



SEWANEE VILLAGE

STORMWATER MASTER PLAN

SEWANEE
THE UNIVERSITY OF THE SOUTH



1 INTRODUCTION + BACKGROUND

Sewanee: the University of the South owns more than 13,000 acres called the Domain located on the Cumberland Plateau, more than 90 percent of which consists of Southern Appalachian forest. This is among the most diverse forest types in the United States and one of the largest unbroken expanses of hardwood-forested plateaus in the world. As an academic institution devoted to learning and knowledge, the University has committed to act as a model of environmental sustainability – including stewardship of natural areas, promotion of environmentally sensitive landscaping practices, and use of Smart Growth land use planning techniques as described in detail in the University’s 2013 Sustainability Master Plan.

Sewanee Village currently consists of a retail and office strip on University Avenue connecting the University campus to US Route 41A. The Village has been designated by the University as one of three future development focus areas in the Campus Master Plan, also including the Core Campus and the School of Theology. The University envisions redevelopment of Sewanee Village as a mixed-use, walkable, vibrant place, with better connections to the Core Campus. The Village Implementation Plan, completed by Town Planning and Urban Design Collaborative (TPUDC) in 2016, produced a design framework for the Village Core.

The 2016 Sewanee Village Implementation Plan builds upon the Sewanee Vision Plan and the Sewanee Action Plan and provides specific planning interventions and strategies to guide redevelopment of the Village and the greater Domain. The goal of this Plan is to enhance connections between the University of the South and the Village, and to ensure the long-term viability of the Village by creating a mixed-use environment that integrates new businesses, civic spaces, and housing into the existing Village fabric. The Implementation Plan seeks to make the Village a regional model for sustainable redevelopment.

SUSTAINABILITY MASTER PLAN: EXCERPT FROM THE INTRODUCTION

Members of this University here affirm their commitment to building a community in which sustainability is seen as a way of life, both collectively and individually, and to encourage development of a curriculum in which sustainability, broadly defined, has a prominent place. We commit not only to continue our engagement in sustainable practices and education but also to seek best use of our extensive land-base on the Domain to offer a model demonstration of how students can be trained in the principles and practices of environmental stewardship.

To progress toward achieving the ambitious goals outlined in this Plan, we must imagine sustainability becoming so integral to the spirit of this institution that it permeates all aspects of campus life, from individual behaviors to institutional decisions regarding greenhouse gas emissions, investment strategies, land management, and building design.



Initial Site Walk - Reading the Landscape

The directive of this project is to build upon the 2016 Village Implementation Plan to the next level of detail, melding a more detailed assessment of on-the-ground existing conditions with the University's sustainability principles, as well as the vision for the Village as a vibrant mixed-use center. The University convened a stakeholder group including TPUDC, University subject matter experts, and local business owners to provide input and guide the project throughout the process.



Beautiful Stormwater Management Inspiration - Monteagle Assembly



GUIDING PRINCIPLES

The University and stakeholder group collaborated to develop the following guiding principles as an overarching framework:

1. Filter + Store

To mitigate the effects of additional runoff resulting from proposed development, demonstrate the application of Light Imprint site planning techniques and green infrastructure Best Management Practices (BMPs) to naturally filter, infiltrate, and store runoff.

2. Balance

Provide a range of land planning and stormwater solutions calibrated to the Domain's natural context, "softer edge" aesthetic to artfully complement the urban design vision for Sewanee Village.

3. Beautify

Artfully incorporate environmental design into Sewanee Village respecting the area's built and natural character. Utilize green stormwater infrastructure as placemaking elements and educational amenities.

4. Innovate

Encourage implementation of highly visible, forward-thinking approaches as a demonstration of the University's commitment to sustainability and learning.

5. Be Realistic

Demonstrate realistic, cost-effective, and constructible nature-based solutions with a focus on long-term maintenance requirements.



EXISTING CONDITIONS

2 EXISTING CONDITIONS

Sewanee Village Planning Timeline

October 2011 Master Plan Approved
The Plan identifies "The Village" as one of three zones for future development. It identifies 5 goals for these areas: 1. Increase vitality; 2. Limit sprawl; 3. Preserve the Domain; 4. Take advantage of existing infrastructure; 5. Encourage walking & cycling. It also recommends locating University support programs within the village and improving connectivity.

Mid 2012 Strategic Plan Approved
The Plan establishes goals for the future of the University, several related to the downtown area, including the promotion of sustainable construction practices, the fostering of relationships between the University and the community, and experiences that engage students with the residents of Sewanee.

Oct 2013 Master Plan Updated
The University Campus Master Plan is updated in order to better align with the 2012 Strategic Plan.

Sustainability Master Plan Approved
The Plan solidifies the University's commitment to a sustainable built environment.

Early 2015 TPUDC Joins the Project
The University engages Town Planning & Urban Design Collaborative (TPUDC), to guide commercial and residential development, as well as associated improvements to infrastructure, for Sewanee's village. The University Lease Committee approves TPUDC's role as Town Planner, making their primary goal to develop a Village Implementation Plan that advances the goals and action items identified in previous studies and moves the development of the village forward.

November 12, 2015 Master Plan Virtual Workshop
TPUDC conducts an online and in-person workshop during which they present the plan developed in the August workshop and allow the public the opportunity to provide feedback on the draft.

Early 2016 Website Created
A website is created at <http://sewanee.edu/village> in order to keep the public informed about the planning process and development in the village.

Oct 2013 Master Plan Updated
The University Campus Master Plan is updated in order to better align with the 2012 Strategic Plan.

Sustainability Master Plan Approved
The Plan solidifies the University's commitment to a sustainable built environment.

March 26-28, 2015 Cultural Immersion Weekend
TPUDC conducts 11 meetings with a variety of Sewanee organizations and campus groups to gain an understanding of how residents, students, and visitors view the downtown area and what they envision for its future. During their visit to Sewanee, planners gain an in-depth understanding of what makes Sewanee unique and special.

Late November 2015 Sewanee Webtool Created
A webtool is created to allow the public an additional method of providing their comments on the draft Village Implementation Plan.

Late December 2015 Village Implementation Plan Completed

Mid 2016 Rezoning and Amendment Process
TPUDC and the University work with the Franklin County Regional Planning Commission to obtain a recommendation for the rezoning of 67 acres of residential and agricultural area south of Highway 41A to Mixed Use, in an effort to bring zoning consistency to an area identified as the "Village" boundary. In addition, the University requests amendments to the Mixed Use and general zoning provisions that will allow for smaller lots, the creation of a more compact, walkable village, and will encourage the development of new housing types.

August 2012 Village Vision and Program Plan Completed
The Plan, developed by the University and the community with assistance from Project for Public Spaces and Celebration Associates, identifies a number of programmatic opportunities in the village and begins to generate a vision for the future. Potential projects include new housing, a grocery store, a new community center, bike lanes, traffic calming, improved streetscape, and additional retail shops and restaurants.

Mid 2014 Village Action Plan
A steering committee consisting of leaders from community organizations and downtown businesses, as well as University administrators, faculty and staff, assisted Ayers Saint Gross with the process of creating a comprehensive report detailing eight goals and sixteen major projects. It serves as an important step in developing the 2016 Sewanee Village Implementation Plan. Primary goals include attracting residents and visitors to the village, creating strong links between the village and campus, spurring economic development and enhancing the vitality of the village businesses.

April 2015 Roundabout Study
TPUDC completes a Roundabout Study that carefully considers the appropriateness of a roundabout, and offers a number of intersection alternatives intended to create a safer, more walkable village environment. A meeting with TPUDC, the University, and Tennessee Department of Transportation (TDOT) determines that a roundabout may not be the best solution for the future of the village.

August 10-13, 2015 Master Plan Workshop
TPUDC and the University of the South host a multi-day public visioning and design workshop to finalize the Village master plan with the participation and input of residents, students, business owners, alumni and the general public.

August, 2016 Developer RFQ Released
The University releases a request for qualifications from experienced developers interested in advancing a number of projects identified in the Implementation Plan process, including potential cottage courts, a mixed-use market building, civic spaces, streetscape improvements, and multi-family apartments or micro-housing. The University begins qualifying builders, architects and developers who respond to the RFQ.

July 18, 2016 Rezoning and Amendments Approved
The Franklin County Board of Commissioners approves the rezoning and requested zoning amendments, paving the way for future development in the Village.

Source: <https://www.sewanee.edu/village/resources/>

2.1 PREVIOUS PLANS AND STUDIES

The University has directed significant focus to the study of watershed health, existing land cover, and the impact of previous development on natural resources as part of its commitment to sustainability and preparation for future growth. The 2017 Stormwater Management Master Plan (SMMP) assessed existing conditions and provided recommendations for improvements within three watersheds that contain the University's central campus and Sewanee Village. Within the Domain, building roofs, streets, parking areas, and other impervious land cover often generate runoff without appropriate stormwater management controls. In addition, in some areas stream buffers have been negatively impacted by development. The Village was one of five "high-value projects" selected for more detailed study in the report. Increases in stormwater runoff resulting from the implementation of development per the Village Implementation Plan were quantified. The SMMP also recommended increased prioritization of natural resource preservation, working with existing terrain, and mitigation of additional runoff volume incurred from the projected increase in impervious area – either within the Village or elsewhere within the watershed.

The SMMP provided more stringent stormwater management performance criteria for future projects to ensure preservation of downstream natural conditions. In addition to filtration for water quality, the SMMP proposes retaining 100% of runoff volume from 1-inch of rainfall based on a project's proposed impervious surface area. The plan suggests this volume be retained onsite, or "if the proposed project site limits the ability to retain 100% of the 1-inch runoff volume due to land availability or soil conditions, account for the equivalent storage volume on a more feasible site within the same watershed". Five preferred stormwater management strategies, or Best Management Practices (BMPs), were selected to mitigate increased stormwater flows due to new impervious surfaces: bioretention areas, vegetated swales, downspout disconnection, underground detention chambers, and pervious pavement.



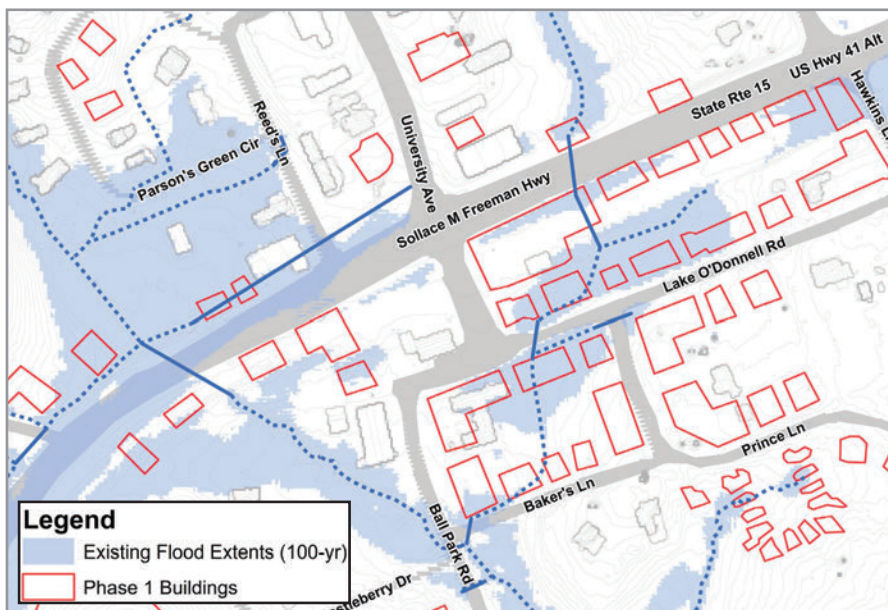
Sewanee Village Implementation Plan - core area (top) and perspective (bottom)

Building on the Sewanee Vision Plan (2012) and the Sewanee Action Plan (2014), the 2016 Sewanee Village Implementation Plan provides a design framework for redevelopment of the Village Core, integrating sustainability, recreation and open space, housing, streets and connectivity, and character. The Implementation Plan provides more detailed information oriented towards implementation and to potential developers as a guide to ensure that phased redevelopment is achieved consistent with the University's larger vision.

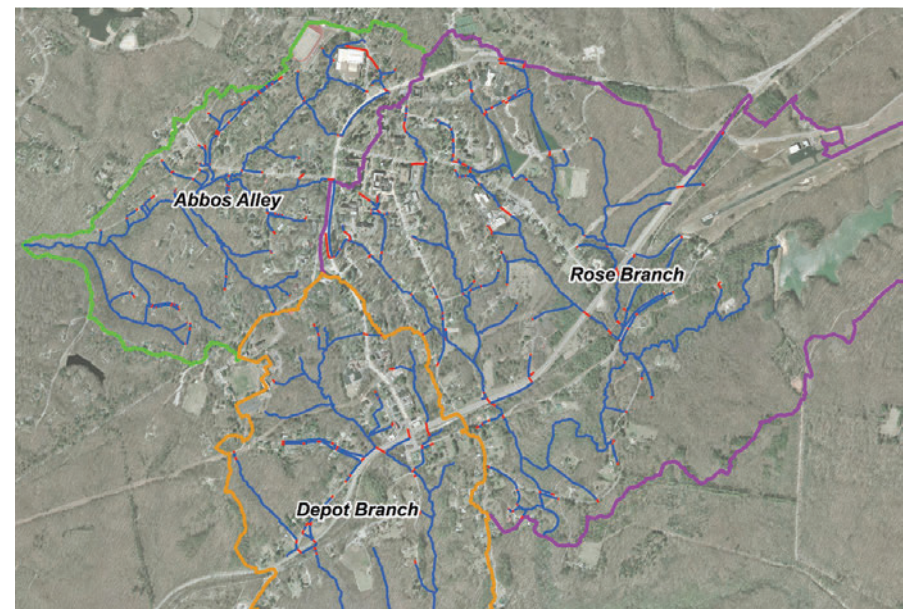
Specifically addressing sustainability, the Implementation Plan recommends "enhancement of cultural and natural resources and creation of a balance between the built and natural environment". Future redevelopment within the Village Core is an opportunity to demonstrate best environmental principles. The 2016 Implementation Plan requires additional design development progress necessary

to provide a detailed assessment of existing natural systems, topography, and on-the-ground drainage patterns. The Plan also requires demonstration of best environmental design principles and application of artful stormwater management approaches integrated into the proposed development vision.

The Sewanee Village "Core" includes land both north and south of the intersection of US Route 41A with University Avenue, designated by the University as a center for future growth and densification. North of Route 41A, University Avenue includes numerous existing businesses generally fronting directly on University Avenue, including several restaurants, retail establishments, a post office, and Angel Park, a pocket park established in 2010. The area south of Route 41A, in contrast, is currently a low-density collection of several existing businesses, the Sewanee Community Center, residential sites, and undeveloped vegetated areas.



2017 Stormwater Master Plan - Sewanee Village Existing Conditions Overlay

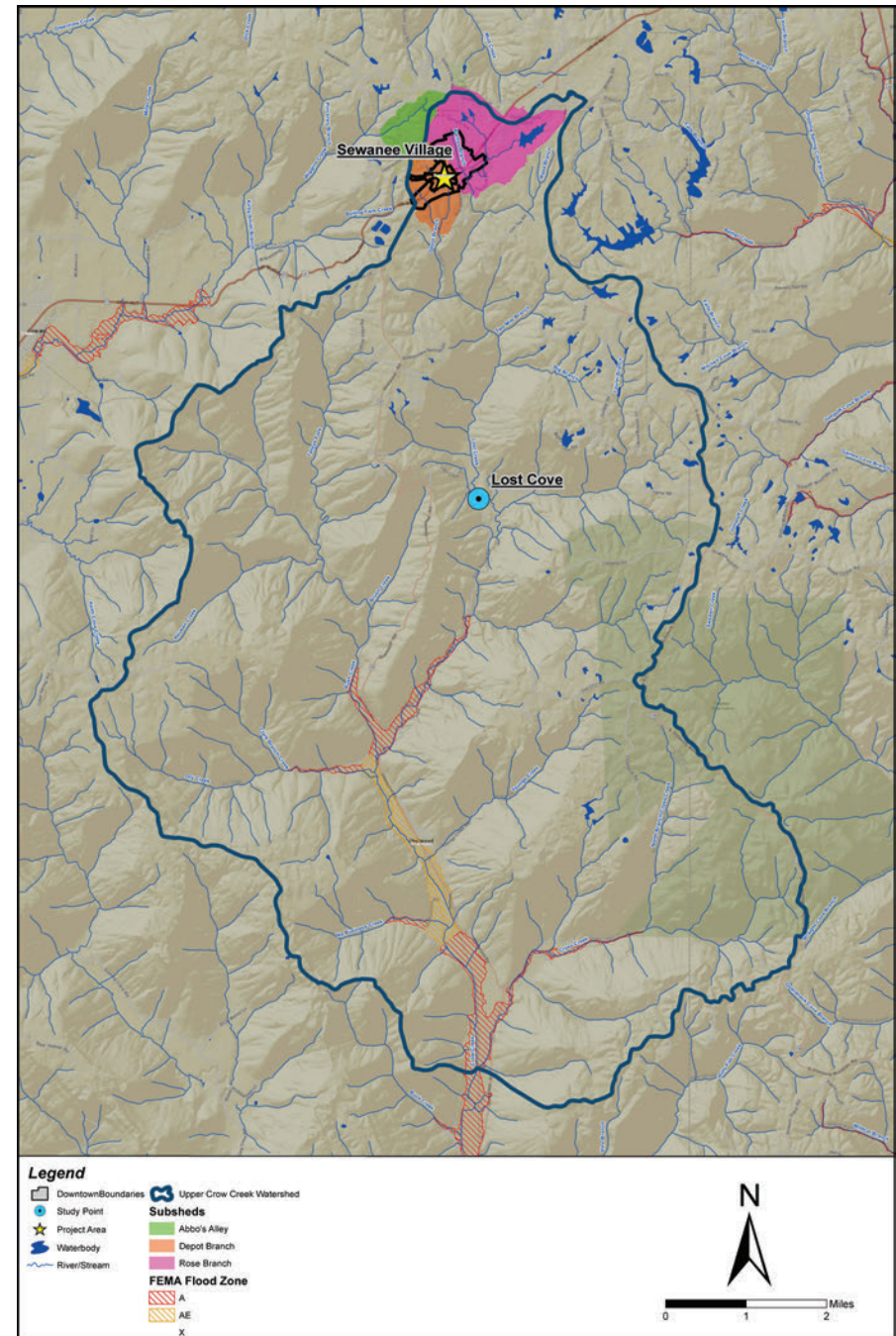


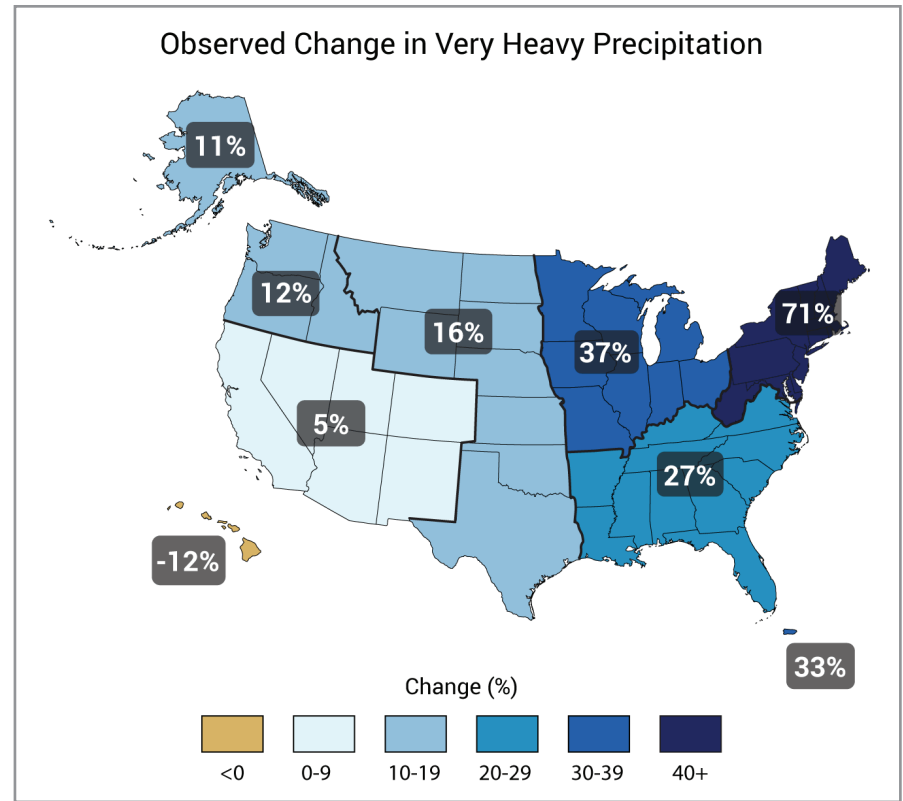
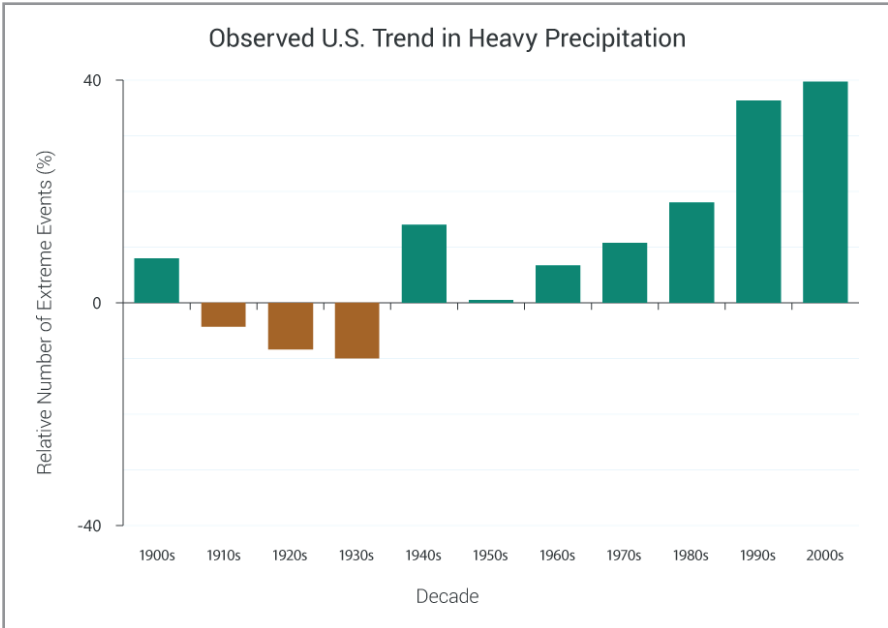
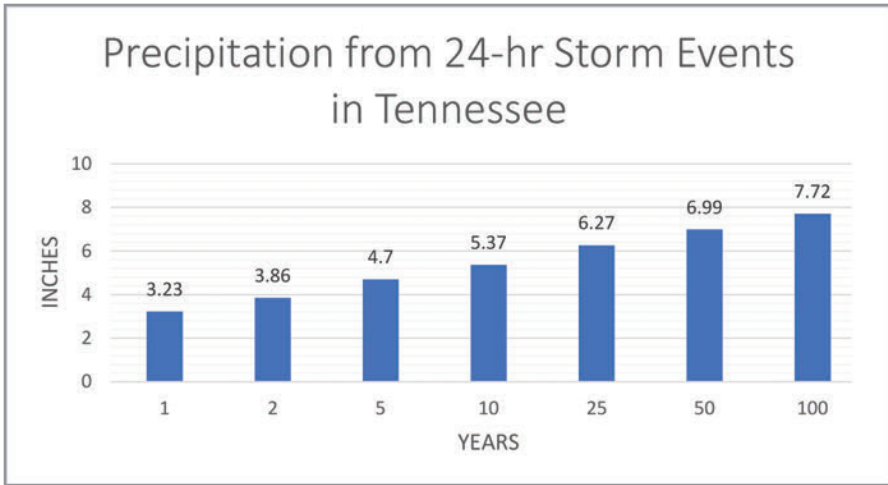
2017 Stormwater Master Plan - Project Watershed Overview

2.2 WATERSHED / VILLAGE CONTEXT

The University and Sewanee Village are situated near the headwaters of the Upper Crow Creek watershed. Downstream conditions include complex karst terrain, and have been identified as a high conservation priority. The University has planned for compact development by focusing University growth within the University Core Campus, School of Theology, and Sewanee Village areas. Compact village-scale development will reduce overall impervious area in the watershed over time and will help reinforce related University sustainability goals, especially energy and transportation. Assessing the Sewanee Village Implementation Plan through this lens, the vision for a mixed-use, walkable, village with a defined center and edge is important to efficiently contain a high increment of growth within a relatively small land footprint. This approach to efficient Smart Growth development is being undertaken in conjunction with ongoing University efforts to maximize stewardship of natural areas.

Though located at the top of the greater Upper Crow Creek watershed, the Village study area is located downstream of much of the University Core Campus and University Avenue areas. University Avenue and Kentucky Avenue run north-south along ridge lines north of Sewanee Village, with runoff flow to Depot Branch (west) and Village Branch (east). Land cover conditions within the upstream subcatchment vary – including highly impervious building and parking conditions along University Avenue with minimal past mitigation of runoff quantity or quality, as well as natural wetland, forest, and meadow areas. These flows are currently either piped, channelized or running overland through Sewanee Village parcels designated for redevelopment, with culverts conveying flow below US Route 41A, Lake O'Donnell Road, and Baker's Lane. Safe conveyance of these flows through the Village is required. The 2016 Implementation Plan assumes that underground piping will divert these flows around the perimeter of proposed redevelopment blocks, discharging at the existing confluence of Depot Branch with Village Branch just south of Bakers Lane.





PRECIPITATION SUMMARY

The above map illustrates a percent increase in heavy precipitation (defined as the heaviest 1% of all daily events) from 1958 to 2012 for each region of the United States. Future modeling and design efforts should take into account the increasing frequency and severity of storm events. (Figure source: updated from Karl et al. 2009).

<https://nca2014.globalchange.gov/report/our-changing-climate/heavy-downpours-increasing#tab1-images>



Downstream Conditions - Future Campsite Location



Downstream Conditions - Erosion at Barnes Branch & Lost Creek Confluence



Downstream Conditions - Typical Access Trail



Downstream Conditions - Karst Terrain



Depot Branch - Upstream Conditions North of US Route 41A



Sewanee Village - Existing Conditions and Land Use



Existing Drainage System Outfall - Sewanee Elementary School



Existing Bioretention Basin - Sewanee University Campus

2.3 HIGH PRIORITY SITES

Four high-priority sites within the Village Core were designated by the University and stakeholders for concept study of the application of sustainable land development principles and GI BMPs. The sites as a whole include the majority of the Village Core limits south of US Route 41A.



Market Block Existing Conditions

The “Market Block” site is located between US Route 41A and Lake O’Donnell Road, east of University Avenue. The Site Assessment Report by St. John Engineering dated October, 2016, summarizes existing topographic conditions, wet-weather conveyances, headwalls, and culverts in detail and is included in the Appendix. Several mature trees were mapped and are shown on the existing conditions plan. Except for the existing Taylor’s Mercantile building at the northeast corner of the intersection with University Avenue, which faces US 41A with a blank wall, existing buildings are set back 60-70 feet from US 41A in the location of the market block. High vehicular speeds and regular truck traffic along the site frontage was observed. Lake O’Donnell Road, and Hawkins Avenue are currently more informal, low traffic, residential lanes generally without sidewalks. Also notable is the presence of the existing Mountain Goat Trail on the site set back approximately 40 feet from US 41A, with a crossing at Hawkins Lane.

Mixed-Use West Existing Conditions

The “Mixed-Use West” site is located between Lake O’Donnell Road, Ball Park Road, and Baker’s Lane – west of Prince Lane. Existing culverts were observed under Lake O’Donnell Road and Baker’s Lane and overland conveyance of the unnamed tributary through the block generally matched the topographic data. The confluence of Depot Branch and the unnamed tributary occurs immediately southeast of the intersection of Ball Park Road and Bakers Lane, south of the Mixed-Use West property. The site includes the existing Sewanee Community Center Building, noting that the first floor of the existing building is below the elevation of Ball Park Road as seen in the picture below. At the time of field assessment in 2018, a constant flow of stormwater was observed exiting the 24” corrugated metal pipe.

Mixed-Use East Existing Conditions

The “Mixed-Use East” site is located south of Lake O’Donnell Road and east of Prince Lane. The site is generally upland, sloping from east to west. Land cover is predominantly grassed with several large white pines near the east property border.

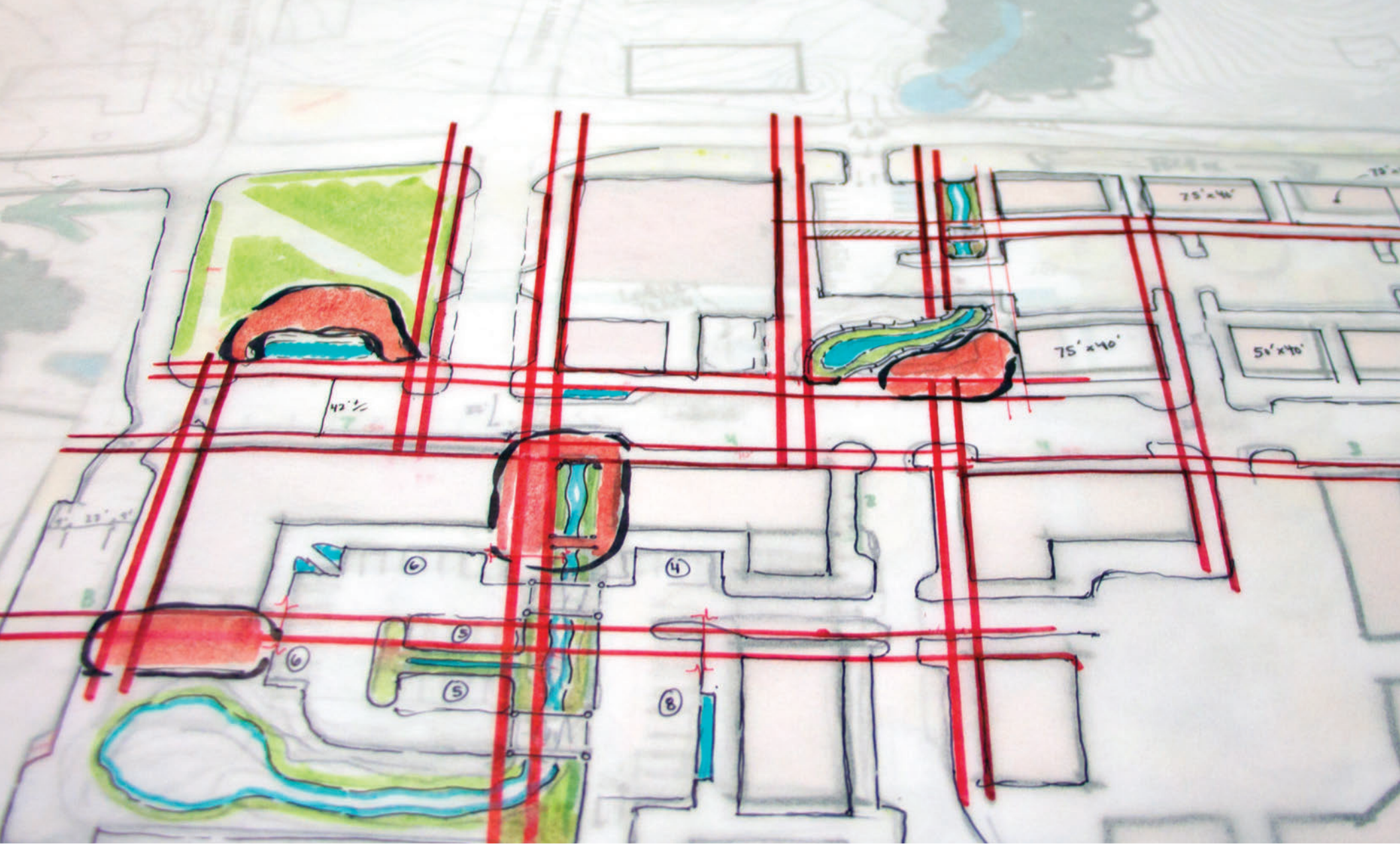
Village Green Existing Conditions

The “Village Green” site is bounded by US Route 41A, University Avenue, Lake O’Donnell Road, and a proposed new street to the west that will connect to Lake O’Donnell Road. The existing site is mostly impervious, consisting of the existing Sewanee Market building along with associated paved parking areas and limited vegetated areas in fair condition. The site generally slopes from north to south, away from US 41A and towards the market building and Lake O’Donnell Road.

Single-Family Residential Block Existing Conditions

The “Single-Family Residential Block” located south of Prince Lane features low-lying topography close to Prince Lane. An existing depression was observed, which may have been historically used as a wet-weather spring, as well as remnants of a previous residential driveway connecting to Prince Lane.

Recent revisions to the plan for the residential block have shifted proposed buildings and associated improvements to the upland south portion of the site, where it appears feasible and reasonable as proposed per the latest version of the Implementation Plan. Alternative layouts (see Appendix) may consider parking consolidation and shifting the driveway connection to be from Prince Lane closer to the intersection with Bakers Lane. This could minimize impacts to low-lying areas and maximize the areas as a location for detention and as a site/neighborhood open space amenity.



CONCEPTUAL DESIGN

22' min.

3 CONCEPTUAL DESIGN

3.1 WATERSHED RECOMMENDATIONS

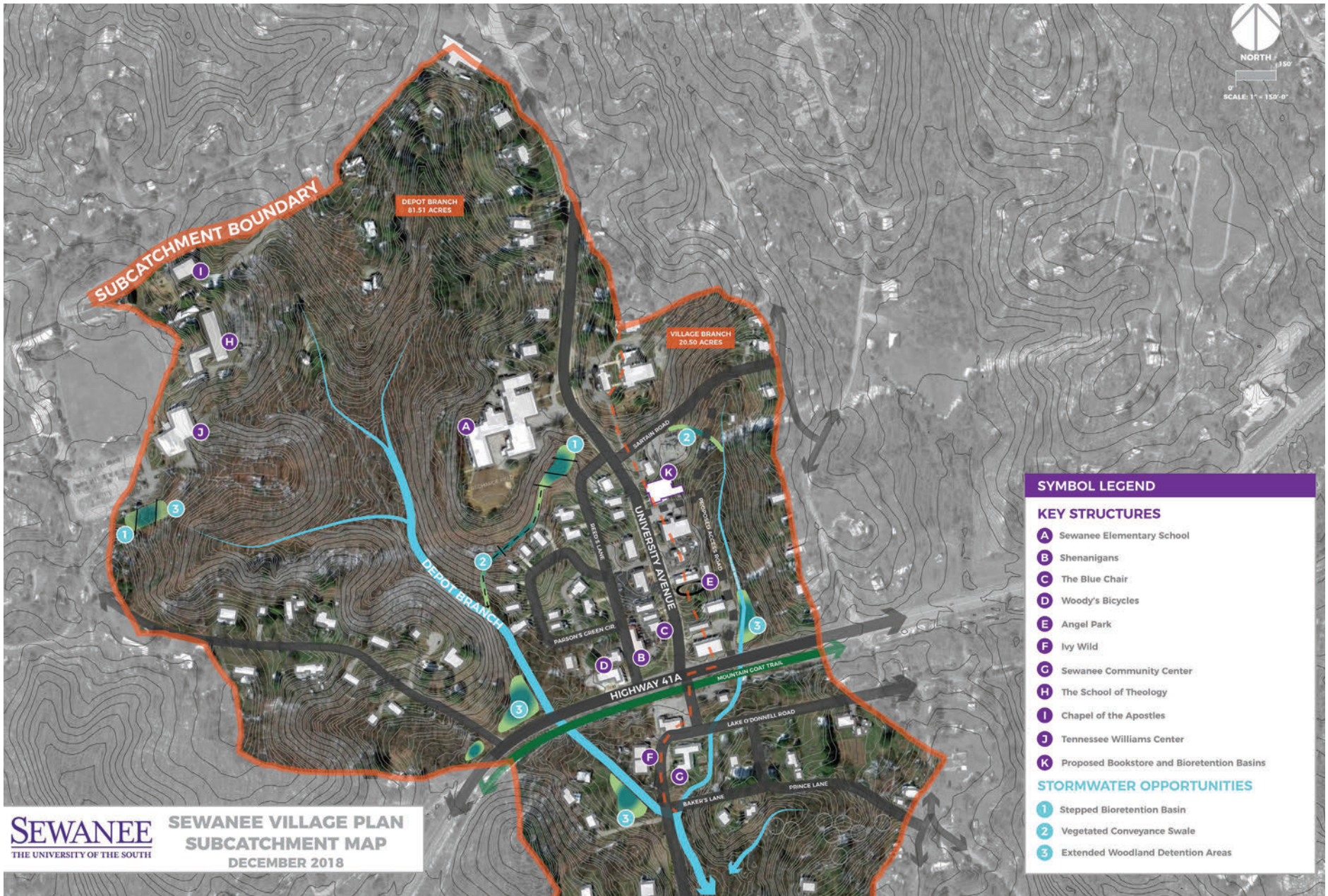
Implementation of upstream stormwater management improvements, such as those recommended in the 2017 SMMP, will reduce the impacts of flows at the Village and further downstream. Reduction in flows to be conveyed through the Village Core will make it much easier to accommodate “daylit” conveyances woven into proposed development, such as vegetated channels and expanded wetland systems. In addition to the projects identified in the 2017 SMMP, the Subcatchment Map on the following page includes additional runoff mitigation projects to address larger storms and flooding that were identified during this project. There appears to be significant opportunity to retrofit upstream existing impervious areas with green infrastructure systems (i.e. bioretention, permeable pavement, and trees) to filter and infiltrate runoff close to the source and provide multiple ecosystem benefits. There also appears to be opportunity to expand wetland systems in natural low-lying areas along Depot Branch and the village tributary to increase flood storage capability, which might be achieved in conjunction with upcoming bookstore and parking improvements. These upstream improvements should be considered an integral part of the Village stormwater recommendations.

LEGEND

1. **Spencer Hall**
2. **Tennessee Williams Center Parking Lot**
3. **Fowler Center**
4. **Willie Six Road**
5. **Sewanee Village**



2017 SMMP - High-Value Projects Overview



Subcatchment Map - Upstream Improvement Opportunities

3.2 DESIGN DEVELOPMENT

The Village Core area was studied first holistically at the neighborhood scale to understand the existing constraints as well as the overall proposed Village framework. Looking at the “South Core” area as a whole, three conceptual alternative approaches to balance the Implementation Plan buildout with sustainable design principles were developed for assessment by the University and stakeholder group. The key elements varied for comparison purposes are:

- Balance of development buildout and parking with preservation of natural systems and topography
- Design approach for the existing runoff conveyances through the Village, specifically through the Market Block and Mixed-Use West Block
- Inclusion of additional “bonus” runoff volume control to slow and infiltrate flows from the Village Core as well as upstream



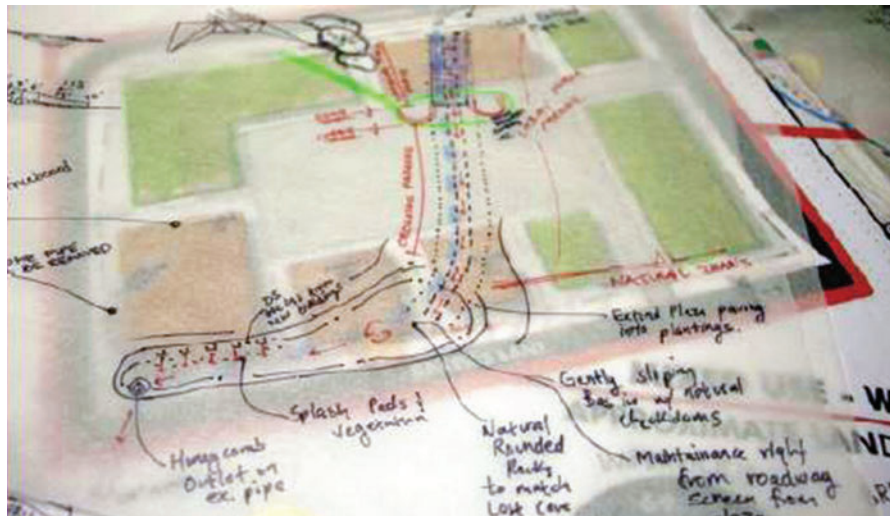
Preliminary Progress Sketches

1. The Original Implementation Plan provides an overlay of green infrastructure practices to the maximum extent possible without significant changes to the 2016 Implementation Plan layout. This concept maximizes development buildout and parking, and as a result includes the most impervious area that will generate runoff requiring mitigation. Stormwater conveyances from upstream are shown diverted around the perimeter of blocks with bypass pipes. Water quality filtration is proposed with porous pavement, bioretention, bioswales, and enhanced tree trench systems, with overflow during larger storm events to structured underground volume control systems with piped overflows.

IMPERVIOUS COVERAGE (%)	CONCEPT DESIGN	COMMERCIAL SPACE (FIRST FLOOR)	DWELLING UNITS (TOTAL)	PARKING SPACES (TOTAL)	GREEN SPACE (AREA SF)	WATER QUALITY (AREA REQ.)	STORAGE VOLUME (BONUS)	INSTALLED COST (DRAINAGE)	URBAN SCALE (TIERS)
80% +/-	IMPLEMENTATION PLAN	Green	Green	Green	Red	Red	Yellow	Green	Green
66% +/-	SEWANEE CANALS	Green	Yellow	Yellow	Green	Yellow	Green	Green	Green
50% +/-	BLUE/GREEN THREAD	Yellow	Red	Yellow	Green	Green	Yellow	Yellow	Green

PLAN COMPARISONS

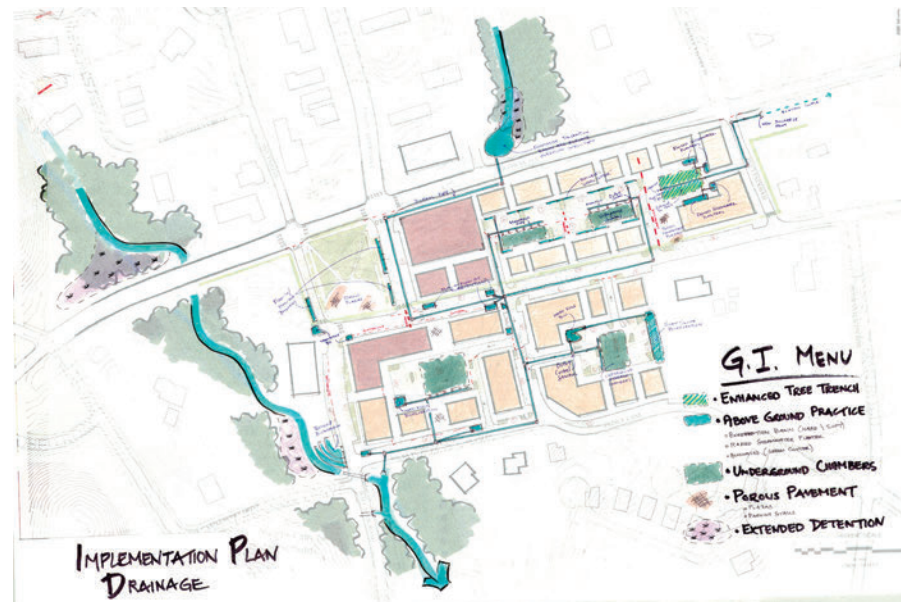
 HIGH	 MEDIUM	 LOW
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Work-in-Progress Sketch



Preliminary Site Plan

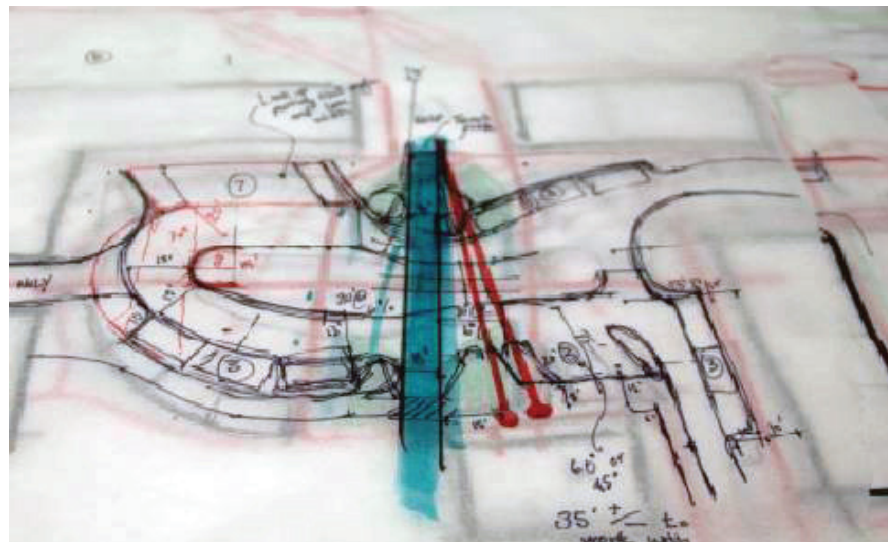


Preliminary Drainage Design

2. The Sewanee Canals Plan starts with the 2016 Implementation Plan buildout and layout, and configures the runoff conveyances through the site as hard-edged urban canals designed to celebrate the features as site amenities. A hard-edged canal is proposed in the same perimeter location around the edge of the Market Block, with a bridge connecting pedestrian circulation from mid-block to the crossing of University Avenue west to the Village Green. In this scheme, the Mixed-Use West block design has been modified to add an expanded vegetated volume control system at the corner of Ball Park Road and Baker's Lane, where runoff from the Market Block canal can spill into the larger, more naturalized system as the centerpiece of a plaza space between buildings. This system can provide additional volume control for runoff from Village impervious surfaces as well as potentially mitigating "bonus" upstream flows. It is expected that the canal conveyance systems will experience long stretches without receiving flow, therefore the design will require careful attention to detail for maintenance access and visual aesthetics especially during drought conditions.



Preliminary Site Plan



Work-in-Progress Sketch

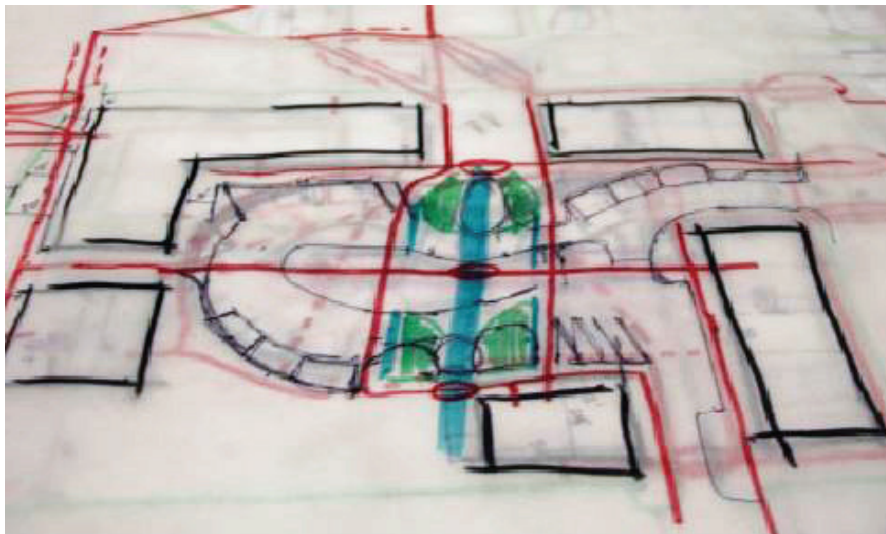


Preliminary Drainage Design

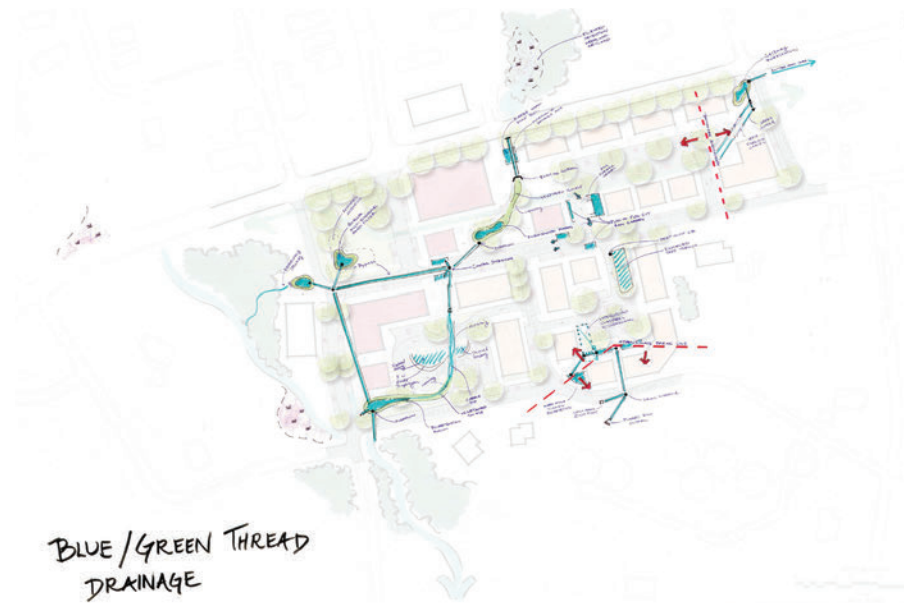
3. The Blue-Green Thread Plan weaves the existing stormwater conveyances and Mountain Goat Trail through the Village Core while remaining truer to the full buildout proposed in the 2016 Implementation Plan, pulling buildings and hardscape closer to the conveyance edges. The plan balances the buildout proposed by the Implementation Plan with the expanded natural systems. The design of the conveyances is envisioned as a more urban hard-edged condition through the busier and more active Market Block, while flowing through the Mixed-Use West Block with softer edges and an expanded vegetated volume control area near the intersection of Ball Park Road with Baker's Lane. Additional mid-block parking is required to accommodate the larger development program. Parking areas are proposed to be broken up to the maximum extent possible with landscape, trees, and green infrastructure practices. A "parking garden" is proposed for the Mixed-Use West block, that would allow restoration of the conveyance through the parking lot and provide increased vegetation and ecosystem services to transition from the surrounding environment to the built village center.



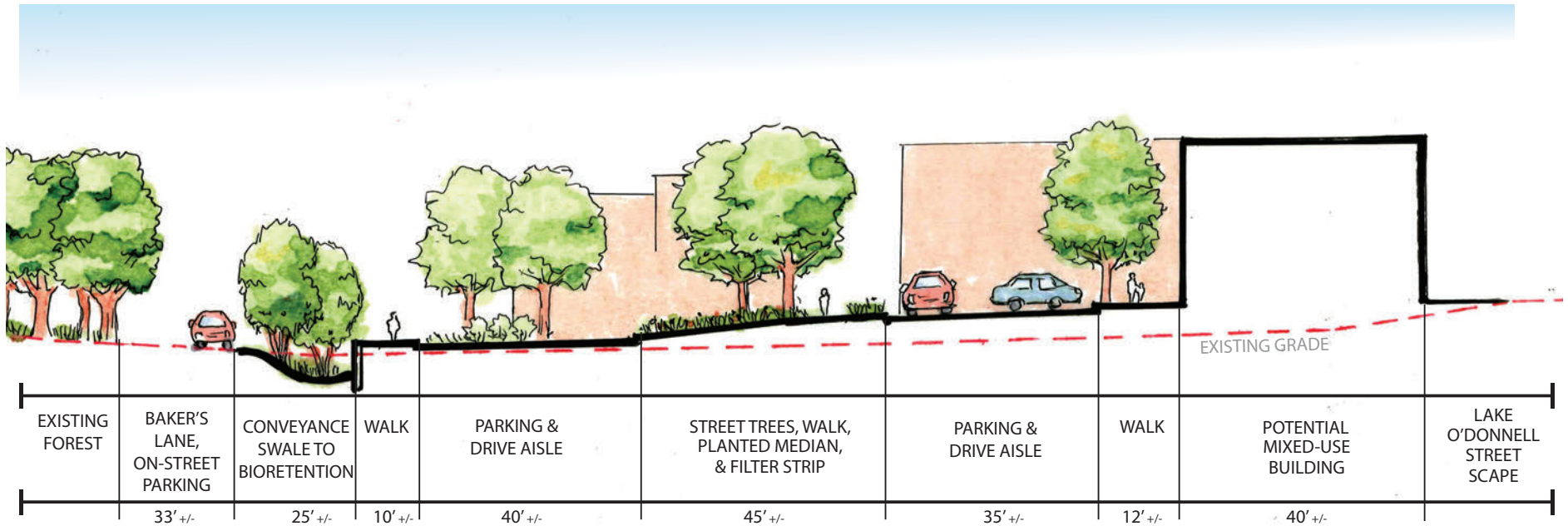
Preliminary Site Plan



Work-in-Progress Sketch



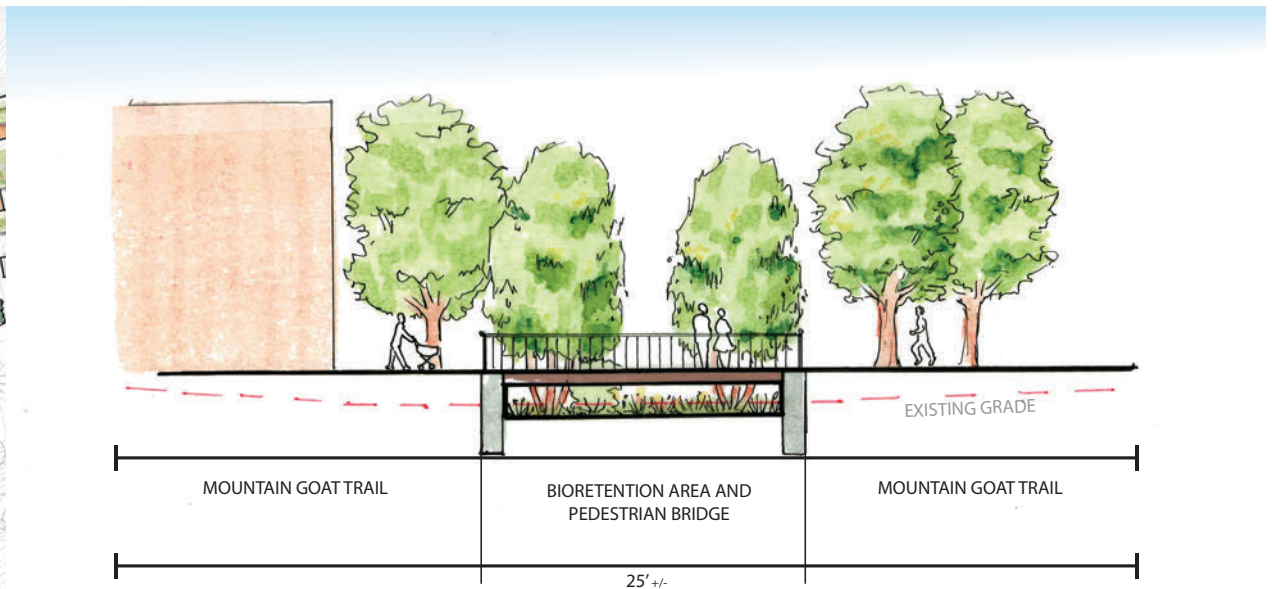
Preliminary Drainage Design



Section A-A Through Mixed-Use West Block



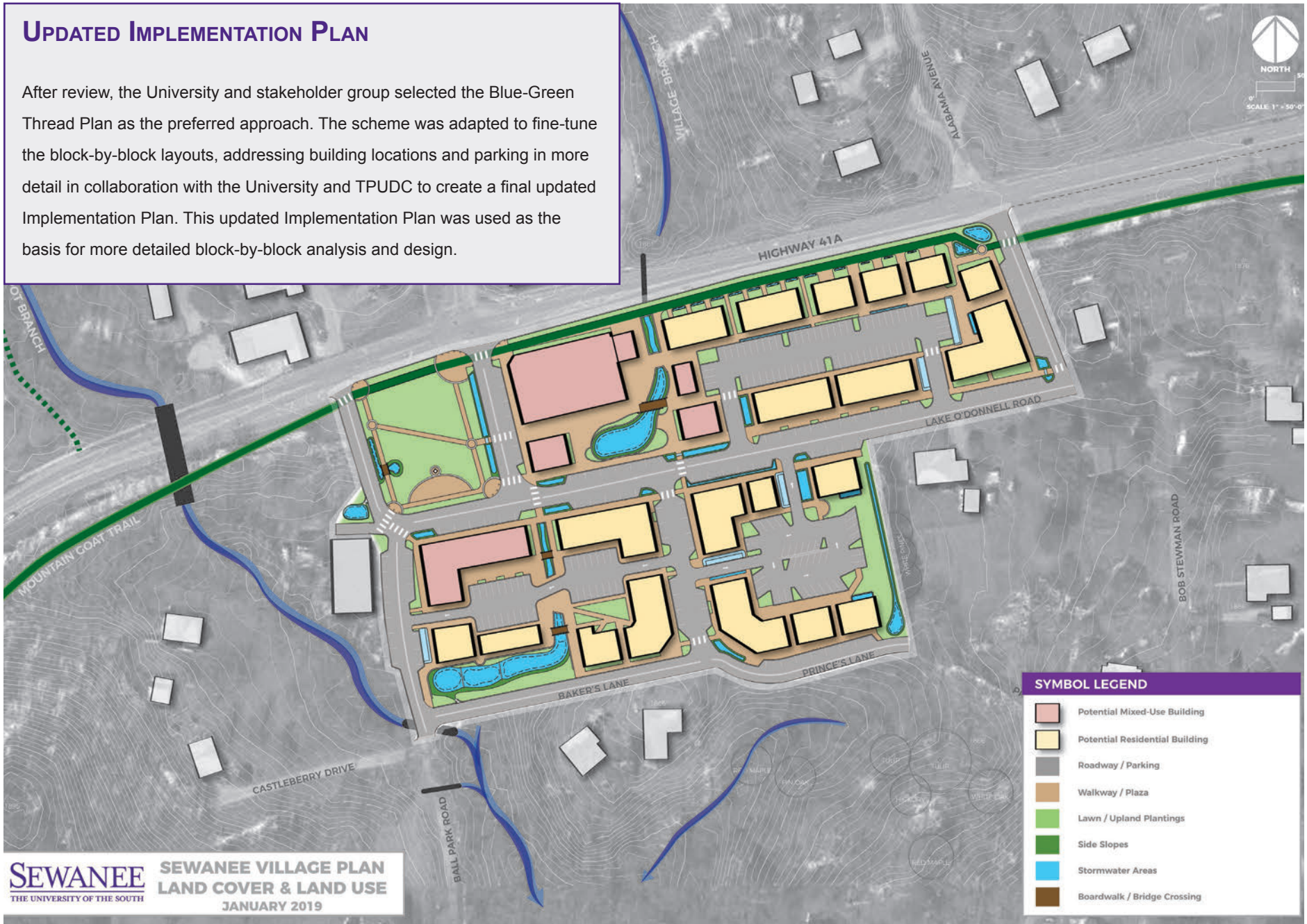
Section B-B Through Market Block



Section B-B Through Market Block

UPDATED IMPLEMENTATION PLAN

After review, the University and stakeholder group selected the Blue-Green Thread Plan as the preferred approach. The scheme was adapted to fine-tune the block-by-block layouts, addressing building locations and parking in more detail in collaboration with the University and TPUDC to create a final updated Implementation Plan. This updated Implementation Plan was used as the basis for more detailed block-by-block analysis and design.



SEWANEE THE UNIVERSITY OF THE SOUTH
SEWANEE VILLAGE PLAN
LAND COVER & LAND USE
JANUARY 2019

SYMBOL LEGEND	
	Potential Mixed-Use Building
	Potential Residential Building
	Roadway / Parking
	Walkway / Plaza
	Lawn / Upland Plantings
	Side Slopes
	Stormwater Areas
	Boardwalk / Bridge Crossing

3.3 UPDATED IMPLEMENTATION PLAN

Beginning with the five preferred BMPs proposed in the 2017 SMMP, a calibrated matrix of paving, channeling, storage, and filtration practices was developed in more detail to demonstrate the “toolbox” of preferred stormwater solutions that fit with the Sewanee Village guiding principles. Solutions have been sorted by their primary function, understanding that some BMPs provide multiple functions. A range of solutions, including more detailed artful design in high-visibility locations, and “typical” simpler design in general areas, should balance placemaking value with site constraints, constructibility, cost, and long-term maintenance requirements.

The green infrastructure overlays on the following pages demonstrate application of the “stormwater toolbox” to the final preferred layout plan. It is assumed that the Village stormwater management system will be planned on a neighborhood scale and be phased by block. In other words, conveyance of wet weather flows as well as compliance with performance standard requirements for stormwater quality and quantity will be met onsite assuming each block is a stand-alone “project” that could be designed and constructed independently. Stormwater BMPs, especially block-scale flooding mitigation BMPs such as underground detention systems and through-block conveyances for offsite flows, may need to be completed as early construction items for each block before construction of the entire block is complete.

FILTERS	<i>Small footprint, source control solutions designed to treat the first flush (WQv).</i>
HYBRIDS	<i>Dual purpose, flexible solutions designed to treat and store minor volumes.</i>
STORAGE	<i>Neighborhood scale, shared solutions designed to manage larger volumes.</i>
SPECIFIC	<i>Specific design elements to compliment Sewanee Village context and character.</i>



Design Standards

The stormwater management approach has been designed at a conceptual level to meet the following performance standards, per the recommendations in the SMMP. Additional design development and coordination is required to refine the approach and confirm assumptions:

- Water Quality: Filter runoff from paved impervious surfaces for the 1-inch storm event.
- Volume: Retain 100% of volume from the 1-inch storm event onsite.
- Overbank Flood Protection: Do not exceed pre-development peak runoff rates for the 1-Year through 25-Year storm events.

FILTERS



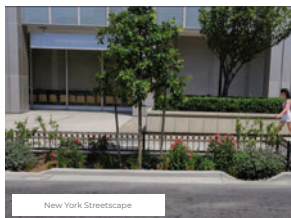
GREEN GUTTER



RAISED STORMWATER PLANTER



RESIDENTIAL RAIN GARDEN



FLOW-IN FLOW-OUT



BIOSWALES



DOWNSPOUT DISCONNECTION

STORAGE



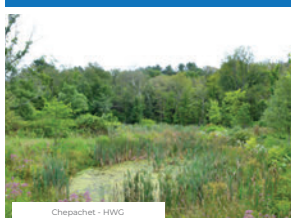
WOODLAND DETENTION (YR. 0)



CONSTRUCTED WETLAND



POROUS GRAVEL RESERVOIR



WOODLAND DETENTION (YR. 6)



UNDERGROUND CHAMBERS



UNDERGROUND CHAMBERS

STORAGE

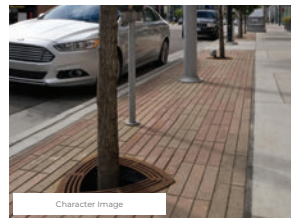
HYBRIDS



BIORETENTION BASINS



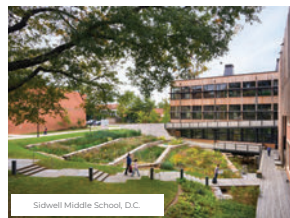
ENHANCED TREE TRENCH



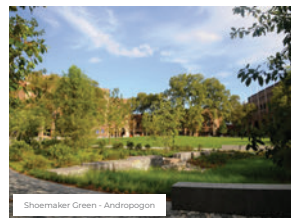
ENHANCED TREE TRENCH



PERMEABLE PARKING STALLS



TERRACED BIORETENTION

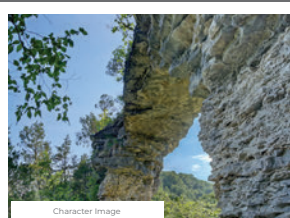


NATURALIZED BIORETENTION

SPECIFIC



GREEN WATERWAY



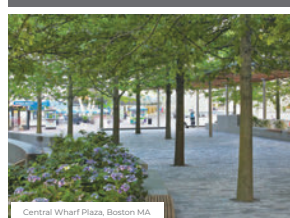
SANDSTONE TEXTURES



BIORETENTION CROSSING



TRANSITIONAL LANDSCAPES



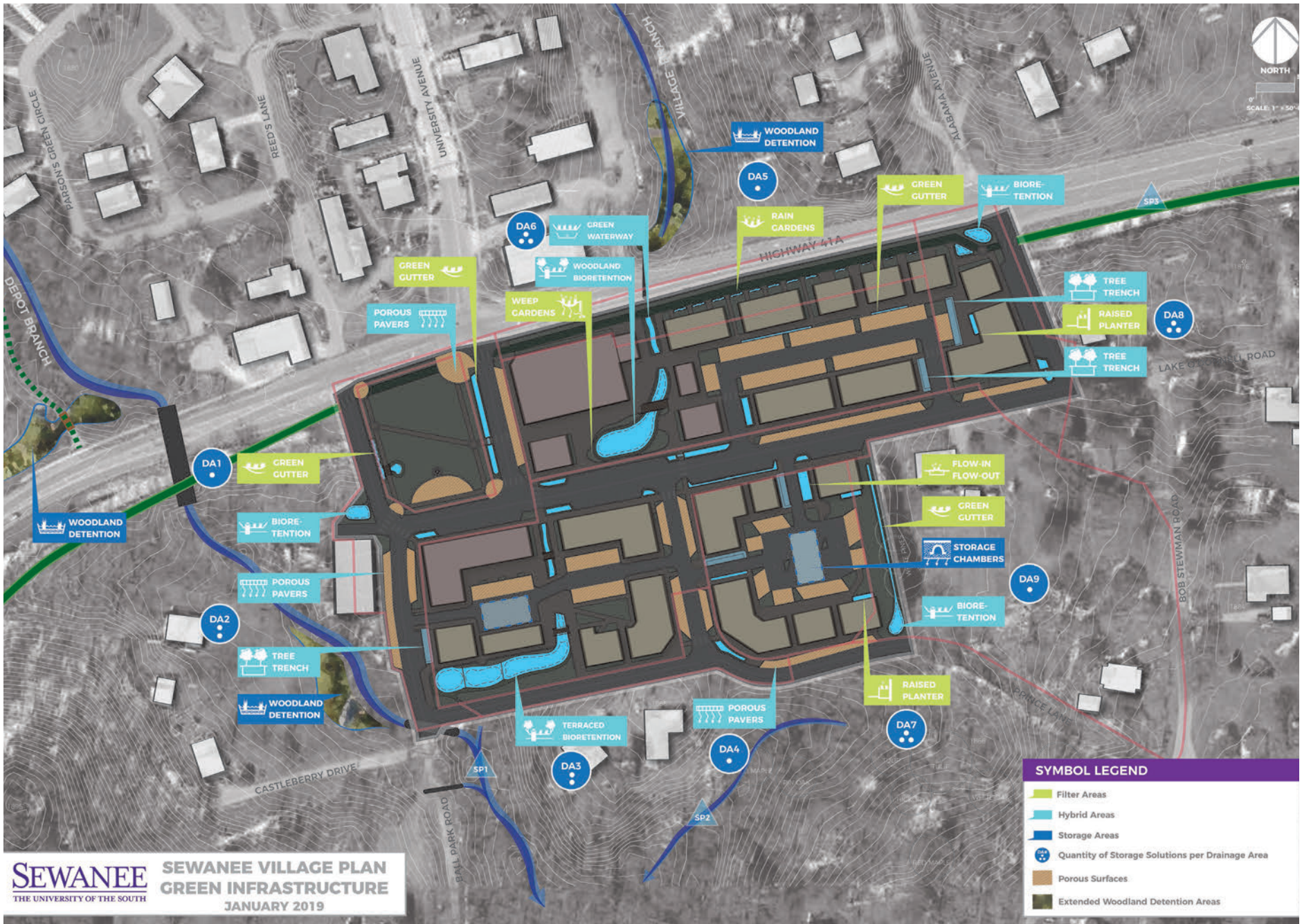
URBAN TREE CANOPY



IMMERSIVE LANDSCAPES

SPECIFIC







Maintenance

Like any infrastructure, green stormwater infrastructure requires regular maintenance to function properly over time. Stormwater management practices function best on a long-term basis when they are:

- Obvious: surface filters, bioretention systems, tree filters, green roofs, pervious paving surfaces;
- Simple: pavement reduction, street trees, bioretention, bioswales, natural filtration systems and erosion control measures, roof downspout daylighting;
- Lovable: immersive landscapes that provide multiple benefits including aesthetic beauty and placemaking value, such as stormwater street trees, green roofs, bioretention systems, green waterways; and
- Not needed in the first place: compact development, redevelopment/infill, shared parking and reduced parking requirements, appropriate-width streets, minimized mowed lawn all reducing the need for formal stormwater controls.

A dedicated funding stream for maintenance of stormwater infrastructure should be established before construction commences. In the village context, green, “lovable” infrastructure systems offer exceptional potential for adoption and stewardship by local residents and business owners as many systems can be maintained by trained landscaping crews and are under the watchful eye of those frequenting the Village on a daily basis. More complicated systems may require additional budgeting for regular inspection and maintenance. A detailed Stormwater Operation and Maintenance Plan should be provided covering the specific needs of each system. The plan should outline inspection thresholds and maintenance procedures, identify responsible parties, and establish an annual maintenance budget.

Construction Cost

Due to the many factors involved and long timeframe to consider, stormwater infrastructure costs are difficult to accurately evaluate for development such as Sewanee Village. In addition to construction costs, which can be very site specific, it is important to assess operation and maintenance cost as well as the enhanced performance abilities of green infrastructure compared to more traditional “gray” infrastructure. The supplemental benefits of various approaches also can provide long-term value when considering full lifecycle implications.

The University’s commitment to consolidation of growth in focused areas utilizing Smart Growth development patterns will reduce overall impervious area in the watershed, protect environmentally sensitive areas, and conserve natural open space. Compact development and redevelopment results in less impervious area per increment of growth, and thus less stormwater runoff requiring costly mitigation.

For Sewanee Village redevelopment, it is assumed that stormwater management systems will be required to meet the design standards summarized in Section 3.3 of this report. At grade, vegetated “green” practices can more cost-effectively meet these standards when compared to “gray” systems by greatly reducing the quantity of structures (manholes, catch basins, separators, etc.) and pipe required. In addition, these vegetated filtering systems are often much more effective in reducing nitrogen, phosphorus, and sediment discharges – a benefit sometimes not fully factored into cost-benefit analyses but highly important when considering the impacts on downstream resources in the Domain.

Planning level stormwater costs are summarized on the next page, noting that best available data is somewhat dated, actual costs will be site specific, and comparative performance and supplemental benefits of various approaches are not included in the assessment.

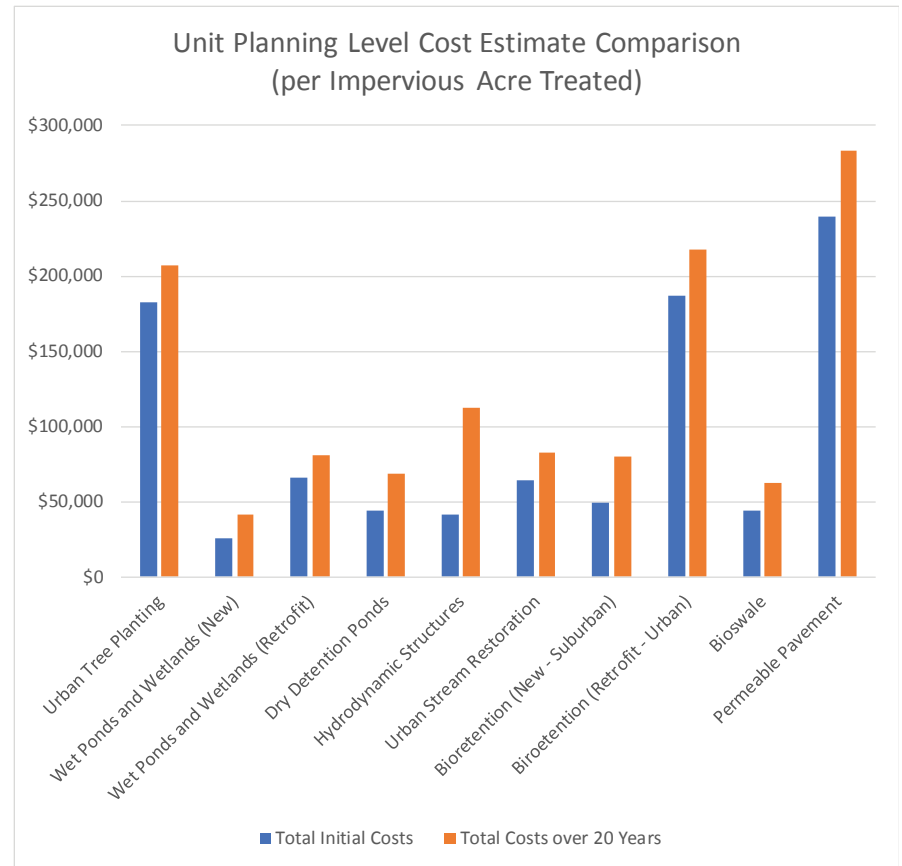
Life Cycle Costs

Annual monitoring, maintenance, and repair costs (such as debris removal, planting maintenance, erosion control, and repairs) can be in the range of 4% to 7% of construction costs. The green infrastructure systems proposed for Sewanee Village can be simpler to maintain over time, as routine maintenance can be undertaken by landscape staff and potentially supplemented with public/private partnerships with Village businesses and residents. In addition, because the function of many systems are visible and easy to understand, “out of sight out of mind” deferred maintenance problems can often be avoided by addressing them before they grow.

As previously noted, it is critical for the University to identify a funding stream and responsible agency or department for monitoring and maintenance of stormwater infrastructure associated with retrofits in the watershed and new development in the Village. Due to the relative lack of familiarity with some proposed stormwater management systems, maintenance responsibilities should be clearly defined and additional education and training may be useful. Economies of scale should be highly beneficial in this regard as the University scales up implementation of green infrastructure.

Supplemental Benefits

Per the University’s vision, green infrastructure systems – visible and artfully implemented as envisioned in this master plan – will be a key ingredient in what makes Sewanee Village feel unique and special. Celebration of existing drainage conveyances, respect for topography and natural systems, dense tree planting, and integration of multi-functional BMPs such as bioretention and permeable pavement will beautify the Village and fulfill the University’s environmental commitments. This “green” approach typically resonates with potential tenants and residents, as sustainability and natural beauty are values well aligned with the vibrant village feel already envisioned in the Implementation Plan.



Source: University of Maryland “Cost of Stormwater Management Practices in MD Counties”, 2011.

Implementation of vegetated, green systems can provide additional benefits related to health and safety. Inclusion of street trees and other streetscape improvements such as curbed bumpouts featuring bioretention systems can significantly increase driver attention and reduce vehicle speeds, thus improving safety via traffic calming and greatly increasing sense of comfort within the Village. A healthy tree canopy can also reduce air temperatures, reduce air pollution, and provide shade value – often also resulting in reduced energy bills for cooling. In addition, the quality of and accessibility to natural systems and green landscapes has been directly linked to mental health and well-being.



Sandwich Library, MA - Green Infrastructure Educational Signage



Montgomery County, MD - Stormwater Art



Maui, HI - Rain Garden Educational Signage



Samoset Street, Plymouth, MA - Bioretention Educational Signage



NEXT STEPS

4 NEXT STEPS: GUIDELINES FOR FUTURE PROJECTS

4.1 UPSTREAM PROJECTS

Design and implementation of volume/flooding control improvements upstream of Sewanee Village, including projects identified in the SMMP and in this report such as proposed improvements for the Tennessee Williams Center parking lot, should be a high priority and an integral part of the overall stormwater management plan for the Village. Design of these retrofits (or inclusion of enhanced stormwater management systems with new projects) should be consistent with the performance standards and design approaches identified in the SMMP and this report. Future planning efforts for the Village should include an updated stormwater modeling analysis to refine the existing conditions assessment, prioritize improvements, and create a future conditions model to quantify the benefits of improvements recommended upstream and within the Village (see Section 4.2).

4.2 STORMWATER MODELING

The University's stormwater management model should be reviewed and updated as necessary to reflect existing conditions. Once updated, the model can be adapted to predict impacts of stormwater retrofits in the watershed as well as impacts of anticipated future growth. The model output can be utilized to determine and prioritize stormwater projects, and, in conjunction with monitoring data (see Section 4.4), quantify progress towards the University's goals.

4.3 PHASING & COST ESTIMATING

The next stage of design development will require coordination of specific building program, refined parking requirements, architectural design, existing conditions survey, geotechnical investigation, and budget that will require a fine tuning of the master plan approach. Depending on phasing, implementation of early infrastructure improvements may be required to precede block or site scale buildout. For example, at the scale of the Village, drainage bypass pipe installation in Lake O'Donnell Road and Ball Park Road should be constructed early so it is in place for connections to be made from block development projects. This work might be accomplished along with green street improvements



Existing Tulip Champion Tree at Prince Lane Site

and streetscape upgrades. At the scale of the block, the market block green waterway and woodland bioretention systems should be constructed as part of first phase improvements and sized to accept flows from full block buildout.

4.4 DESIGN & CONSTRUCTION OVERSIGHT

Utilization of peer review and design collaboration at key checkpoints during the detailed design process for specific blocks or sites is strongly recommended to help ensure consistency with the overall stormwater management and urban design objectives for the Village established in this plan. Peer review and oversight will guide “big picture” aesthetic and functional consistency, and could identify cost/constructibility efficiencies and/or maintenance considerations that should be addressed during the design process.

As the village design moves forward in detail, selection of stormwater tools from the matrix of solutions should generally adhere to the conceptual approach outlined in this report, coordinating with more detailed soil conditions, topography, and architectural building detail as the design progresses. Phased development should meet the recommended performance criteria identified in the SMMP and emphasized in this report.

Design should always consider flexibility to adapt to various building uses and maintenance capabilities over time. Green infrastructure practice selection is shown to best fit the site specific context. During design development, special care should be devoted toward maintenance access, pretreatment, and caretaker capabilities. An Operation and Maintenance Guide for stormwater infrastructure in the Village, combined with advanced performance monitoring at key locations (i.e. just downstream of the confluence of Depot Branch and Village Branch, south of Baker’s Lane) would be extremely useful to improve long-term performance, assist local stakeholders, and inform educational opportunities.

July 2016



July 2016

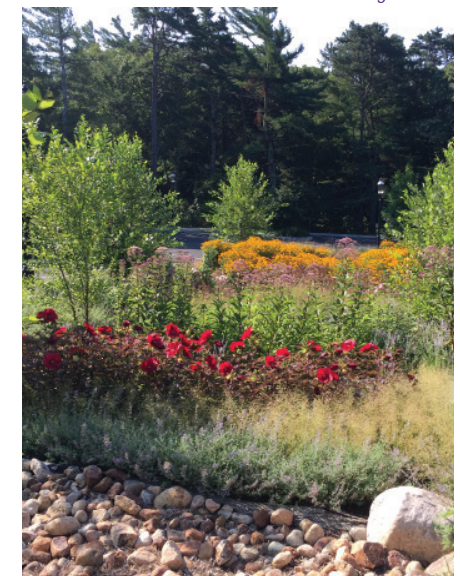


Confirming Elevations, Bottom of Bed Conditions, and Specified Fill Materials

September 2016



August 2018



Fine Grading, Plant Layout, Monitoring and Maintenance

ACKNOWLEDGMENTS

Sewanee Village Stormwater Stakeholder Group:

- Dr. Amy Turner* – Director, Office of Environmental Stewardship and Sustainability
- Dr. Martin Knoll* – Professor, Earth and Environmental Systems
- Dr. Keri Watson – Assistant Professor, Earth and Environmental Systems
- Brian Wright – Principal, Town Planning and Urban Design Collaborative
- Sallie Green* – Superintendent of Leases and Village Advisory Group Member
- Pam Byerly – Office Coordinator, Marketing and Communications; Village Advisory Group member
- Woody Deutsch – Owner, Woody’s Bicycles; Village Advisory Group member
- William Shealy* – Superintendent of Landscaping Planning and Operations
- Annika Derham* – GIS Technician, Facilities Management
- Nick Cookson – Sustainability Program Manager, Office of Environmental Stewardship and Sustainability
- Ben Beavers – Manager, Sewanee Utility District
- Scott Torreano – Professor, Earth and Environmental Systems
- Frank Gladu* – Special Assistant to the Vice-Chancellor for Sewanee Village Development

* = Participant in the University Stormwater Master Plan process

Others:

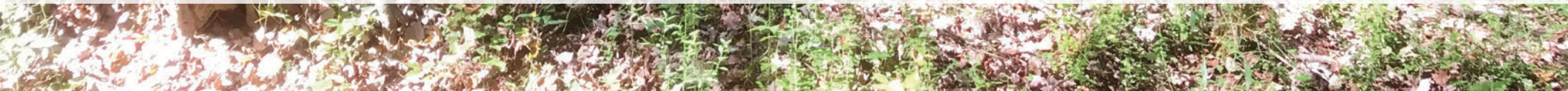
- Nate Wilson – Domain Manager, Office of Environmental Stewardship and Sustainability



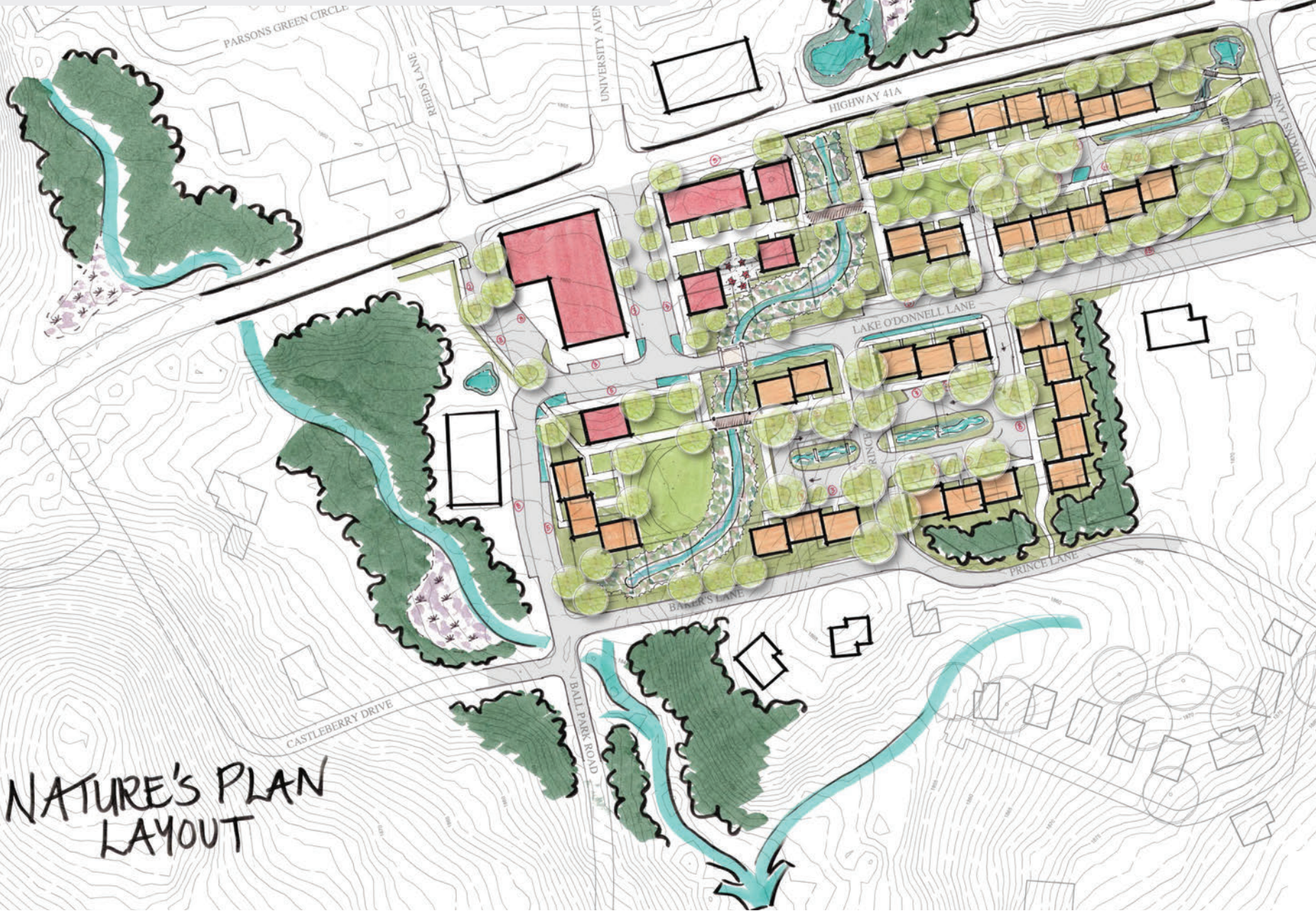
A special thanks to everyone who participated, contributed to the process, and shared their stories.



APPENDIX: Unused Concepts



THE NATURE PLAN



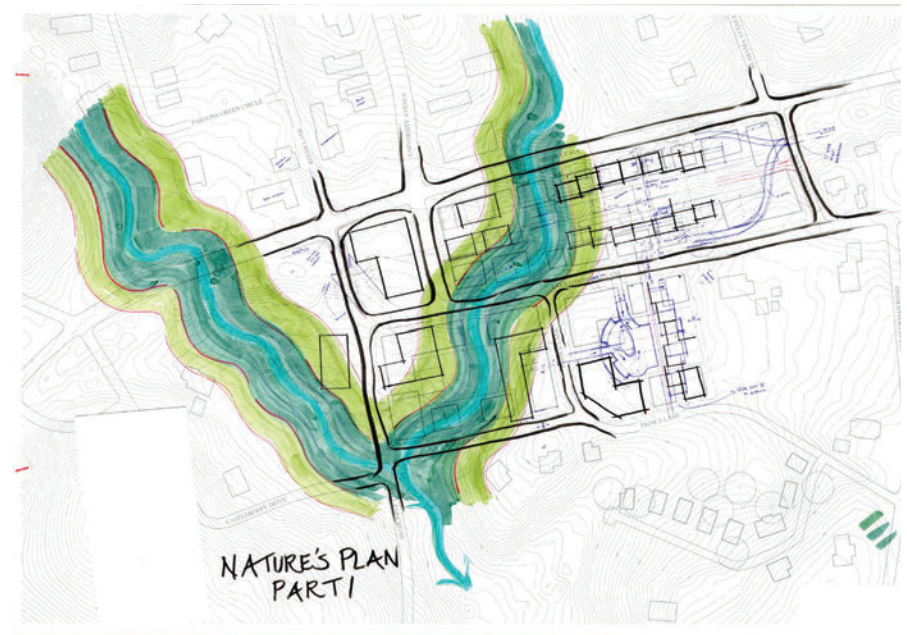
NATURE'S PLAN
LAYOUT

THE NATURE PLAN

Early Village Concept

The Nature Plan was produced as design scheme early in the design development process. The concept was deemed to be too much of a departure from the Implementation Plan, and was not utilized as a preferred alternative moving forward. The plan embraces existing natural systems and topography to the maximum extent, pulling proposed development back from existing stormwater flow paths, artfully vegetating and celebrating these conveyances, and expanding vegetated buffers and open space systems. To accommodate expanded preservation of natural systems in their current location, the market is shifted west of University Avenue. Proposed buildout is comparatively the lowest in this scheme, with development consolidated into three subareas to maintain a village-scale intensity and aesthetic with a smaller footprint: near the market, on the east side of Ball Park Road, and east of the flow conveyance systems.

Several new open spaces are proposed, including a village courtyard, pocket parks, and a floodable “water smart park” within the Mixed-Use West Block that can accommodate substantial onsite and “bonus” volume control capacity during rain events and serve neighborhood active or passive community park uses during dry periods. Mid-block parking areas are highly vegetated including green infrastructure systems, and a vegetated buffer is envisioned to preserve existing vegetation and provide passive recreation area along the east edge of the Market Block and Mixed-Use East Block. Inclusion of expanded naturalized flood control systems in these key areas could add significant aesthetic value to the Village as amenities, and reduce the need for expensive structured stormwater management systems such as retention/detention systems below parking lots.



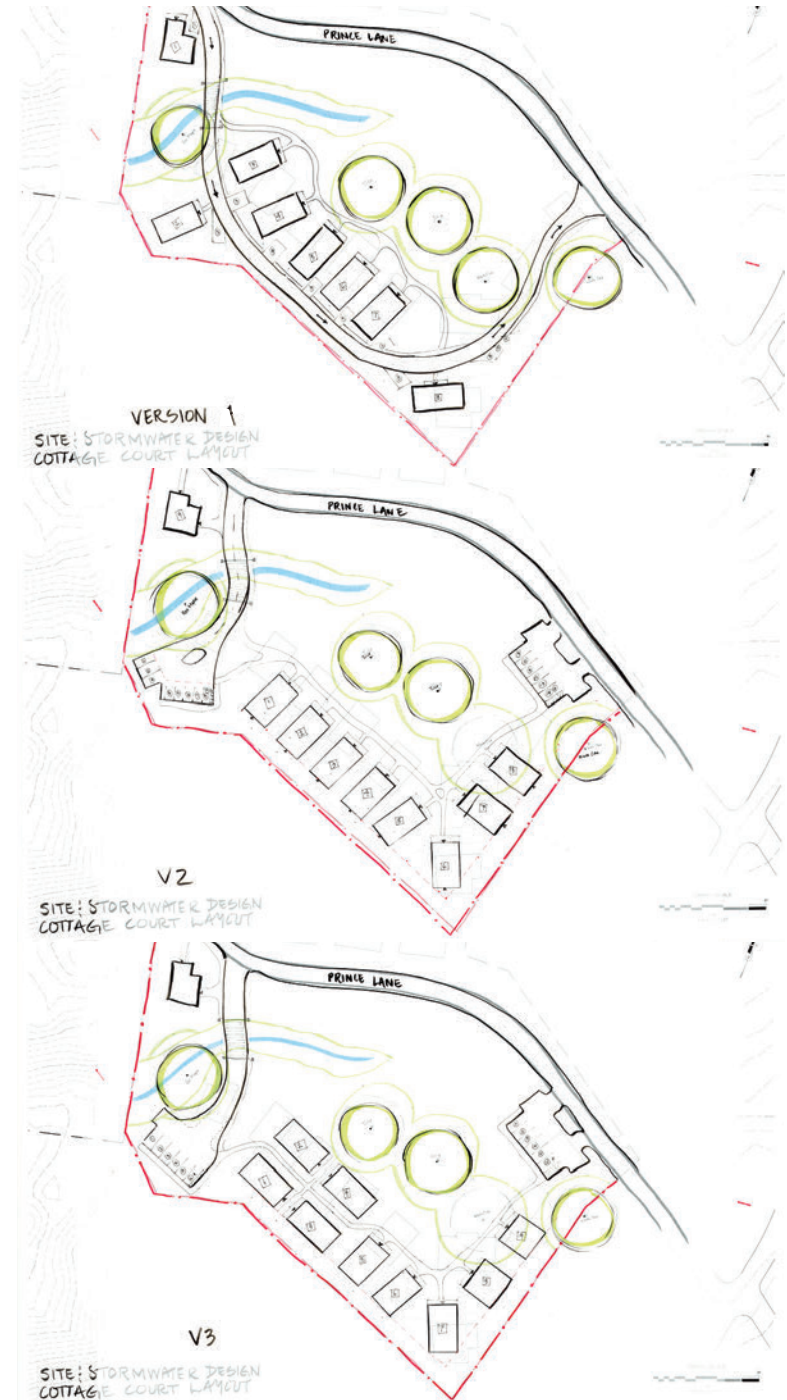
PRINCE LANE SITE

Design Sketches: Residential Possibilities

Potential residential development of the currently undeveloped “Single-Family Residential” site south of Prince Lane was considered as part of preliminary review of the Implementation Plan. A residential cottage court was identified for this site in the Implementation Plan, with the concept adapting over time (after adoption of the Implementation Plan) to consider alternative approaches shifting disturbance towards higher ground at the rear of the property and avoiding existing low-lying areas.

Updated sketch-level concepts shown to the right include alternative ideas for configuration of residential development on the property. The layouts provide for parking consolidation and shifting the driveway connection to be from Prince Lane closer to the intersection with Bakers Lane. This could minimize impacts to low-lying areas and maximize the areas as a location for detention and as a site/neighborhood open space amenity.

More detailed review of existing conditions and design development is required to evolve layout and infrastructure concepts for this site.



PREPARED FOR:



PREPARED BY:

