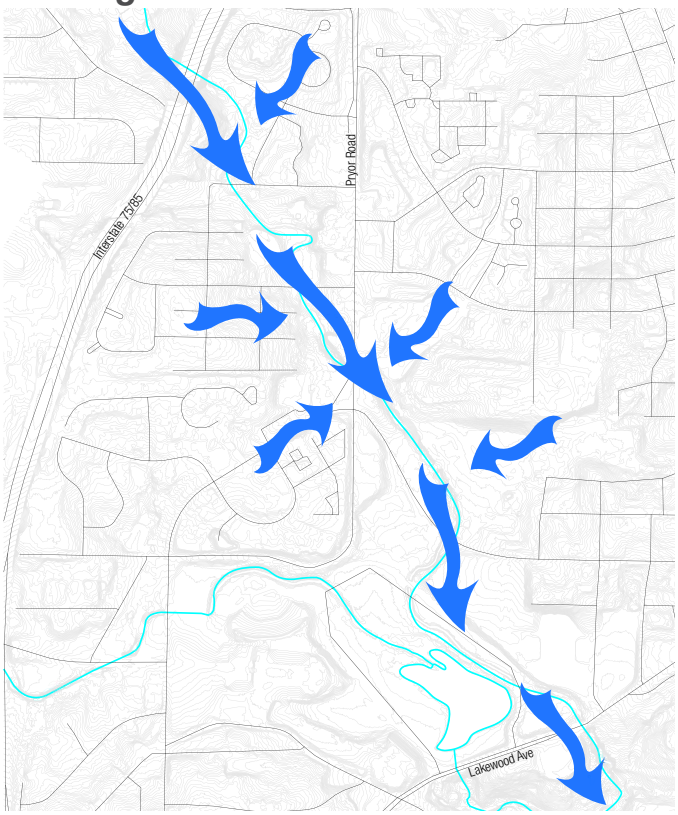
Daylight Pipes
This strategy is aimed at blocking and daylighting the pipes underground, forcing the stormwater to flow through the infiltration surfaces, like parks, green streets, and detention ponds. Divide the main pipe into several smaller pipes to help disperse the large amount of water, which will force the runoff to infiltrate into the ground.



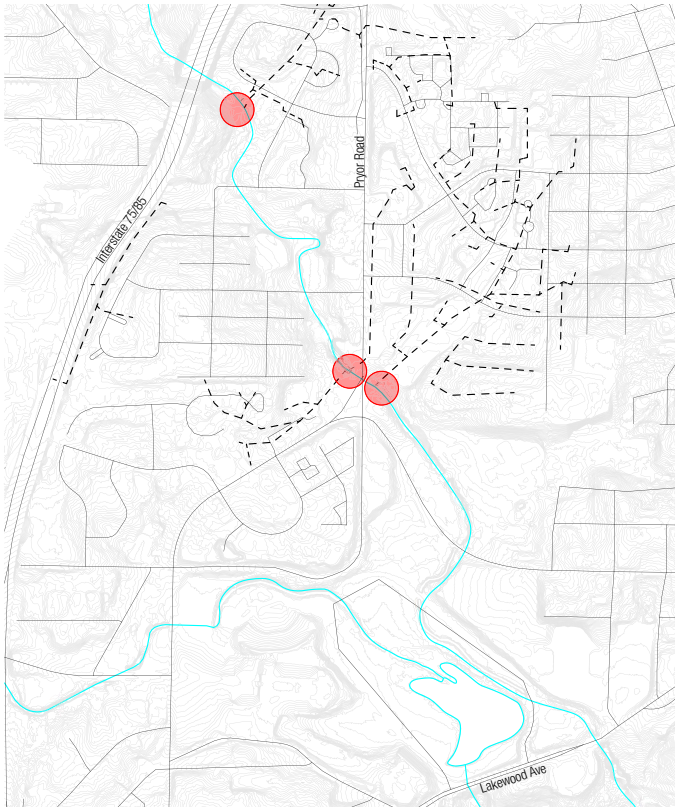
Detention and Retention Ponds
Holding water in detention ponds is the primary goal for this phase. The pond is 10 feet at the deepest point, which holds 40 acre feet of water. The pond will require a 2 foot permanent water depth to prevent erosion. The topography of the pond will be shaped to all the water levels to change.

Terraces
In order to allow the water to rise and drop, use terraces to handle different volumes of water. Along the terraces, water tolerant plants will be planted to help with erosion.

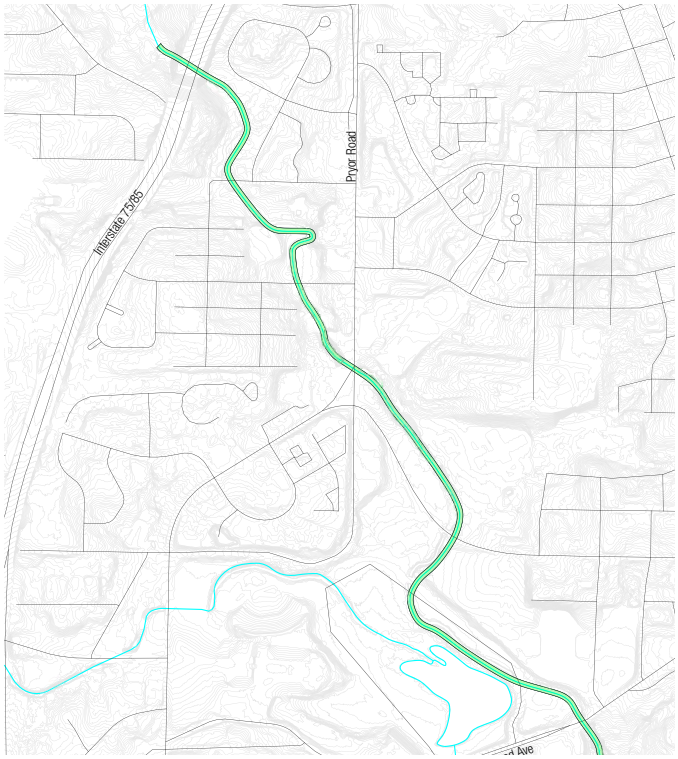
Strategies for McDaniel Creek



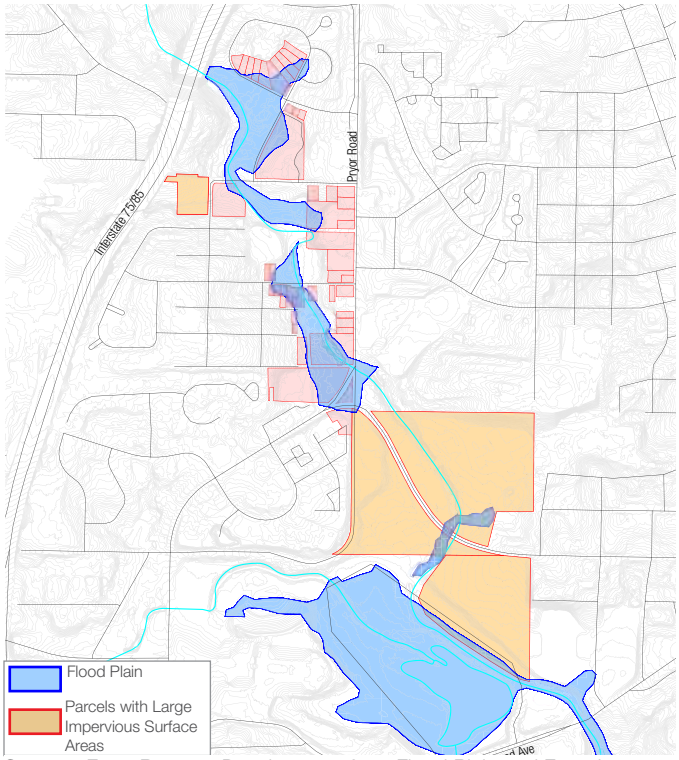
Strategy One: Move Water Out Quickly



Strategy Two: Control Velocity of Water Coming Out of Pipes (over 6 cubic feet per second)



Strategy Three: Restore Stream Bank



Strategy Four: Remove Development from Flood Plain and From Large Impervious Areas

McDaniel Creek Master Plan

ANSLEY MALL AND THE CLEAR CREEK GREENWAY

AND WATERSHED

INTRODUCTION

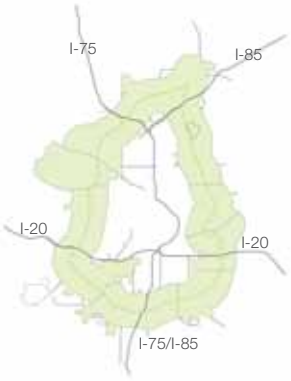
The BeltLine Subarea 6 site lies within the Peachtree Creek Watershed within the larger Upper Chattahoochee Watershed. Clear Creek feeds into Peachtree Creek, and eventually into the Chattahoochee River. The creek flows from Historic Old Fourth Ward Park to Orme Park in Virginia Highland near Grady High School, behind Ansley Mall through Ansley Golf Club, through the Armour Industrial area, behind Brookwood Hills, finally merging into Peachtree Creek.

The Ansley Mall site is located near the intersection of Piedmont Avenue NE and Monroe Drive NE in the Piedmont Heights neighborhood. Parts of the creek were previously piped in the 1930s, and the Piedmont Park Conservancy has worked to uncover some of these sections. The creek is known for being polluted by sewage overflows within the City, and signs posted near the creek warn the public of these dangers.

Recent projects near or effecting this Subarea include the 53 acre expansion of Piedmont Park into the North Woods for publicly accessible greenspace, as well as Historic Old Fourth Ward Park, which serves as a detention pond in an area south of the project area known for intense flooding issues. The BeltLine Subarea 6 Master Plan recommends the redevelopment of Ansley Mall into a mixed use development that acts as a central activity center for this area of the city.

This proposal for BeltLine Subarea 6 begins with an understanding of the site's position within the Peachtree Creek Watershed, the hydrology and its changing characteristics for the next generation, and the relationship of site conditions, stormwater management, and public/ private spaces.

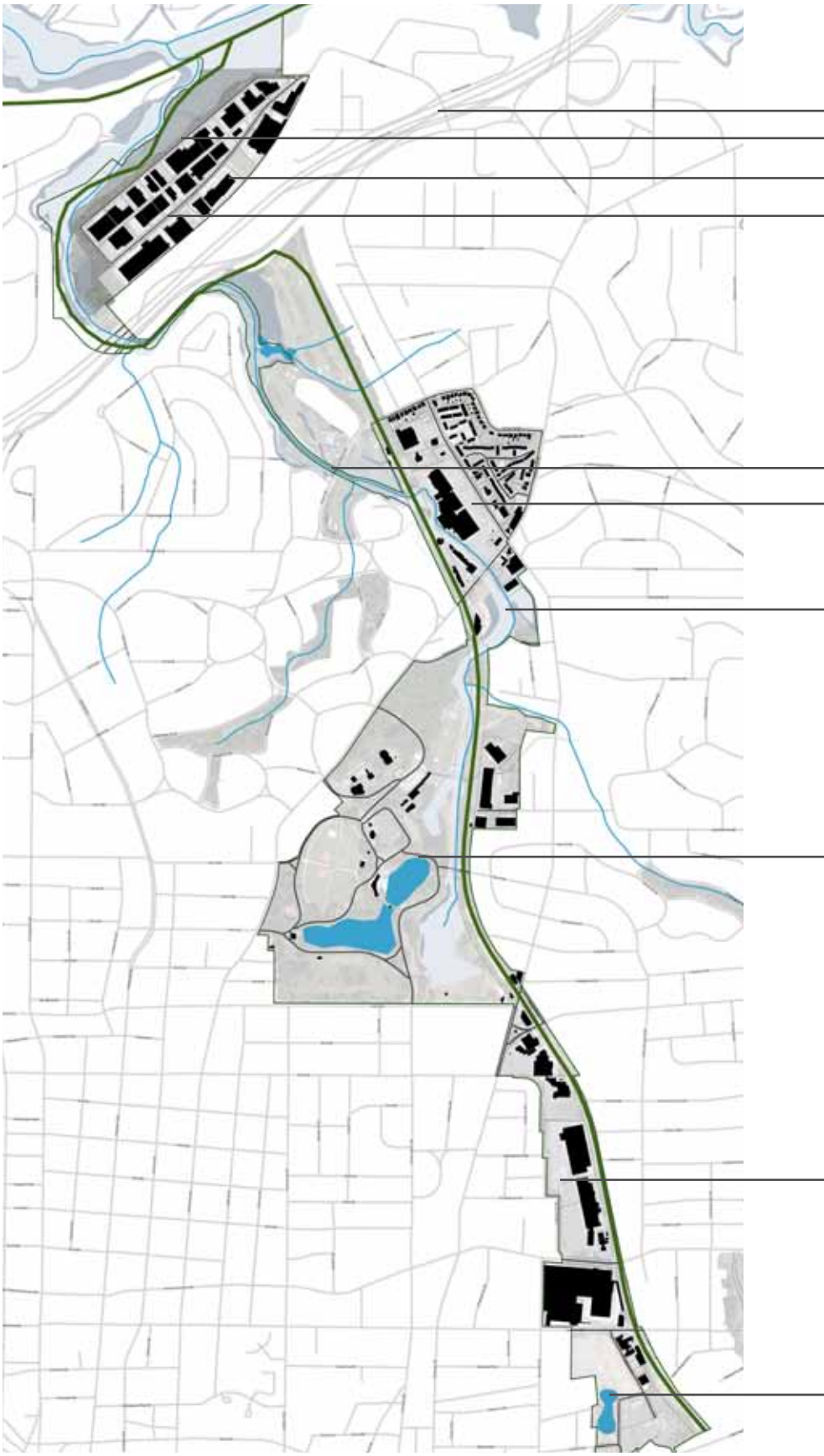
Existing Conditions



Atlanta BeltLine

Streams and BeltLine Context

Ansley Mall and Clear Creek Watershed





Underpass at Monroe and I-75/I-85
Armour-Ottley and adjacent forest
SweetWater Brewery
Armour-Ottley Industrial complexes (below)



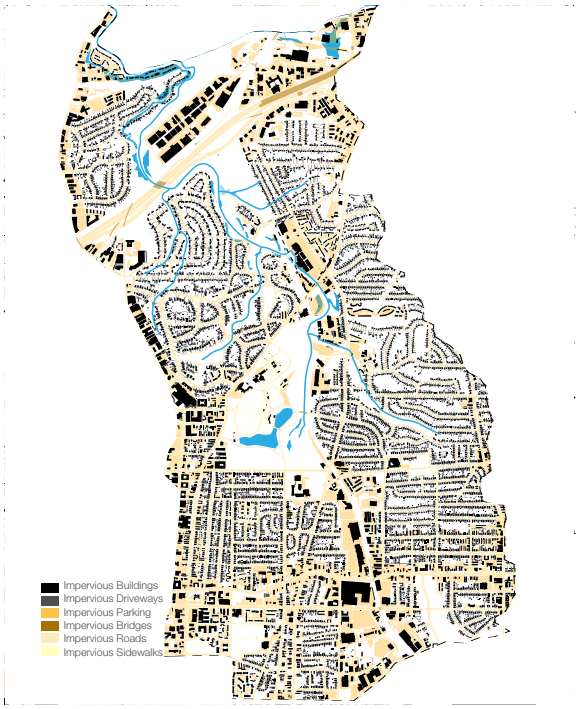
Ansley Golf Course (left)
Ansley Mall (above)
Bird's eye of Ansley Mall (above right)



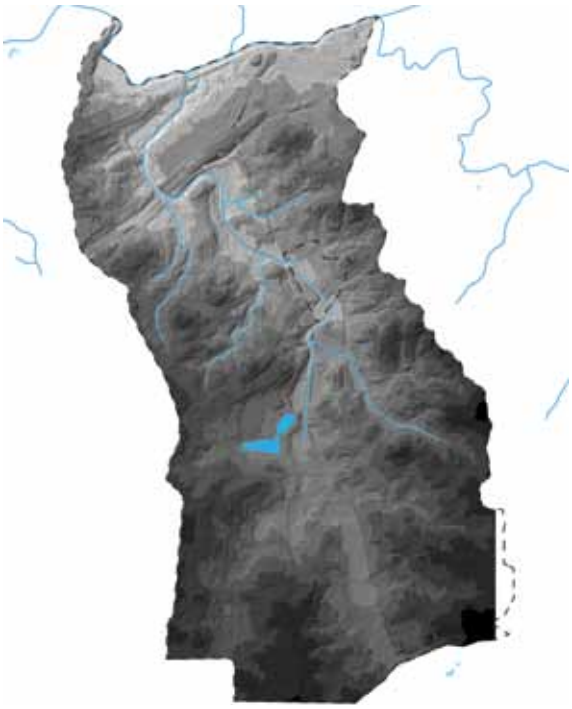
Piedmont Park Expansion - North Woods (above two)
Lake Clara Meer in Piedmont Park (right)
Old Fourth Ward Park (below)
Midtown Place Shopping Center (bottom right)



Existing Site Features

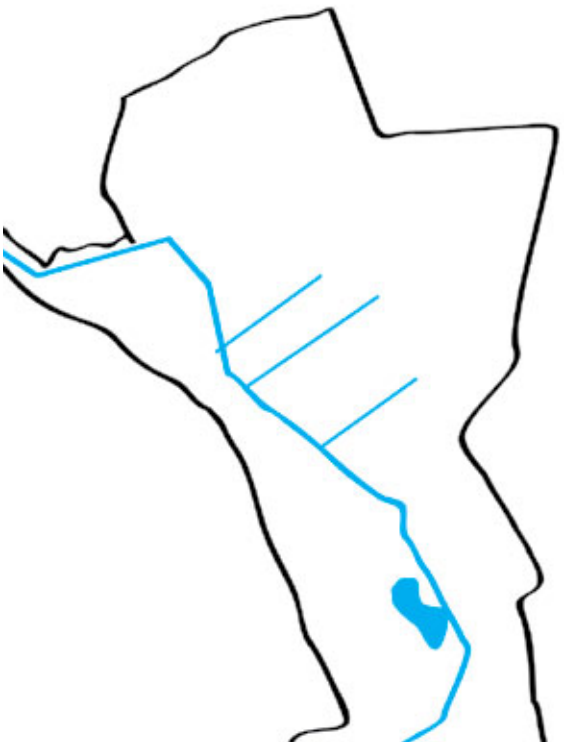


Impervious Surfaces in the Watershed

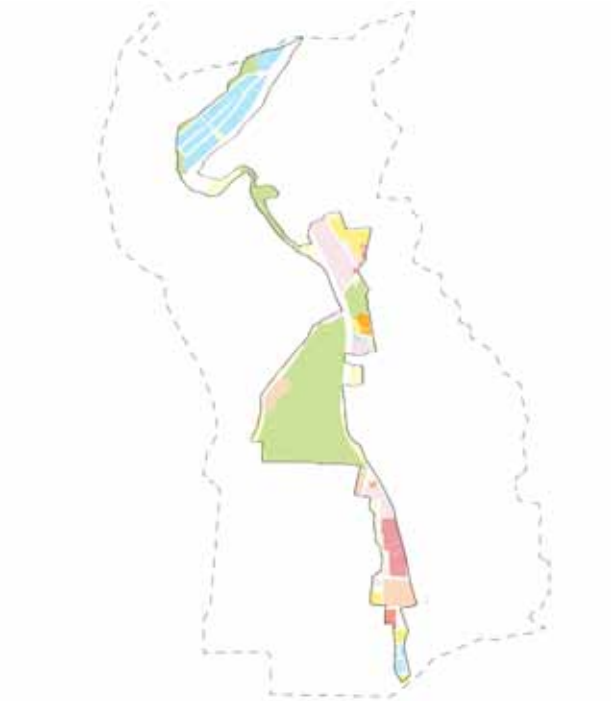


Topography in the Watershed

Satellite Image at Ansley Mall



Pipe Systems at Ansley Mall



Land Use in Project Area

Transit and Public Space in Watershed

Flood Plain and Buildings at Ansley Mall

Water Features at Ansley Mall

Urban Design Strategies

Public Space Performance

Capture water through ponds and canals
Create amenities
Add vegetation and open space

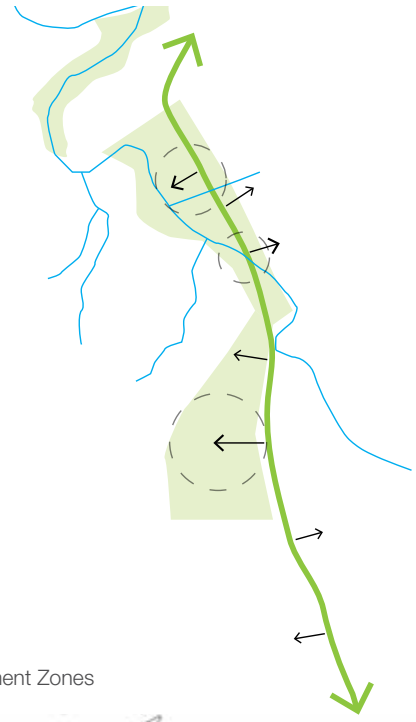
Water Detention

Capture water through ponds and canals
Create amenities
Add vegetation and open space

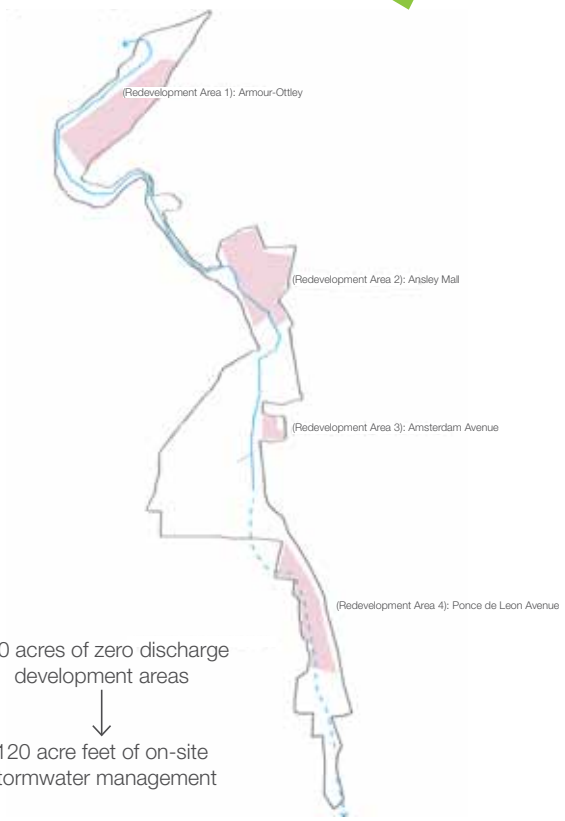
Filter + Reuse

Living machine implementation
Block by block cleaning + reuse on site
Swales to daylight stormwater pipes
Water reuse for commercial + public space

Public Space Performance



Redevelopment Zones

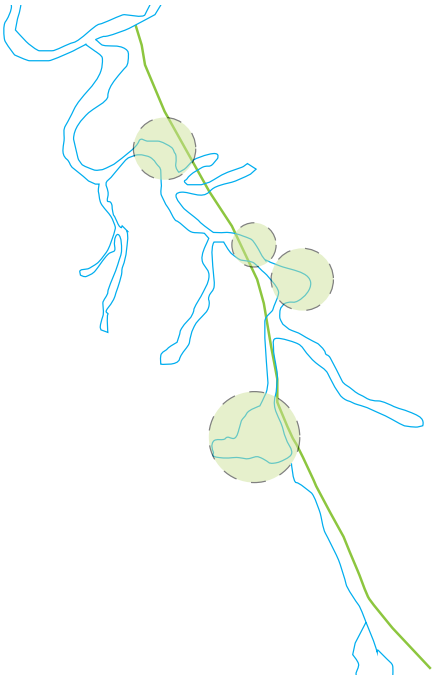


120 acres of zero discharge development areas

↓

120 acre feet of on-site stormwater management

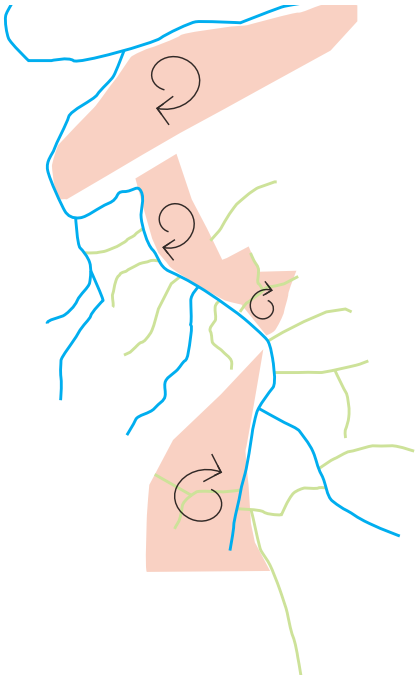
Water Detention



Water Detention

13 acres of retention area:
Holds 130 acre-feet of water (55% of “control volume”) during flooding

Filter + Reuse



Greenway + Filter

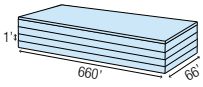
4,600 feet of swale:
30% of new riverbank filters and cleanses water

Ansley Mall Proposed Master Plan

WATERSHED + SITE

SITE AREA	64 ACRES
WATERSHED AREA	3,532.89 ACRES
100 YR FLOOD - WATERSHED	7,354,193 FT^3
VOLUME TO CONTROL - SITE	4.267 ACRE-FEET
VOLUME TO CONTROL - WATERSHED	236.698 ACRE-FEET
VOLUME TO CONTROL - SITE %	1.8% OF OVERALL WATERSHED

SITE
4.27 acre-feet of water



WATERSHED
x 55 = 236.70 acre-feet

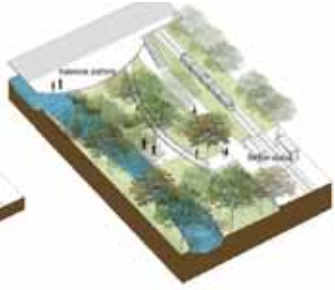
Clear Creek Greenway Master Plan Features

Water Capture Example:
Clara Meer Retention Pond

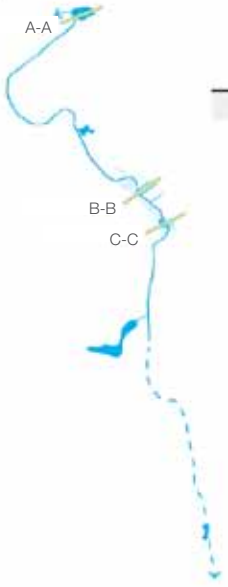
Swale Example:
North Piedmont Park Swale

Redevelopment Zone Example:
Green Block + Green Street

Transit Example:
BeltLine Southern Station

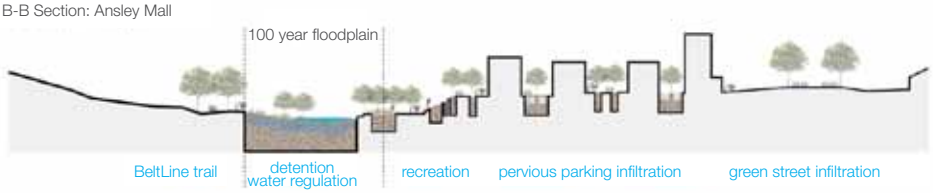


Section Key

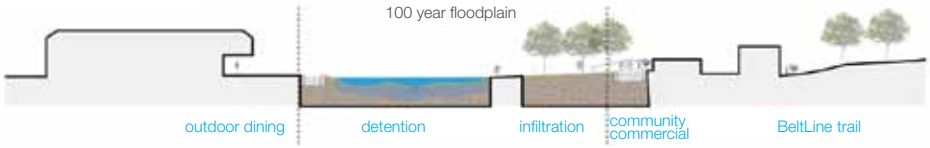


A-A Section: Armour-Ottley District

B-B Section: Ansley Mall



C-C Section: Clear Creek Center



Clear Creek Greenway Master Plan

A. Armour-Ottley (above) B. Northeast Highway

C. Ansley Mall

D. Clear Creek Center

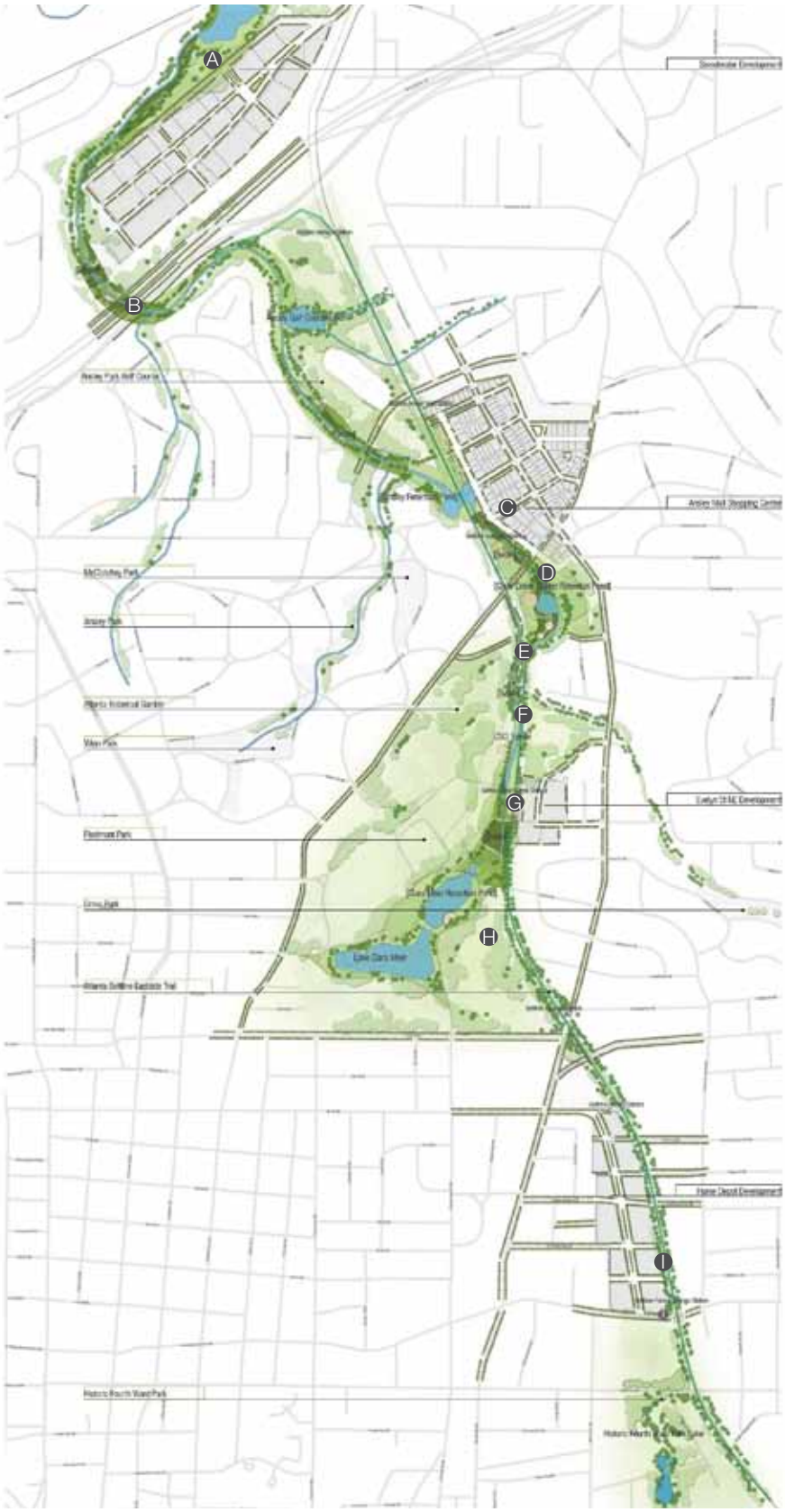
E. BeltLine Eastside Trail

F. Botanical Garden, Piedmont Ave CSO

G. Amsterdam Walk

H. Piedmont Park

I. City Hall East



DESIGN + RESEARCH CONCLUSIONS

CONCLUSIONS

#1 Every project - public or private, no matter how large or how small, must begin with an understanding of its associated drainage basins. For urban design - watersheds always come first!

#2 The location of a project in its watershed shapes both urban design and stormwater decisions. For urban design, site based solutions are the wrong approach. Stormwater policies and regulations must recognize this fact.

#3 High performance site design, for urban design and stormwater, can combine greenways as incentives for revitalization and new development.

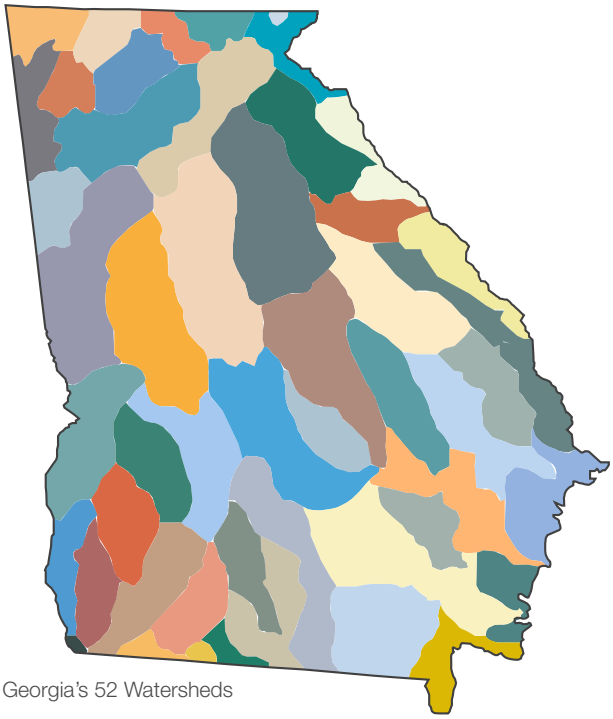
#4 Urban design and stormwater management must be the responsibility of private developers and not limited to local stormwater ordinances. Owners and developers must look to the long term to enable today's decisions to share better stormwater solutions in the future.

#5 Urban design can MANAGE stormwater when flooding cannot be eliminated. Combine retention and detention in greenways, swap land out of flood plains, create new development opportunities.

CONCLUSION 1

EVERY project -- public or private, no matter how large or how small, must begin with an understanding of its associated drainage basins.

For urban design -- watersheds always come first!!



Georgia's 52 Watersheds

CONCLUSION 2

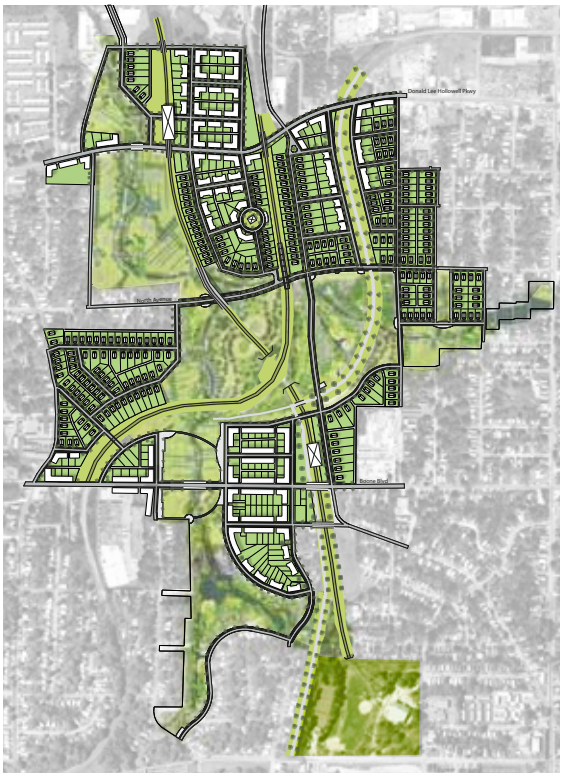
The location of a project in its watershed shapes both urban design and stormwater decisions.

For urban design, site based solutions are the wrong approach. Stormwater policies and regulations must recognize this fact.

University Avenue, Pittsburgh, and McDaniel Branch Greenway

CONCLUSION 3

High performance site design, for urban design and stormwater, can combine greenways as incentives for revitalization and new development.



Maddox Park, Boone Boulevard, and the Proctor Creek Watershed

CONCLUSION 4

Urban design and stormwater management must be the responsibility of private developers and not limited to local stormwater ordinances.

Owners and developers must look to the long term to enable today's decisions to share better stormwater solutions in the future.

Ansley Mall and the Clear Creek Greenway

CONCLUSION 5

Urban design can MANAGE stormwater when flooding cannot be eliminated.

Combine retention and detention in greenways, swap land out of flood plains, create new development opportunities.

Colonial Homes, Bobby Jones Golf Course and Peachtree Creek

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COORDINATORS

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GEORGIA INSTITUTE OF TECHNOLOGY STUDIO, FALL 2012

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Blueprints for Successful Communities is an education and technical assistance program of the Georgia Conservancy designed to facilitate community-based planning across the state. The program is committed to achieving successful communities by creating sound conservation and growth strategies, and building consensus for action.

Georgia is home to an abundance of natural and cultural resources. Our development patterns over the last 50 years present a very real threat to these resources and to quality of life as a whole. Sprawling, decentralized development, where people must depend on automobiles, is expensive for local governments to serve and has a staggering effect on the environment. Vehicle emissions create toxic air pollution. Stormwater runoff from asphalt poisons rivers and streams. Thousands of acres of farms, woodlands, and open space are lost to wasteful, non-sustainable forms of development.

The Georgia Conservancy in partnership with the Urban Land Institute and the Greater Atlanta Homebuilders hosted its first Blueprints for Successful Communities symposium in 1995. Currently the Conservancy maintains an active partnership with thirteen organizations. These diverse organizations and their members provide a great deal of understanding and expertise in the relationships that exist between land use, public infrastructure, economic growth, and environmental quality.

Prior to the *Design + Research* effort, *Blueprints* has addressed multi-jurisdictional watershed planning, heritage corridor preservation, location of commuter rail stations, inner city neighborhood issues, coastal sea level rise research and other planning opportunities all through a collaborative planning process.

BLUEPRINTS PRINCIPLES

Maintain and enhance quality of life for residents of the community	Employ regional strategies for transportation, land use, and economic growth	Consider the effect of the built environment on the natural environment as well as history and culture	Employ efficient land uses

Water – quality, quantity and/or access to – is a central issue within the State of Georgia and globally. All program areas at the Georgia Conservancy are working to address water challenges through statewide advocacy, education and research on coastal sea level rise, and advancing awareness through our stewardship trips and land conservation. Thus, it is a natural progression for the Sustainable Growth program to look at stormwater and how our built environment negatively and positively impacts our streams, rivers, and overall quality of life.

The Georgia Conservancy, in partnership with Georgia Institute of Technology's College of Architecture conducted an urban design studio to look at four sites along the Atlanta BeltLine. Each site has particular and varying struggles managing water creating opportunities for creative site design to address these challenges. The studio involved multiple site visits, presentations, collected information and maps, hydrological analysis and calculations to help develop a set of draft recommendations for consideration. These recommendations are supported by technical advisors and form the basis of this report.

This *Design + Research Blueprints* project concentrates on stormwater and built environment conditions through site specific analysis. The project focus was to reflect on typical development processes and identify creative ways to solve water issues on site after understanding the site's placement within a watershed. The intent is to share these findings around the state, as well as for this work to influence future stakeholder-based *Blueprints* projects.

Georgia
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