

Bridging past and present: integration of modern stormwater infrastructure into a historic interpretation site

by

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A REPORT

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Abstract

How can modern stormwater management practices be integrated into a historical preservation site like the Marlatt Homestead, ensuring both ecological health and the preservation of cultural heritage, while also creating opportunities for public education on sustainable water management? This research investigates the intricate balance between watershed management and the preservation of historical homesteads, a challenge that sits at the intersection of environmental sustainability and cultural heritage. Watershed management involves practices designed to protect and manage water resources, which can sometimes conflict with the preservation of historical structures that contribute to a site's cultural value. This study aims to explore how landscape architecture can reconcile these competing interests through a multidisciplinary approach. By reviewing literature on both historical preservation and watershed management, conducting field assessments, and analyzing case studies, the research will identify best practices for integrating modern environmental strategies with the conservation of historical sites. Key areas of focus include evaluating the environmental impacts of preserving historical features, navigating regulatory challenges, and engaging with community stakeholders. The research will also explore innovative design solutions and adaptive reuse strategies that respect historical integrity while addressing contemporary environmental needs. Ultimately, this study seeks to develop practical recommendations for landscape architects and policymakers to create designs that harmonize ecological health with cultural preservation, ensuring sustainable and culturally sensitive land use.

Bridging Past and Present

**Integration of Modern Stormwater
Infrastructure into a Historic Interpretation Site**

Devin Holliday - Spring 2025

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CHAPTER 1

Project Background

Introduction

The revitalization of historical watersheds requires a balanced approach that integrates environmental sustainability with cultural heritage preservation. This research examines how watershed management strategies can be effectively implemented while maintaining the historical integrity of the Marlatt Homestead. By analyzing both ecological and preservation methodologies, the study aims to develop strategies that support long-term sustainability without compromising the historical significance of the site.

This research is structured around four key themes. First, the historical context of the Marlatt Homestead is explored to establish its cultural value and the preservation challenges it faces. Second, watershed management practices are examined to identify strategies for mitigating environmental degradation while supporting ecosystem health. Third, principles of historic preservation in landscape architecture are analyzed to determine how design interventions can harmonize sustainability with heritage conservation. Finally, the role of education and environmental stewardship is considered, emphasizing the importance of community involvement in sustaining these landscapes. By addressing these themes, this research seeks to inform best practices for integrating watershed revitalization with historic landscape preservation.

Methodology

Methods

Methods for this type of research topic will be straight forward. Methods will begin with on-site site analysis. Focusing on current physiological state, hydrological conditions, and how historic and current site uses have affected the landscape. Next, case study analysis. This method looks further into other existing projects with successful watershed management and historical preservation solutions to provide valuable insights. Finally, I will look into design and visualization of on-site implementations. This will be achieved by creating visual models of potential design interventions to help communicate ideas to stakeholders, showing how stormwater management features could look in harmony with the Marlatt Homestead’s historical aspects.

Figure 1 Highlights the earliest stages of research for this project. This working diagram allowed me to see the broad picture of information related to my research topic. Through the course of my research, sources have adapted and changed to better suit this project. Continued research brought this project to where it currently sits.

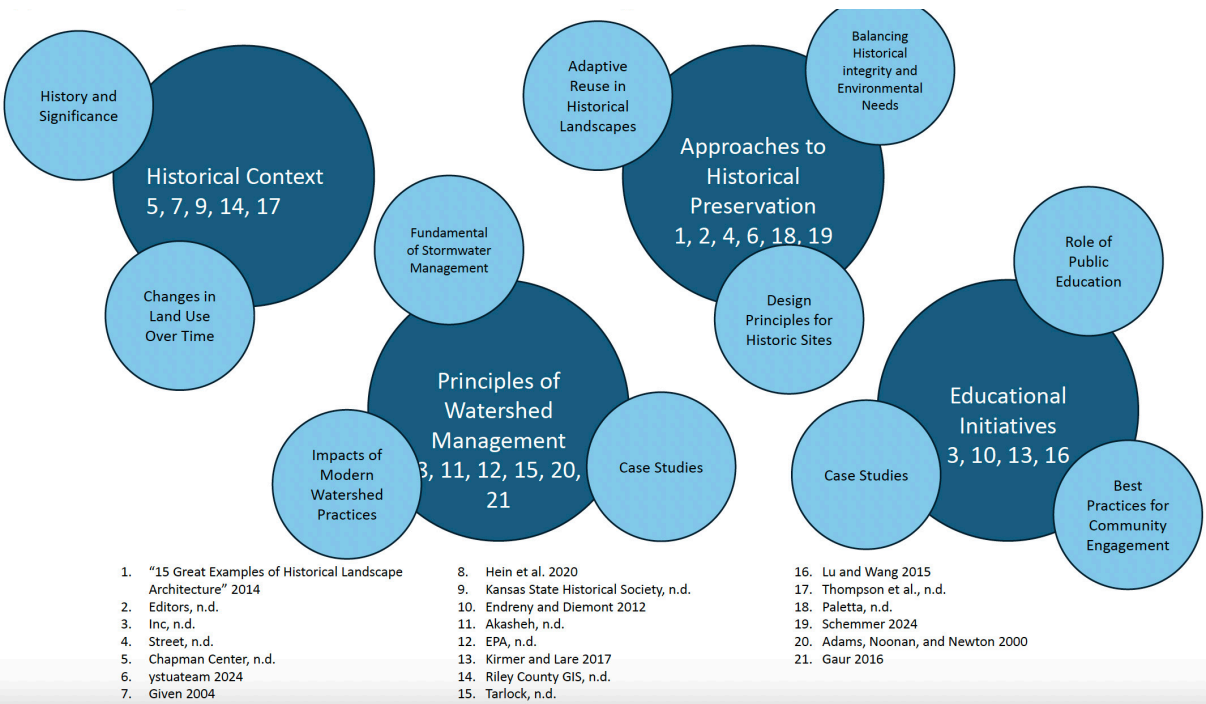


Figure 1 Literature Review Map, Devin Holliday

Site Analysis

This method begins with a preliminary assessment that reviews any existing maps, aerial images, and documents about the Marlatt Homestead to understand its layout, historical boundaries, and past land use changes. For my research, I have generated a set of steps to guide me:

- Hydrological Mapping
 - Observe and record current drainage patterns, identifying any areas where water accumulates or flows off-site. Note the location and size of existing drainage infrastructure, such as ditches or basins.
- Historical Feature Mapping
 - Document historical structures, landscaping features, and any remnants of past water management practices, like old irrigation systems, which could influence current conditions.

Case Study Analysis

Case study analysis focuses on reviewing similar sites with successful watershed management and historical preservation solutions providing valuable insights. By examining completed projects with similar goals, I will draw on effective design approaches, educational components, and public engagement strategies. The following set of key components guided the case study analysis process:

- Stormwater Management
 - Looked for specific green infrastructure solutions, such as rain gardens, bioswales, or permeable paving, and analyze how these elements were implemented without compromising historical aesthetics.
- Preservation of Cultural Features
 - Focused on strategies for protecting or highlighting historical structures, landscape features, and cultural landscapes within a stormwater management framework.
- Public Engagement and Education
 - Identified the educational strategies used in these case studies, such as interpretive signage, guided tours, or interactive installations related to water management.

Design and Visualization

Creating visual models of potential design interventions will help communicate ideas to stakeholders, showing how stormwater management features could look in harmony with the Marlatt Homestead’s historical aspects. Visualization tools enable the testing of different design ideas before committing to them and invite feedback from stakeholders.

- Develop Conceptual Designs
 - Based on site analysis, case study insights, and stakeholder input, sketch preliminary concepts for stormwater management features were developed. For example, bioswales, rain gardens, and permeable pathways were designed to blend in with the homestead’s historic character.
 - Integrated interpretive features (e.g., educational signage or demonstration areas) within the designs, using case study inspiration and emphasizing how these elements can educate the public on sustainable water practices.

Conclusion and Outcomes

The combined outcomes from these methods will yield a comprehensive understanding of the Marlatt Homestead’s current landscape, highlighting the site’s hydrological dynamics, historical features, and potential areas for stormwater intervention. Site analysis will establish baseline conditions, capturing elevation changes, drainage patterns, and the presence of any historically significant elements that influence water flow. Insights from relevant case studies will inform best practices, showcasing effective stormwater management strategies and educational components integrated at similar historic sites, which can serve as adaptable models. Finally, design visualizations, present these proposed interventions in a way that illustrates how stormwater management infrastructure and interpretive educational elements could be incorporated seamlessly, aligning environmental and historical preservation goals. This synthesis enables well-informed design recommendations, fostering ecological functionality and cultural preservation on the Marlatt Homestead site.

CHAPTER 2
Site and Case Study Analysis

Historic Background

The Washington and Julia Marlatt homestead, built in 1856, is the oldest standing stone home in Riley County and played a crucial role in the early days of Kansas State University, originally Bluemont Central College. Washington Marlatt, an advocate for an anti-slavery Kansas, helped transition the college into Kansas State Agricultural College, the first operational land-grant institution. Now owned by Kansas State University, the homestead is a historic site that recognizes the region’s Indigenous heritage and contributions (Chapman Center, n.d.) (Kansas State Historical Society, n.d.). Within Manhattan there are many connections relating to the marlatt homestead, one of which being the Dewey ranch on the Konza prairie. C.P. Dewey, born in Ohio in 1843, built a significant ranching empire in Kansas, beginning with land purchases in 1872 and expanding during the 1887-88 economic downturn, eventually owning over 5,000 acres. The Deweys became prominent figures in Manhattan, Kansas, with investments in various businesses and properties, including a large cattle operation and the Manhattan Beach resort, although their fortunes waned after C.P.’s death in 1904. The Dewey ranch was eventually sold in 1930, with parts becoming Konza Prairie, now used by Kansas State University for research, thanks to acquisitions by The Nature Conservancy (Given 2004).

Another source related to the history of the Marlatt Homestead provided me with some more information. The Marlatts arrived in Kansas in 1856, aiming to support the anti-slavery movement, and together with Julia, whom he married in 1861, played key roles at Bluemont Central College. The college became Kansas State Agricultural College (KSAC) in 1863, the nation’s first operational land-grant institution under the Morrill Act, with Washington being instrumental in this transition and serving as president of the Manhattan Town Association. The original Bluemont building was dismantled in the 1880s, and materials were repurposed by Marlatt, with the barn constructed of salvaged Bluemont stone. Today, the homestead is owned by Kansas State University and is recognized as a historic site, acknowledging the area’s Indigenous heritage as well as the role in the community played by Washington and Julia Marlatt (Thompson et al., n.d.).

Site Analysis

The Marlatt Homestead site is a small (2.49 acres), improperly used site near the Kansas State University Campus. This site lies off college avenue in Manhattan, Kansas near the K-State soccer complex.



Figure 2 Marlatt Homestead Aerial (Littlefield 2024)

The current use of the site is primarily functional, serving as a storage and staging area for K-State athletic (Facilities personnel), band activities on game days, buses, emergency vehicles, and overflow parking. While these uses support campus operations, they do not contribute to the ecological or historical value of the site. Additionally, the site’s design does not currently accommodate sustainable stormwater management, limiting its potential for environmental restoration or historical landscape integration.

The existing stormwater infrastructure is minimal, with the site functioning primarily as a pass-through for water. Runoff moves across the landscape, eventually connecting to the drainage system south of the site without any meaningful filtration, retention, or detention. This lack of highly-effective infrastructure results in increased surface runoff, potential erosion, and limited groundwater recharge—issues that could be mitigated through improved stormwater management practices. Implementing sustainable solutions such as bioswales, retention basins, or constructed wetlands could enhance both environmental performance and the site’s overall resilience.

According to NRCS soil classifications, the eastern portion of the site is characterized by Smolan silt loam, a deep, moderately well-drained soil type. This soil provides a strong foundation for stormwater management interventions, particularly for naturalized detention areas that can slow water flow, promote infiltration, and improve water quality. With proper design, this soil type could support vegetation that enhances both ecological function and aesthetic value, aligning with broader goals of watershed revitalization and historical landscape preservation. Across the west end of the site exists similar soil covered by multiple compacted layers of gravel. These layers of gravel disrupt infiltration of water into the soil further amplifying stormwater runoff.

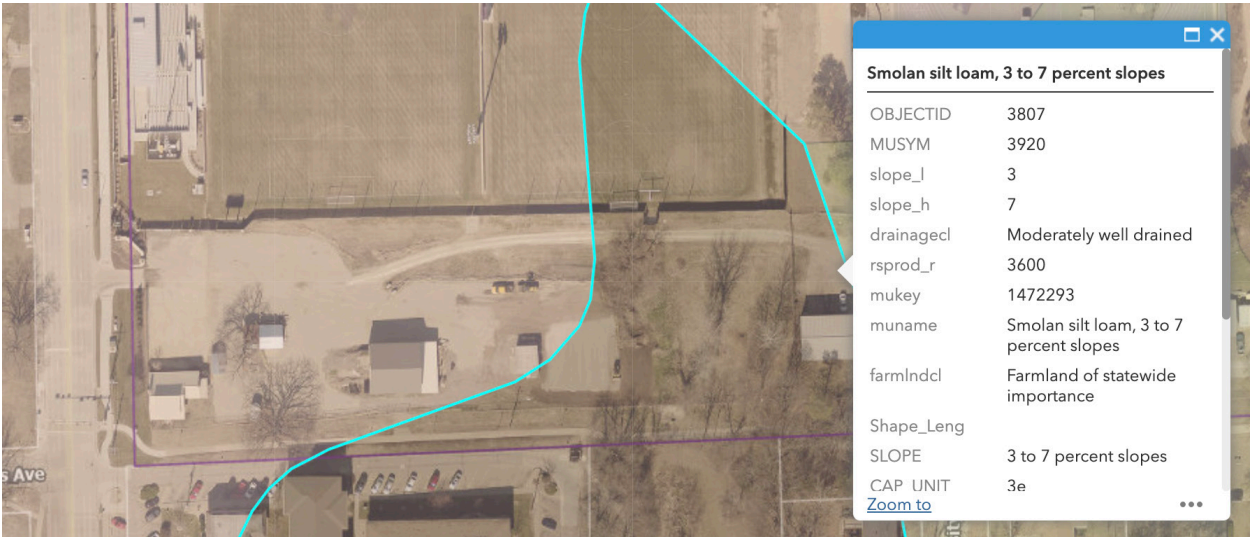


Figure 3 Soil Survey (“NRCS Soils,” n.d.)

By integrating sustainable stormwater strategies into the site’s redevelopment, there is an opportunity to not only improve hydrological function but also enhance the cultural and ecological significance of the landscape. Gravel fill should be recycled and reused in the integration of permeable paving infrastructure. Future design considerations will balance these elements to create a space that serves both functional and conservation goals.

Case Study Analysis

Fountain View Recreation Center



Figure 4 Fountain View Recreation Center (Skabelund 2022)

The Fountain View Recreation Center in Carol Stream, Illinois, incorporates permeable pavers in its parking lot as part of its commitment to sustainable and environmentally friendly design. These pavers are a key feature of the center’s stormwater management system, helping to mitigate runoff and reduce the impact of urban development on local waterways.

Function of Permeable Pavers

Permeable pavers allow water to infiltrate through their surface and into the ground below rather than running off into storm drains. This process helps:

- Reduce Stormwater Runoff: By allowing rainwater to seep through, permeable pavers decrease the volume of water entering the drainage system, reducing the risk of flooding and erosion.
- Improve Water Quality: The infiltration process helps filter pollutants such as oil, grease, and heavy metals before they reach natural water bodies.
- Recharge Groundwater: Instead of directing water away, the pavers facilitate groundwater recharge, supporting the local hydrological cycle.

Integration with Other Sustainable Features

The permeable pavers at Fountain View Recreation Center are part of a broader sustainability strategy that contributed to the facility earning LEED Silver certification from the U.S. Green Building Council.

In addition to permeable surfaces, the center features:

- A geothermal heating and cooling system to improve energy efficiency.
- Extensive natural lighting to reduce electricity consumption.
- A focus on sustainable landscaping that complements the stormwater management benefits of the pavers and stormwater storage/ detention features.

Impact and Benefits

By incorporating permeable pavers into the parking lot design, the Carol Stream Park District has created an eco-friendly solution that enhances water management while demonstrating the benefits of sustainable infrastructure in public spaces. This approach reduces environmental impact but also serves as a model for future recreation and municipal projects (“Fountain View Recreation Center,” n.d.).

Natural Stream Design by Philadelphia Water Department

The Philadelphia Water Department’s Ecological Restoration Tools provide a strong precedent for integrating sustainable watershed management into historic landscapes. Their approach emphasizes naturalized streambank stabilization, using bioengineering techniques like root wads, coir logs, and native vegetation to mitigate erosion while enhancing water quality.

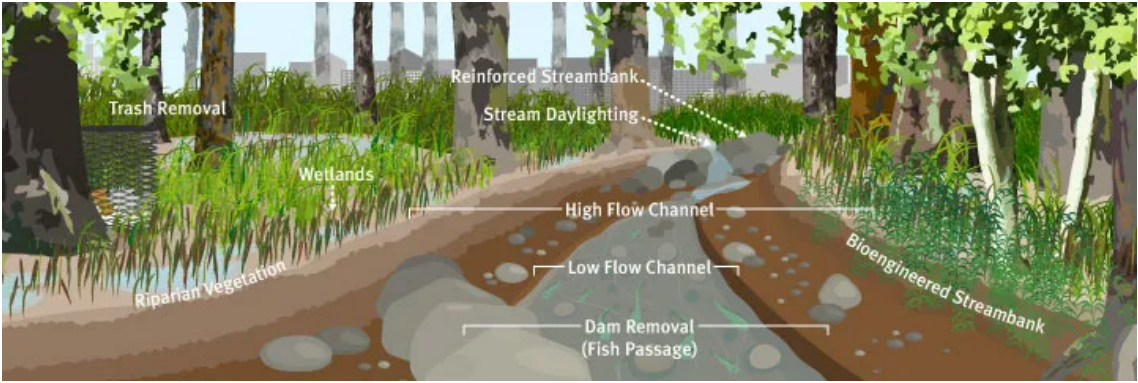


Figure 5 Natural Stream Design - (“Ecological Restoration Tools – Philadelphia Water Department,” n.d.)

One of the primary ecological benefits of their methodology is sediment control, which prevents excessive soil loss and maintains the integrity of stream channels. By stabilizing streambanks with deep-rooted native plants, their designs slow water velocity and reduce the likelihood of channel widening or bank collapse. This not only preserves aquatic ecosystems but also ensures that downstream water bodies remain free from excessive sedimentation, which can smother habitats and degrade water quality.

Another key impact is hydrological restoration. By allowing water to infiltrate more naturally into the soil, their strategies reduce surface runoff, enhance groundwater recharge, and moderate stream flow fluctuations—all critical for long-term watershed resilience. This natural approach to stormwater management helps protect against flash flooding while maintaining base flow levels in streams during dry periods.

Beyond hydrology, their ecological design improves habitat diversity. Stabilized streambanks with riparian buffers create essential breeding and feeding grounds for fish, amphibians, and aquatic insects, while native plantings attract pollinators and bird species. These restored environments increase biodiversity and support ecosystem services, contributing to a more resilient watershed system. The Philadelphia Water Department’s strategies align closely with efforts to revitalize the Marlatt Homestead watershed. By adapting similar bioengineered techniques, it is possible to enhance stormwater infiltration, prevent erosion, and create habitat corridors, all while respecting the historical integrity of the landscape. This precedent underscores the potential for harmonizing ecological restoration with cultural preservation, making it a valuable reference for sustainable historic watershed management (“Ecological Restoration Tools – Philadelphia Water Department,” n.d.).

Historic Preservation

Adaptive reuse revitalizes historic and vacant buildings by repurposing them for new uses, such as homes, offices, or hotels, balancing preservation with modern needs. Unlike traditional historic preservation, which aims to maintain a building's original form and materials, adaptive reuse allows for more flexibility, incorporating new materials to enhance efficiency while preserving a structure's history. Approaches like renovation, integration, and facadism each offer unique ways to adapt structures, from maintaining a building's facade to constructing around it or preserving its original function, while some projects even transform old infrastructure into new community spaces (Schemmer 2024). There are many case studies related to this practice. Adaptive reuse is a topic that can have many different types. I believe that despite different types they still provide similarities. This rooftop garden project in Manhattan showcases the complexities of transforming a high-rise roof into a vibrant green space, balancing structural realities with design ambitions. Joey Shimoda of Shimoda Design Group navigated numerous constraints—like existing elevator bulkheads and 24-hour building use—to carve out skylights, add new stairways, and design a 22,000-square-foot pavilion while retaining significant open space. HMWhite's landscape design, led by Hank White, responded to the rooftop's challenging conditions, including high winds funneled through nearby skyscrapers and intense sun exposure. To mitigate these environmental factors, the landscape architects implemented three planting typologies: a dense, shaded upland forest at the north end, a diverse shrubland in the center, and a lowland meadow that preserves expansive views to the south (Paletta, n.d.).

One of the most important aspects of historic preservation is having appreciation and respect for these historic spaces. The Old Chicago Post Office Meadow displayed on the right was design using a tight envelope of restrictions due to the office building continuing to be used and maintained. However, despite these constraints, a thoughtful and beautiful design was created that respected this historic space. I would like to carry this idea into my design in order to create a design that respects and appreciates the Marlatt Homestead.



Figure 6 Old Chicago Post rooftop landscape design (Paletta, n.d.)

Educational Initiatives

Educational initiatives at the Marlatt Homestead site could include hands-on workshops and interpretive displays on stormwater management and green infrastructure. Visitors could learn about the design and function of naturalized detention systems, such as bioswales and rain gardens, which reduce runoff and improve water quality. Guided tours could highlight how native plants stabilize soil and filter pollutants, while school programs could incorporate experiments on infiltration rates and the benefits of permeable surfaces. These initiatives would foster environmental stewardship and community engagement around sustainable watershed practices.

Biohabitats simulated a two-tiered rain garden for Croghan Park in Fairlawn, Ohio, to address stormwater management issues in three depressional lawn areas that become waterlogged after heavy rain. The system redirects sump pump discharge into the rain garden, allowing water to infiltrate through soil media and native plants, which help filter pollutants and attract local wildlife. This project not only improves the park’s usability but also serves as an educational demonstration of sustainable stormwater practices (Inc, n.d.). Despite not being implemented into the site, the ideas shown had a direct impact on educating the community on how these difficult stormwater issues could be addressed.



Figure 7 Croghan Park Rain Garden Simulation (Inc, n.d.)



Figure 8 Sandstone Visitor Center Bio-Swale, Skabelund 2022

Sandstone Visitor Center

The Sandstone Visitor Center serves as a gateway to the southern section of the New River Gorge National Park and Preserve. Developed on a former quarry and highway fill it is an example of an integrated ecological site design. A formerly low-land value area filled with invasive plants was repurposed in a way that preserves natural areas. Stormwater management features, such as naturalized islands and detention areas that filter parking and roadway runoff water to infiltrate back into the soils are implemented. Throughout the landscape, native plants are used that require minimal watering, fertilizer, or pesticide use. Overall, this supports local biodiversity. Strategic planning of watershed analysis and effective use of restorative ecological design make the Sandstone Visitor Center landscape a powerful precedent for the Marlatt Homestead Site. (Dinep and Schwab 2010)



Figure 9 Sandstone Visitor Center Rain Garden, Skabelund 2022



Figure 10 Sandstone Visitor Center Naturalized Detention Basin, Skabelund 2022

Approaches to Stormwater Management

The Principles of Watershed Management is a document that aims to enhance understanding of key aspects of watershed management, including watershed processes, long-term management principles, successful frameworks, and the advantages of this approach. Successful watershed management relies on four core principles: recognizing watersheds as natural systems, adopting a continuous and multidisciplinary approach, utilizing a framework that encourages partnerships and evidence-based actions, and maintaining flexibility. The module presents real-world examples of effective watershed management efforts to illustrate these principles and their application (EPA, n.d.). Watersheds are expected to remain central units for planning and management throughout the 21st century due to historical precedence, contemporary support, regulations, and institutional backing. Achieving sustainability through watershed management requires prioritizing natural resource issues, balancing resource use, advancing technology, and maintaining supportive public policies and research. The success of watershed management is likely to continue, as organizations involved are adaptable, actively seek new information, and use innovative approaches (Adams, Noonan, and Newton 2000).

The Marlatt Homestead site shares an interesting position in relation to the watersheds of Manhattan, Kansas. Figure 11 shows the area near the homestead site that stormwater runoff can be expected. Along with this, highlighted in pink are areas that contribute to significant runoff with minimal to no infiltration. Highlighted in light green are areas nearby that have been designed to infiltrate or control stormwater runoff. These areas are beneficial as they all reduce flooding downstream of these detention basins and green spaces.

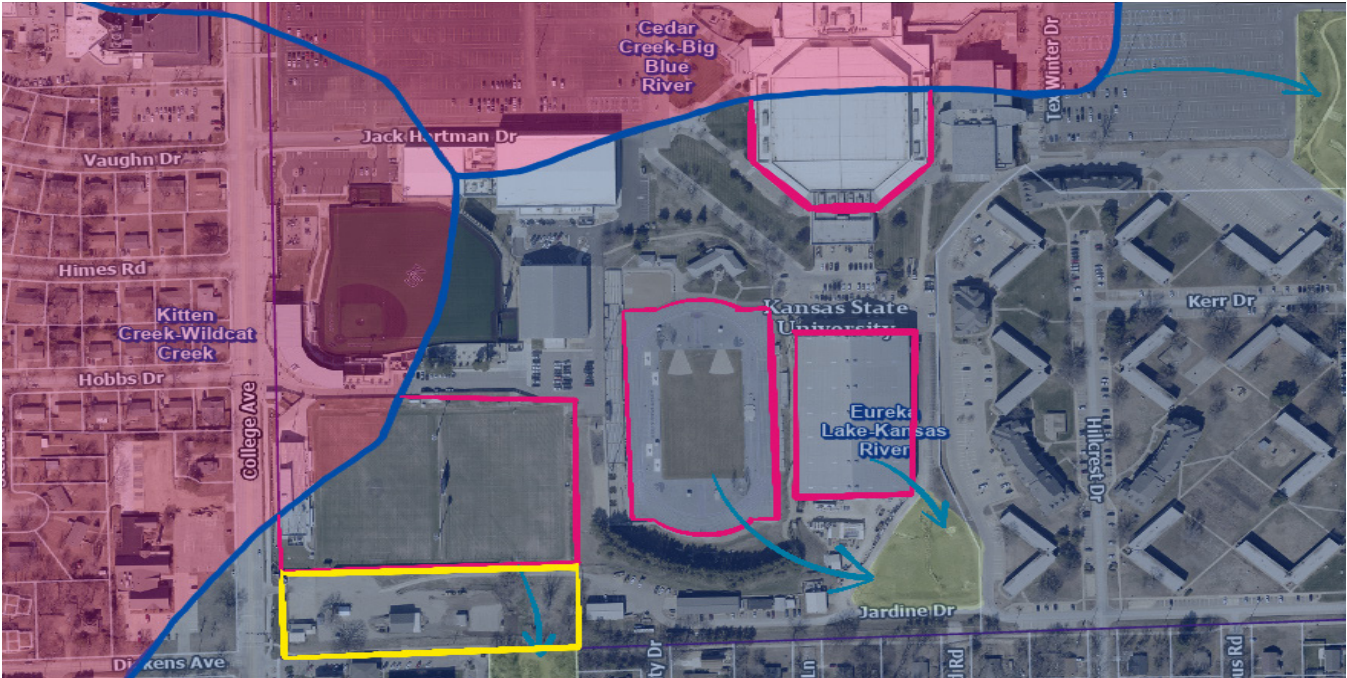


Figure 11 K-State Soccer Complex Watershed Analysis Created by Devin Holliday

CHAPTER 3

Project Design

Design and Visualization

The eastern portion of the site was designed using the strategies outlined earlier, emphasizing sustainable stormwater management and green infrastructure techniques. A naturalized detention basin was integrated into the design, leveraging the Wymore silt clay loam soil to support infiltration and water retention. Native vegetation was carefully researched and selected to be planted along the detention area and streambanks to stabilize soil, filter pollutants, and create habitats for local wildlife. Permeable pavers and bioswales were incorporated throughout the site to reduce runoff, improve water quality, and enhance groundwater recharge. These elements align ecological restoration with the site’s historical preservation goals for the creation of an inclusive stormwater management plan.

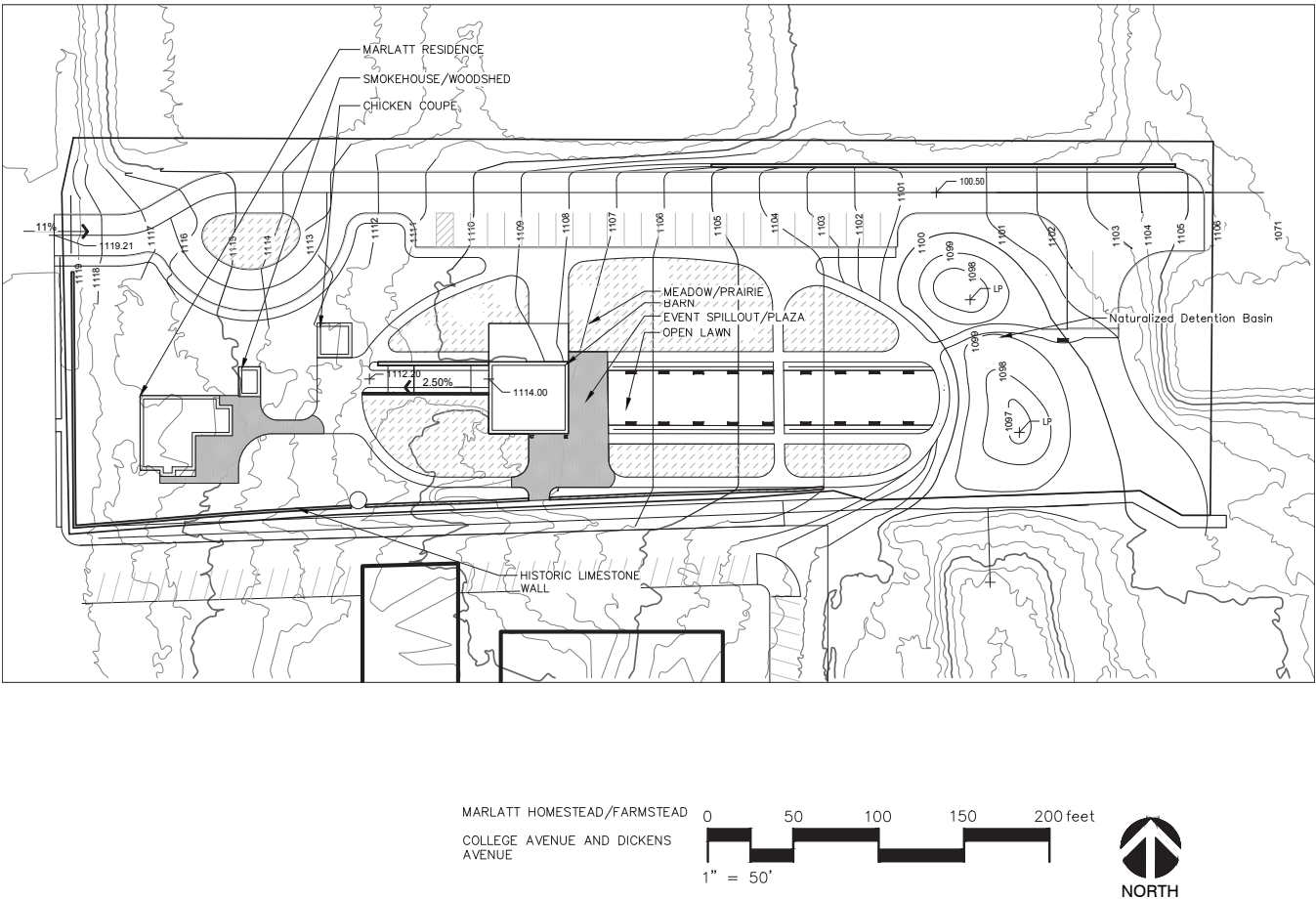


Figure 12 Naturalized Detention Plan, Chris Marble and Devin Holliday

Design Features

In the design for the site, permeable paving is implemented extensively across sidewalks, driveways, and parking areas to enhance stormwater management. These pavers allow water to infiltrate directly into the ground, reducing surface runoff and mitigating the risk of erosion. By integrating permeable surfaces in high-traffic areas, the design supports groundwater recharge while maintaining functionality and accessibility. This approach complements the naturalized detention system on-site, creating a cohesive strategy for managing stormwater while blending seamlessly with the historical and ecological context of the Marlatt Homestead.

Along with permeable paving, the use of level spreaders is a highly important feature. Level spreaders are a design feature used to collect water runoff at a point, or multiple points, and spread it evenly along a consistent grade allowing for quicker infiltration of stormwater into the soil. Level spreaders have been implemented throughout the site along the eastern end of the event space and the northern part of the naturalized detention basin.

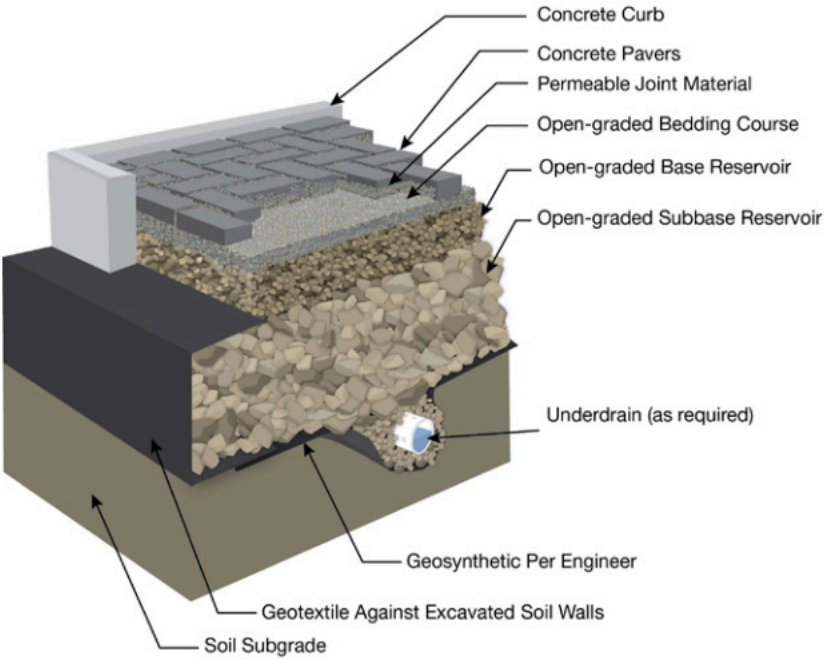


Figure 13 Diagrammatic Representation of Permeable Paving Design (Tyson and Smith, n.d.)



Figure 14 Site and Naturalized Detention Plan Labeled, Chris Marble and Devin Holliday

Marlatt Homestead Site Concept

A Connected Site

The Marlatt Homestead site was split up into three different sections to focus on promoting a connected site with many different use spaces. Private space located on the west end of the site include the Marlatt Homestead itself and a private outdoor gathering space for those staying on the property. The middle of the site is reserved for public event spaces and outdoor activities. The east end of the site is a naturalized detention area that is visible from surrounding walkways. There are four primary types of green infrastructure at the Marlatt Homestead: permeable paving, meadow, rain gardens/bio-swales, and naturalized detention (dry prairie to wetland).

Understanding the Design



Figure 15 Site and Naturalized Detention Plan w/ Section Cuts, Chris Marble and Devin Holliday

In order to understand the design on a deeper level, section drawings were cut. The sections cuts displayed here showcase different features of the Naturalized Detention Basins as well as connections between the basins and the rest of the site.

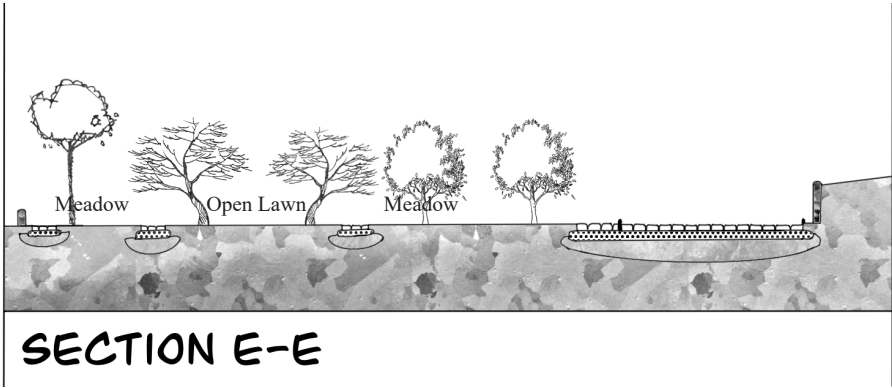


Figure 16 Section E-E Devin Holliday

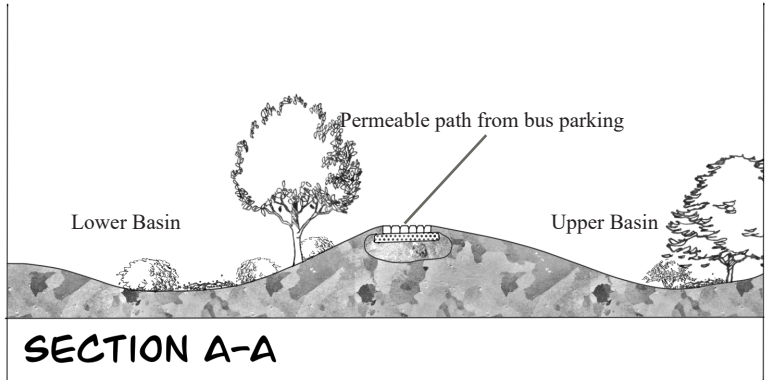


Figure 17 Section A-A Devin Holliday

The permeable paving systems consist of layers of different sized gravels to promote infiltration of water into the soil below. Gaps between pavers allow water to flow through paving rather than running across the surface. The retaining wall works together with this system as it allows water through, into the detention basins.

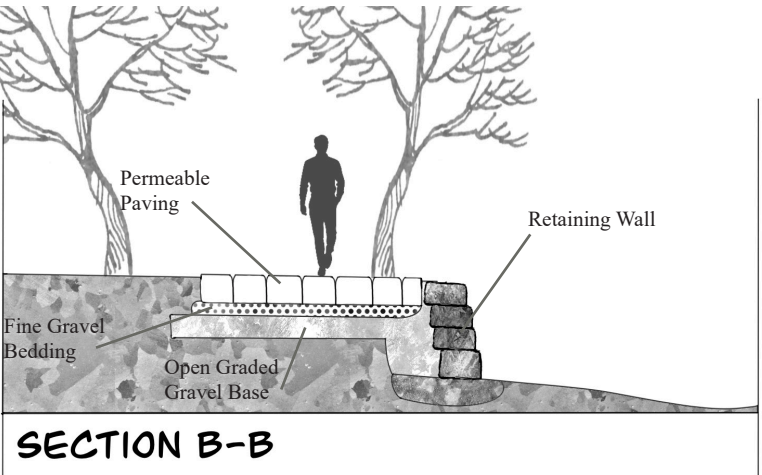


Figure 18 Section B-B Devin Holliday

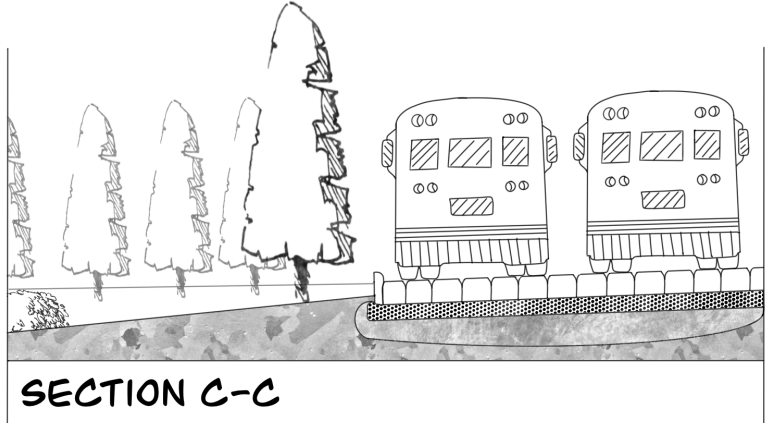


Figure 19 Section C-C Devin Holliday

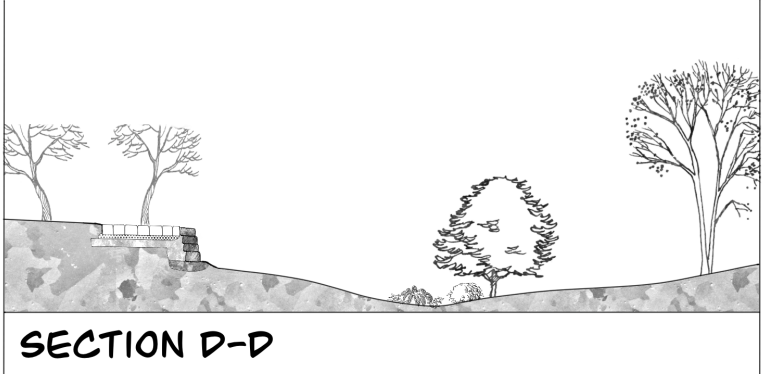


Figure 20 Section D-D Devin Holliday

Stormwater Management

Naturally, the site slopes gently from west to east. This allows a majority of water to flow towards the naturalized detention pools on the east end of the site. Through further grade changes throughout, water has been directly and evenly spread through these pools. Stormwater infiltrates into and slowly flows through the site. As water flows it is filtered by gravel beneath the permeable paving, prairie-like vegetation and soils in the meadow, rain garden and bio-swale soils and vegetation, and soils and vegetation in naturalized detention (with plants from dry prairie to wetland types).

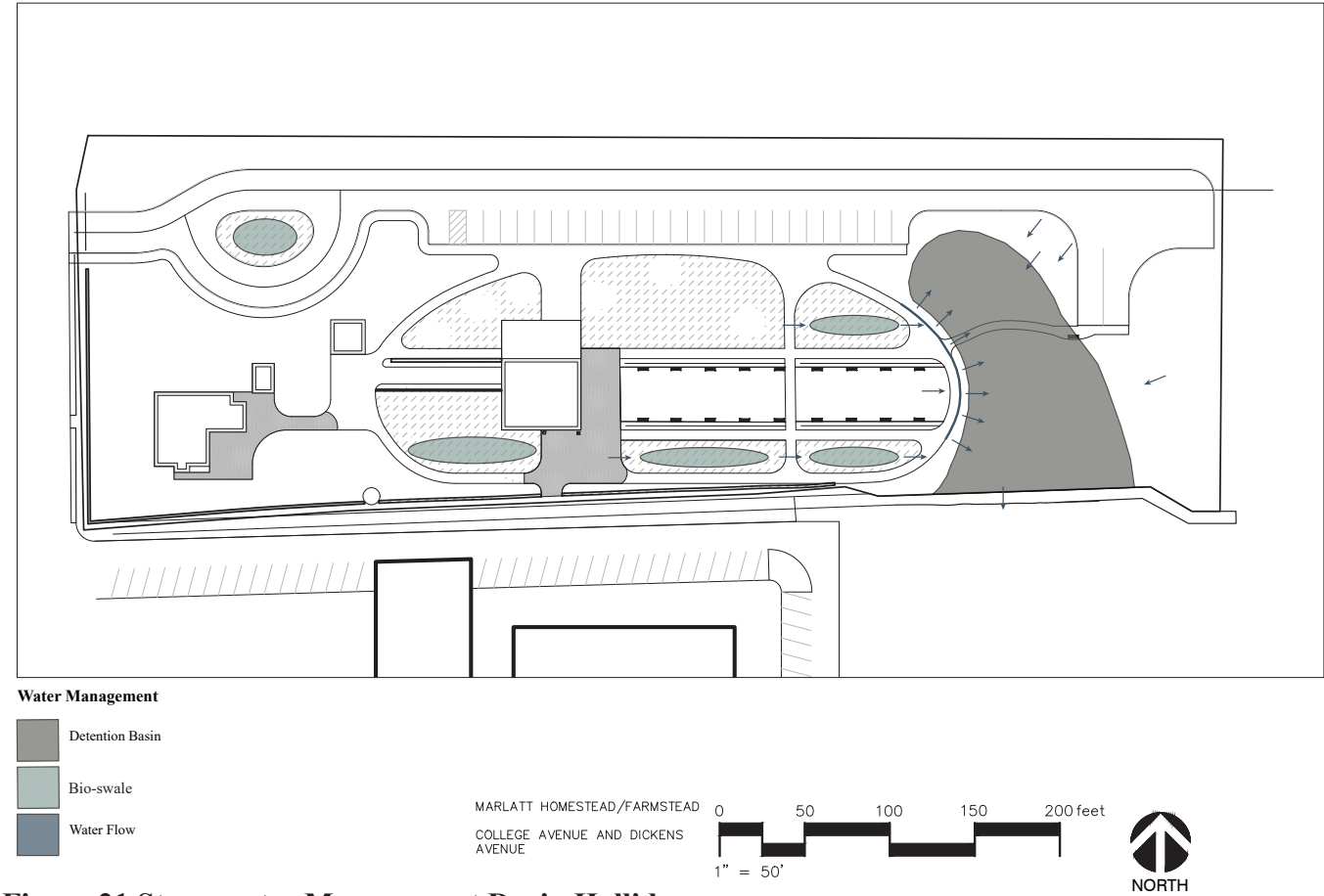


Figure 21 Stormwater Management Devin Holliday

Maintenance

Maintenance for the Marlatt Homestead should be simple but effective. For this reason, much of landscape is going to have minimal to no maintenance required. A maintained meadow consists of native plantings that require a limited amount of maintenance and a naturalized landscape should be allowed to evolve and adapt to changes.

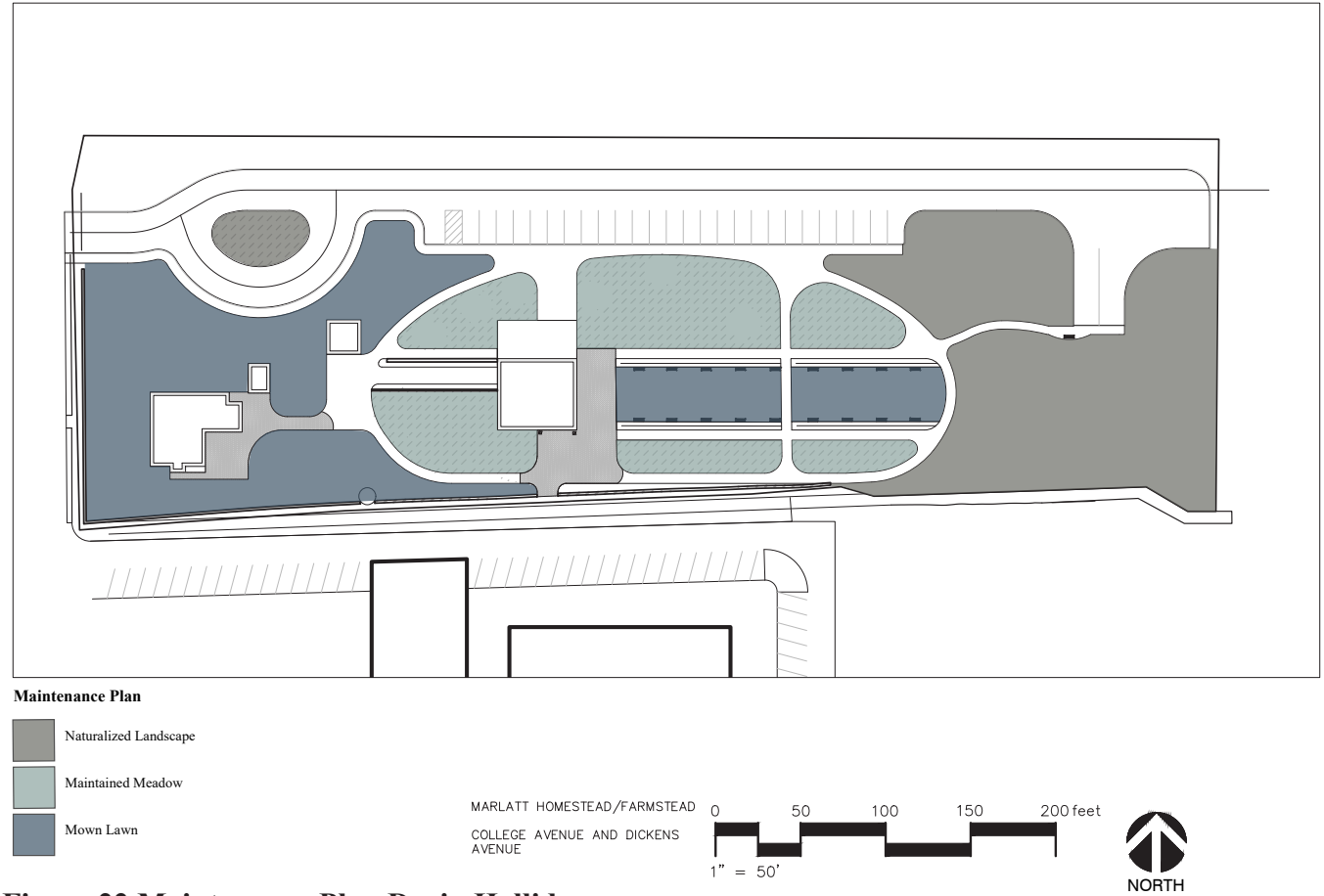


Figure 22 Maintenance Plan Devin Holliday

Saturation Zone A	Tolerates periodic standing water as well as seasonal dry spells. (Rain Gardens)				
	Perennials				
		Size	Light	Soil	Tolerances
Actaea racemosa	Bugbane	Large (>24")	Shade Tolerant	Moist, Well-Drained	Occasional Flooding
Athyrium filix-femina	Lady Fern	2'-2'	Shade	Medium, Moist	Deer Resistant, Erosion
Asclepias incarnata L.	Swamp Milkweed	2'-8'	Full/ Partial Sun	Moist	Deer Resistant
Eupatorium serotinum	Fall Boneset	1.5'-6.5'	Full/ Partial Sun	Moist	Deer Resistant
Aster novae-angliae	New England Aster	3'-6'	Full/ Partial Sun	Medium, Moist	Deer Resistant
	Grasses				
Andropogon gerardii	Big Bluestem	5-8'	Full sun	Dry, Medium, Moist	Deer Resistant
Panicum virgatum	Switchgrass	3'-6'	Full sun	Dry, Medium, Moist	Deer Resistant
Spartina pectinata	Prairie Cordgrass	3'-7'	Full sun	Wet, Moist	Deer Resistant
Carex vulpinoidea	Fox Sedge	1'-3'	Full sun	Wet, Moist	Deer Resistant
	Shrubs/ Trees				
Betula nigra	River Birch	40'-70'	Part Shade	Moist, Well-Drained	Drought Tolerant
Cephalanthus occidentalis	Buttonbush	Up to 12'	Part Shade	Wet, Moist	Cold Tolerant
Cornus amomum	Pale Dogwood	16'	Full/ Partial Sun	Moist, Well-Drained	

Table 1 Plant Selection List for Naturalized Detention Area by Devin Holliday

The plant lists in tables 1 and 2 are placed into the three different saturation zones that have been designated for the naturalized detention basin (Enlarged in Appendix C pg. 78). Each zone has different requirements that plants needed to meet in order to best occupy each space. Saturation zone A requires the ability to tolerate periodic standing water as well as seasonal dry spells. Saturation zone B needs to be able to grow in average soil moistures, potential standing water but not for long. Lastly, saturation zone C should be able to tolerate average to dry soil conditions. This is a strategy that was adapted from one found in the book “Rain Gardens” which showcased many different plants that do well in different conditions (Steiner and Domm 2012).

Saturation Zone B	Grows well in average soil moistures, potential standing water but not for long. (Rain Gardens)				
	Perennials				
		Size	Light	Soil	Tolerances
Baptisia australis	Wild Indigo	3'-5'	Sun	Moist	
Echinacea purpurea	Purple Coneflower	Up to 4'	Sun/ Part Shade	Dry, Medium	CAN BECOME AGGRESSIVE
Monarda fistulosa L.	Wild Bergamot	5'	Sun/ Part Shade	Dry, Moist	Drought Tolerant
Liatris pycnostachya	Prairie Blazing Star	3'-5'	Full sun	Medium, Moist	Deer Resistant
	Grasses				
Schizachyrium scoparium	Little Bluestem	2'-3'	Full sun	Dry, Medium	Deer Resistant
Sorghasturm nutans	Indian Grass	3'-8'	Part Shade	Dry, Moist	Drought Tolerant
Andropogon gerardii	Big Bluestem	5-8'	Full sun	Dry, Medium, Moist	Deer Resistant
Panicum virgatum	Switchgrass	3'-6'	Full sun	Dry, Medium, Moist	Deer Resistant
Chasmanthium latifolium	Northern Sea Oats	3'-4'	Full/ Partial Sun	Dry, Medium	Deer Resistant
	Shrubs/ Trees				
Betula nigra	River Birch	40'-70'	Part Shade	Moist, Well-Drained	Drought Tolerant
Amelanchier aborea	Downy Serviceberry	15'-25'	Full/ Partial Sun	Moist, Well-Drained	Occasional Drought
Prunus virginiana	Choke Cherry	6'-18'	Sun/ Part Shade	Moist	Drought Tolerant
Cornus amomum	Pale Dogwood	16'	Full/ Partial Sun	Moist, Well-Drained	
Saturation Zone C	Tolerates average to dry soil conditions. Plants in this zone tend to be shorter. (Rain Gardens)				
	Perennials				
Aquilegia canadensis	Red Columbine	Up to 3'	Part Shade, Shade	Dry, Moist	Cold and Heat Tolerant
Ruellia humilis	Wild Petunia	1'-2'	Full sun	Dry, Medium	Deer Resistant
Polemonium reptans	Jacob's Ladder	1'-1.5'	Part Shade	Medium	Deer Resistant
Asclepias tuberosa	Butterfly Milkweed	1'-2'	Sun	Dry, Moist	Drought Tolerant
Solidago speciosa	Showy Goldenrod	5'	Full/ Partial Sun	Dry, Medium	Deer Resistant
Monarda fistulosa L.	Wild Bergamot	5'	Sun/ Part Shade	Dry, Moist	Drought Tolerant
Rudbeckia hirta	Black-Eyed-Susan	Up to 3'	Sun	Dry, Moist	Drought Tolerant
Asclepias tuberosa	Butterfly Milkweed	1'-2'	Sun	Dry, Moist	Drought Tolerant
Penstemon digitalis	Foxglove Beardtounge	4'	Full/ Partial Sun	Medium	Deer Resistant
	Grasses				
Schizachyrium scoparium	Little Bluestem	2'-3'	Full sun	Dry, Medium	Deer Resistant
Bouteloua hirsuta	Hairy Grama	6"-28"	Part Shade	Dry, Medium	
Sporobolus heterolepis	Prairie Dropseed	2'	Full/ Partial Sun	Medium, Moist	Deer Resistant
Bouteloua gracilis	Blue Grama	1'-2'	Full sun	Dry	Drought Tolerant
Koeleria macrantha	Junegrass	2'	Full sun	Medium	Deer Resistant

Table 2 Plant Selection List for Naturalized Detention Area by Devin Holliday



Figure 23 Saturation Zones by Devin Holliday



Figure 24 Barn, Side entrance by Chris Marble

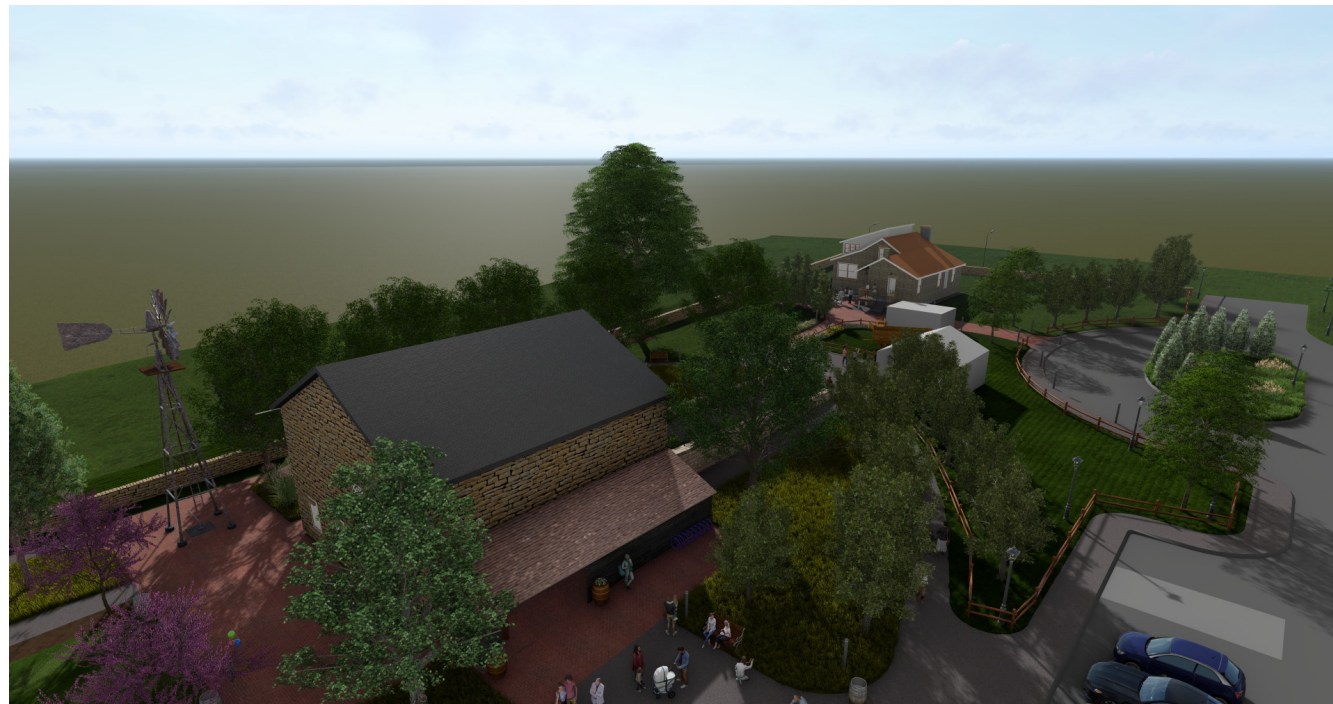


Figure 25 Site overview by Chris Marble

Discussion

In conclusion, the design for the Marlatt Homestead demonstrates how sustainable stormwater management and green infrastructure can harmonize with the preservation of historical landscapes. The integration of naturalized detention basins, permeable paving, and native plantings creates a site that not only manages stormwater effectively but also enhances biodiversity and ecological health. Moving forward, adopting this design style in similar projects can further refine the balance between environmental restoration and cultural preservation.

The Marlatt Homestead project has the potential to serve as a model for integrating sustainable practices with historical preservation. As the site matures, its stormwater management features—such as permeable paving and naturalized detention areas—will demonstrate their effectiveness in reducing runoff and improving water quality. These elements could inspire further adoption of green infrastructure in both urban and rural settings.

Additionally, educational programming could expand to engage communities in watershed health, fostering environmental stewardship. Future phases can explore monitoring water quality impacts, scaling up biodiversity efforts, and adapting techniques for regional or national implementation. By documenting outcomes, this project could pave the way for more widespread use of these strategies in balancing ecological restoration and cultural heritage conservation.

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Appendix A
Project Presentation

Bridging Past and Present
A Research Project by: Devin Holliday

Project Overview

Site Location



Marlatt Homestead
Project Overview



Dilemmas

- Improper Use of the Site:
- Facilities and Athletics Storage
 - Staging area for facilities personnel
 - Gameday activities such as band parking, buses, emergency vehicles, and overflow parking.
 - Lack of highly-effective stormwater infrastructure



Research Question

How can modern stormwater management practices be integrated into a historical preservation site like the Marlatt Homestead, ensuring both ecological health and the preservation of cultural heritage, while also creating opportunities for public education on sustainable stormwater management?

Existing Site Conditions



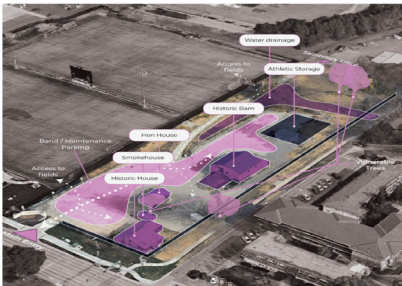
Marlatt Homestead Site
Concept



A Connected Site

- As a group, we decided to split the group into three sections, focusing on private space, active space, and passive space.
- This site is able to include many different events from private stays to public events.

Group Work



Early Analysis

- Site analysis as a group to provide an early basis of information related to the site.
- Inventory and Analysis allowed us as a group to familiarize ourselves with the Marlatt Homestead.

Site Concepts

- Site Concepts were developed further to create visualizations of how the site could look.
- Concepts were presented to multiple groups of people to spread the word of why the Marlatt Homestead was so important.

Interiors

- Working with other disciplines allowed the project to reach a new depth.
- being able to visualize indoor spaces gives a new light to how the outdoor spaces can interact with the indoor spaces.

Background & Methods

Site History

The Washington and Julia Marlatt homestead, built in 1856, is the oldest standing stone home in Riley County and played a crucial role in the early days of Kansas State University, originally Bluemont Central College. Washington Marlatt, an advocate for an anti-slavery Kansas, helped transition the college into Kansas State Agricultural College, the first operational land-grant institution. Now owned by Kansas State University, the homestead is a historic site that recognizes the region's Indigenous heritage and contributions (Chapman Center, n.d.) (Kansas State Historical Society, n.d.). Within Manhattan there are many connections relating to the marlatt homestead, one of which being the Dewey ranch on the Konza prairie. The Marlatts arrived in Kansas in 1856, aiming to support the anti-slavery movement, and together with Julia, whom he married in 1861, played key roles at Bluemont Central College. The college became Kansas State Agricultural College (KSAC) in 1863, the nation's first operational land-grant institution under the Morrill Act, with Washington being instrumental in this transition and serving as president of the Manhattan Town Association. The original Bluemont building was dismantled in the 1880s, and materials were repurposed by Marlatt, with the barn constructed of salvaged Bluemont stone. Today, the homestead is owned by Kansas State University and is recognized as a historic site, acknowledging the area's Indigenous heritage as well as the role in the community played by Washington and Julia Marlatt (Thompson et al., n.d.).



Goals

- Historical Context of the Marlatt Homestead.
- Proper watershed management practices.
- Practicing proper historic preservation principles in landscape architecture.
 - Education and environmental stewardship.

Methods

- On-Site Site Analysis (Physical State of the site, Hydrological State of the Site, How historic and current uses have affected the site.)
- Case Study Analysis (Looking further into existing projects with successful watershed management and historical preservation.)
- Design and Visualization (On-site implementations and conceptual design for the site.)

Outcomes

- A comprehensive understanding of the Marlatt Homestead site.
- Baseline conditions to design and improve upon.
- Adaptable ideas from existing projects.
- Conceptual design illustrating the possibility of proper stormwater infrastructure.

Case Study Analysis

Sandstone Visitor Center

The Sandstone Visitor Center serves as a gateway to the southern section of the New River Gorge National Park and Preserve. Developed on a former quarry and highway fill it is an example of an integrator site. A formerly low-land value area filled with invasive plants was repurposed in a way that preserves natural areas. Stormwater management features such as planted islands and detention areas that filter runoff water to infiltrate back into the soils are implemented. Throughout the landscape, native plants are used that require minimal watering, fertilizer, or pesticide use. Overall, this supports local biodiversity. Strategic planning of watershed analysis and effective use of site diagramming served as a powerful precedent when looking deeper into the Marlatt Homestead Site.



Fountain View Rec Center

The Fountain View Recreation Center in Carol Stream, Illinois, incorporates permeable pavers in its parking lot as part of its commitment to sustainable and environmentally friendly design. These pavers are a key feature of the center's stormwater management system, helping to mitigate runoff and reduce the impact of urban development on local waterways.

Function of Permeable Pavers

Permeable pavers allow water to infiltrate through their surface and into the ground below rather than running off into storm drains. This process helps: Reduce Stormwater Runoff: By allowing rainwater to seep through, permeable pavers decrease the volume of water entering the drainage system, reducing the risk of flooding and erosion.

Improve Water Quality: The infiltration process helps filter pollutants such as oil, grease, and heavy metals before they reach natural water bodies.

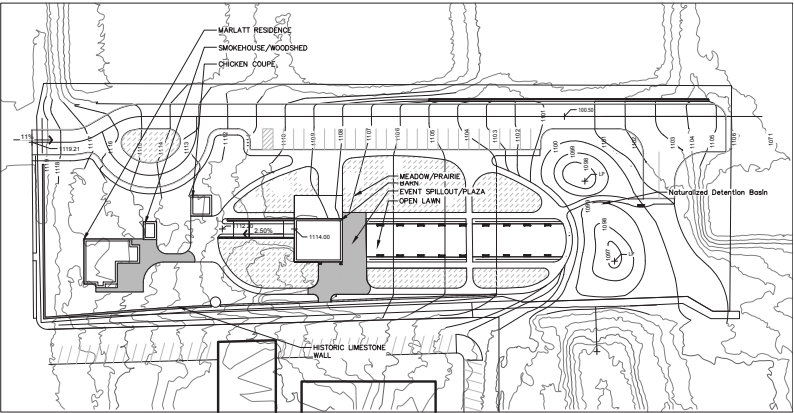
Recharge Groundwater: Instead of directing water away, the pavers facilitate groundwater recharge, supporting the local hydrological cycle.



Design and Visualization

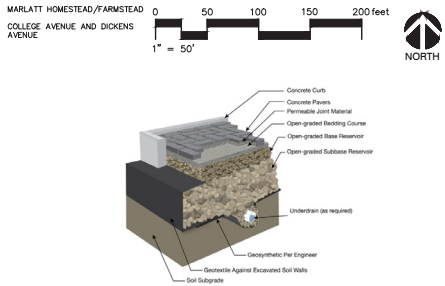
Site Design

The eastern portion of the site was designed using the strategies outlined earlier, emphasizing sustainable stormwater management and green infrastructure techniques. A naturalized detention basin was integrated into the design, leveraging the Wymore silt clay loam soil to support infiltration and water retention. Native vegetation was carefully researched and selected to be planted along the detention area and streambanks to stabilize soil, filter pollutants, and create habitats for local wildlife. Permeable pavers and bioswales were incorporated throughout the site to reduce runoff, improve water quality, and enhance groundwater recharge.



Design Features

In the design for the site, permeable paving is implemented extensively across sidewalks, driveways, and parking areas to enhance stormwater management. These pavers allow water to infiltrate directly into the ground, reducing surface runoff and mitigating the risk of erosion.



Design Discussion

Planting

This plant list is a carefully crafted list of plants separated into the three different saturation zones that have been designated for the naturalized detention basin. Each zone has different requirements that plants needed to meet in order to best occupy each space.

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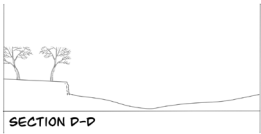
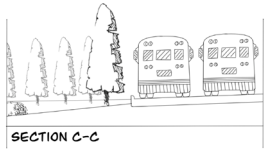
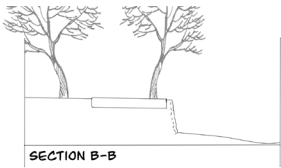
Visualization

The design for the Marlatt Homestead demonstrates how sustainable stormwater management and green infrastructure can harmonize with the preservation of historical landscapes. The integration of naturalized detention basins, permeable paving, and native plantings creates a site that not only manages stormwater effectively but also enhances biodiversity and ecological health.

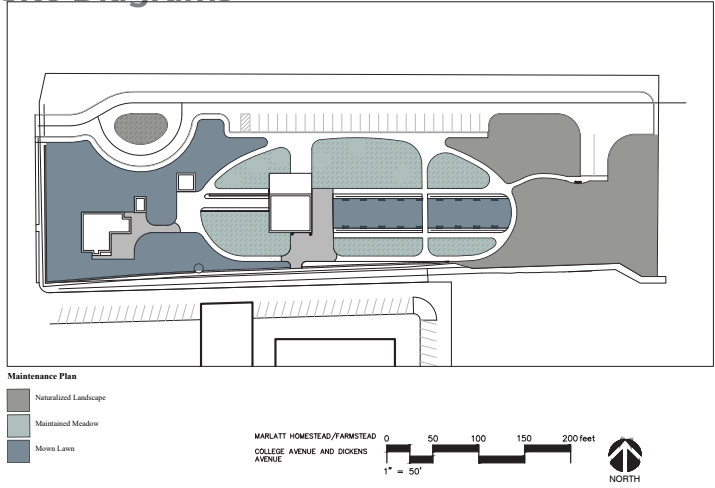


Site Sections

Cutting sections through a design allow for a deeper understanding of how different elements of a site will work together. The below sections show a simplified but informative view of how the grade changes throughout the site. Along with this, relationships between paving, planting, and slopes can be seen in further clarity. Further exploration of sections will be continued throughout the site to gain a deeper understanding more site connections and scale.



Site Diagrams

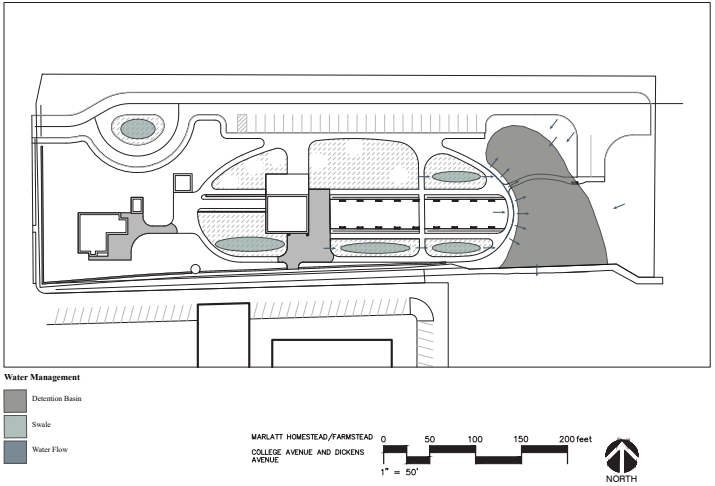


Water Management

Naturally, the site slopes gently from west to east. This allows a majority of water to flow towards the naturalized detention pools on the east end of the site. Through further grade changes throughout, water has been directly and evenly spread through these pools.

Maintenance

Maintenance for the Marlatt Homestead should be simple but effective. For this reason, much of landscape is going to have minimal to no maintenance required. A maintained meadow consists of native plantings that require a limited amount of maintenance and a naturalized landscape should be allowed to evolve and adapt to changes.



Conclusion

Design for the Future

The Marlatt Homestead project has the potential to serve as a model for integrating sustainable practices with historical preservation. As the site matures, its stormwater management features—such as permeable paving and naturalized detention areas—will demonstrate their effectiveness in reducing runoff and improving water quality.

Lessons Learned

Overall, this project has allowed me to gain a deeper understanding of designing stormwater infrastructure. Along with this, I have also learned the importance of historical significance when designing and how this can affect many different design decisions.

Further Project Development

As this project has progressed, many aspects have been discovered as well as parts that continue to be developed. A deeper understanding of site connections will be built upon, a further exploration of existing precedents will also allow this project to have a deeper impact.

Discussion & Questions

Appendix B
Glossary of Terms

Appendix A - Glossary of Terms

- 1. **Watershed:** An area of land where all water flows to a common outlet, such as a stream, river, or basin.
- 2. **Stormwater Management:** Practices designed to control and manage runoff water from rain or snow to minimize flooding, erosion, and water pollution.
- 3. **Runoff:** Excess water from precipitation that flows over the land surface, often carrying pollutants.
- 4. **Infiltration:** The process by which water permeates the soil and recharges groundwater.
- 5. **Erosion Control:** Methods to prevent soil loss caused by water or wind, particularly in areas with disturbed or bare soil.
- 6. **Green Infrastructure:** Nature-based solutions like rain gardens, bioswales, and vegetative buffers that manage stormwater sustainably.

Historical Preservation and Cultural Heritage

- 7. **Cultural Landscape:** A geographic area that includes cultural and natural resources, historically shaped by human activity.
- 8. **Adaptive Reuse:** Repurposing historical structures or sites for modern use while maintaining their cultural significance.
- 9. **Historical Integrity:** The authenticity of a historical site, including its design, materials, and setting, which must be preserved during interventions.
- 10. **Preservation Practices:** Strategies to maintain, protect, and restore historical features, ensuring they remain intact for future generations.
- 11. **Heritage Interpretation:** Methods used to communicate the historical, cultural, or ecological significance of a site to the public.

Environmental Sustainability

- 12. **Sustainability:** Practices that meet present needs without compromising the ability of future generations to meet their own needs, especially regarding environmental, social, and economic factors.
- 13. **Ecological Health:** The state of a natural environment, including its biodiversity, water quality, and overall resilience.

- 14. **Pollution Mitigation:** Techniques to reduce or eliminate contaminants from water or soil, particularly runoff containing chemicals or fertilizers.
- 15. **Biodiversity:** The variety of plant and animal species in an ecosystem, which can be impacted by land use and water management practices.

Design and Site Analysis

- 16. **Topography:** The physical features and elevation of the land, which influence water flow and drainage patterns.
- 17. **Drainage Basin:** A physical catchment area where all water collects and flows toward a single outlet, such as a stream or ditch.
- 18. **Landscape Architecture:** The design and planning of outdoor spaces, integrating natural and built environments.
- 19. **Low-Impact Development (LID):** A design approach that manages stormwater close to its source by mimicking natural processes, such as infiltration and evaporation.
- 20. **Permeable Surfaces:** Materials like porous concrete or gravel that allow water to infiltrate, reducing runoff.

Community and Stakeholder Engagement

- 21. **Stakeholder Collaboration:** Engaging with individuals or groups (e.g., community members, university departments) who have an interest in the project.
- 22. **Public Outreach:** Educational efforts to raise awareness and involve the community in site preservation and stormwater management initiatives.
- 23. **Educational Programming:** Activities or installations designed to teach visitors about sustainable water management and historical preservation.

Policy and Regulation

- 24. **Environmental Regulations:** Laws and policies governing land use, water management, and contamination control.
- 25. **Preservation Guidelines:** Standards set by organizations like the National Park Service for maintaining the historical integrity of structures and landscapes.
- 26. **Watershed Ordinances:** Local rules aimed at protecting water quality and managing stormwater within a watershed.

Appendix C
Saturation Zone Table

Saturation Zone A							Tolerates periodic standing water as well as seasonal dry spells. (Rain Gardens)									
	Perennials	Size	Light	Soil	Tolerances	Link										
Actaea racemosa	Bugbane	Large (>24")	Shade Tolerant	Moist, Well-Drained	Occasional Flooding	https://mortonarb.org/plant-and-protect/trees-and-plants/bugbane/										
Athyrium filix-femina	Lady Fern	2'-2"	Shade	Medium, Moist	Deer Resistant, Erosion	https://www.prairienursery.com/lady-fem-athyrium-filix-femina.html?sstlid=AfmB0oozU2hVJSzcsI73n2FhKudHV6eqkgfY0ahPnOkoh1-66ZNo08										
Asclepias incarnata L.	Swamp Milkweed	2'-8'	Full/ Partial Sun	Moist	Deer Resistant	https://kswildflower.org/lower_details.php?flowerID=279										
Eupatorium serotinum	Pale Boneset	1.5'-6.5'	Full/ Partial Sun	Moist	Deer Resistant	https://kswildflower.org/lower_details.php?flowerID=403										
Aster novae-angliae	New England Aster	3'-6'	Full/ Partial Sun	Medium, Moist	Deer Resistant	https://www.prairienursery.com/new-england-aster-aster-novae-angliae.html?sstlid=AfmB0ooLpKndHfZab5Itsu1-CfPcR6gBGsW7lO08wPwMkKNhd7KfK										
Grasses	Big Bluestem	5-8'	Full sun	Dry, Medium, Moist	Deer Resistant	https://www.prairienursery.com/big-bluestem-andropogon-gerardii.html?sstlid=AfmB0ooqe6NVjJOCiPhKtWFPpQVx_s24osHWIDC3j04lDE3-HDLk-F										
	Switchgrass	3'-6'	Full sun	Dry, Medium, Moist	Deer Resistant	https://www.prairienursery.com/switchgrass-panicum-vigatum.html?sstlid=AfmB0or5MQxUnpR0_YpmwLel7Cw7y6ZBpRK6a7WcP0oKEp_pdu3Oz										
	Prairie Cordgrass	3'-7'	Full sun	Wet, Moist	Deer Resistant	https://www.prairienursery.com/prairie-cordgrass-spartina-pectinata.html?sstlid=AfmB0ooPj0dkEMVU2HnsD5F6Q7HDC0LWrruqEFfgXceUj9XwWFXC										
	Carex vulpinoidea	Fox Sedge	1'-3'	Full sun	Wet, Moist	Deer Resistant	https://kswildflower.org/sedge_details.php?sedgeID=8									
	Shrubs/ Trees															
Betula nigra	River Birch	40'-70'	Part Shade	Moist, Well-Drained	Drought Tolerant	https://shop.arborday.org/river-birch?sstlid=AfmB0ooHFKMX3ppPKXj5y/TEs6DoKOzdbd3mnVGXW-rUj3bSnmhd0										
Cephalanthus occidentalis	Butterbush	Up to 12'	Part Shade	Wet, Moist	Cold Tolerant	https://www.wildflower.org/plants/result.php?id_plant=ceoc2										
Cornus amomum	Pale Dogwood	16'	Full/ Partial Sun	Moist, Well-Drained		https://kswildflower.org/tree_details.php?treeID=55										
Saturation Zone B							Grows well in average soil moistures, potential standing water but not for long. (Rain Gardens)									
	Perennials	Size	Light	Soil	Tolerances	Link										
Baptisia australis	Wild Indigo	3'-5'	Sun	Moist	Tolerances	https://www.wildflower.org/plants/result.php?id_plant=BAAU										
Echinacea purpurea	Purple Coneflower	Up to 4'	Sun/ Part Shade	Dry, Medium	CAN BECOME AGGRESSIVE	https://www.wildflower.org/plants/result.php?id_plant=ecpu										
Monarda fistulosa L.	Wild Bergamot	5'	Sun/ Part Shade	Dry, Moist	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=mo1										
Liatris pycnostachya	Prairie Blazing Star	3'-5'	Full sun	Medium, Moist	Deer Resistant	https://www.prairienursery.com/prairie-blazingstar-liatris-pycnostachya.html?sstlid=AfmB0ooJ6oVGQjRcKdzYCs4ZA922W3LyYEabxg1FX23YTukbWxs										
Grasses	Little Bluestem	2'-3'	Full sun	Dry, Medium	Deer Resistant	https://www.prairienursery.com/little-bluestem-schizachyrium-scaparium.html?sstlid=AfmB0oozJpdq3Ys1JhV9R4ZuKjUp40Z0KHtVwTtUjVrsLVmhHwE6Wn										
	Sorghastrum nutans	3'-8"	Part Shade	Dry, Moist	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=sonu2										
	Andropogon gerardii	Big Bluestem	5-8'	Full sun	Dry, Medium, Moist	Deer Resistant	https://www.prairienursery.com/big-bluestem-andropogon-gerardii.html?sstlid=AfmB0ooqe6NVjJOCiPhKtWFPpQVx_s24osHWIDC3j04lDE3-HDLk-F									
	Panicum virgatum	Switchgrass	3'-6'	Full sun	Dry, Medium, Moist	Deer Resistant	https://www.prairienursery.com/switchgrass-panicum-vigatum.html?sstlid=AfmB0or5MQxUnpR0_YpmwLel7Cw7y6ZBpRK6a7WcP0oKEp_pdu3Oz									
	Chasmanthium latifolium	Northern Sea Oats	3'-4'	Full/ Partial Sun	Dry, Medium	Deer Resistant	https://www.prairienursery.com/northern-sea-oats-chasmanthium-latifolium.html?sstlid=AfmB0o64DM65kUxmblu3oM6erZscs2sgd10Ds1HPt3T7N3wUnX									
Shrubs/ Trees	Betula nigra	40'-70'	Part Shade	Moist, Well-Drained	Drought Tolerant	https://shop.arborday.org/river-birch?sstlid=AfmB0ooHFKMX3ppPKXj5y/TEs6DoKOzdbd3mnVGXW-rUj3bSnmhd0										
	Amelanchier alaborea	Downy Serviceberry	15'-25'	Full/ Partial Sun	Occasional Drought	https://mortonarb.org/plant-and-protect/trees-and-plants/downy-serviceberry/										
	Prunus virginiana	Choke Cherry	6'-18'	Sun/ Part Shade	Drought Tolerant	https://kswildflower.org/tree_details.php?treeID=39										
	Cornus amomum	Pale Dogwood	16'	Full/ Partial Sun	Moist, Well-Drained	https://kswildflower.org/tree_details.php?treeID=55										
	Tolerates average to dry soil conditions. Plants in this zone tend to be shorter. (Rain Gardens)															
Saturation Zone C							Tolerates average to dry soil conditions. Plants in this zone tend to be shorter. (Rain Gardens)									
	Perennials	Size	Light	Soil	Tolerances	Link										
Aquilegia canadensis	Red Columbine	Up to 3'	Part Shade, Shade	Dry, Moist	Cold and Heat Tolerant	https://www.wildflower.org/plants/result.php?id_plant=aqca										
Ruellia humilis	Wild Petunia	1'-2'	Full sun	Dry, Medium	Deer Resistant	https://www.prairienursery.com/wild-petunia-ruellia-humilis.html?sstlid=AfmB0oo3MqZkQDOzm5Xdp5g4H1HC-WFSku59zGA70p2pG6_cpho_V										
Polemonium reptans	Jacob's Ladder	1'-1.5'	Part Shade	Medium	Deer Resistant	https://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=1810										
Asclepias tuberosa	Butterfly Milkweed	1'-2'	Sun	Dry, Moist	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=astu										
Solidago speciosa	Showy Goldenrod	5'	Full/ Partial Sun	Dry, Medium	Deer Resistant	https://www.prairienursery.com/solidago-speciosa-showy-goldenrod#panel-descrip										
Monarda fistulosa L.	Wild Bergamot	5'	Sun/ Part Shade	Dry, Moist	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=mo1										
Rudbeckia hirta	Black-Eyed-Susan	Up to 3'	Sun	Dry, Moist	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=ruh2										
Asclepias tuberosa	Butterfly Milkweed	1'-2'	Sun	Dry, Moist	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=astu										
Penstemon digitalis	Foxglove Beardtounge	4'	Full/ Partial Sun	Medium	Deer Resistant	https://www.prairienursery.com/penstemon-digitalis-foxglove-beardtongue#panel-descrip										
Grasses	Little Bluestem	2'-3'	Full sun	Dry, Medium	Deer Resistant	https://www.prairienursery.com/little-bluestem-schizachyrium-scaparium.html?sstlid=AfmB0oozJpdq3Ys1JhV9R4ZuKjUp40Z0KHtVwTtUjVrsLVmhHwE6Wn										
	Hairy Grama	6'-28"	Part Shade	Dry, Medium		https://www.wildflower.org/plants/result.php?id_plant=bohl2										
	Sporobolus heterolepis	Prairie Dropseed	2'	Full/ Partial Sun	Medium, Moist	Deer Resistant	https://www.prairienursery.com/sporobolus-heterolepis-prairie-dropseed									
	Bouteloua gracilis	Blue Grama	1'-2'	Full sun	Dry	Drought Tolerant	https://www.wildflower.org/plants/result.php?id_plant=bgg2									
	Koeleria macrantha	Junegrass	2'	Full sun	Medium	Deer Resistant	https://www.prairienursery.com/koeleria-macrantha-june-grass									