Report for

Kentucky Division of Water

Stormwater Master Plan for Kenton County School District Final Report

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Submitted By:
Kelly Kuhbander, LEED® AP
STRAND ASSOCIATES, INC.®
615 Elsinore Pl Ste 320
Cincinnati OH 45202
www.strand.com

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EXECUTIVE SUMMARY

The Kenton County School District (KCSD) in Kentucky was the recipient of a 319(h) grant from the United States Environmental Protection Agency (USEPA) and the Kentucky Division of Water to develop a green stormwater master plan for its three-school campus. This master plan is intended to showcase the latest cutting-edge green technologies and serve as a national model for sustainable practices and education. The schools on this campus have already earned various energy awards for their green building and energy practices, and now this campus is demonstrating a commitment to controlling stormwater runoff and nonpoint source pollution from its site. The stormwater master plan is a conceptual plan for the entire site that integrates water quality, water quantity, educational, and community needs throughout the 22 acre campus.

The three-school campus presented a unique opportunity to resonate with students of all ages; kindergarten through twelfth grade students are taught at James A. Caywood Elementary School, Turkey Foot Middle School, and J.D. Patton Area Technology Center (ATC). This campus goes beyond just the physical green elements and the school district. Its partners recognize the capacity this campus has to develop a future labor force capable of meeting the demand for green collar jobs over the next 20 years.

KCSD partnered with Strand Associates, Inc.® (Strand) and Human Nature, Inc. (Human Nature) to develop the master plan and design site elements.

This master planning process was a tremendous success as it engaged students throughout the school district, teachers, professional engineers, university representatives, major industry leaders, and community members. A 50-member visioning team was created to represent the region’s top leaders in business, industry, education, and postsecondary institutions. The team identified and prioritized innovative green strategies and educational elements for incorporation into the master plan.

Upon completion of the vision, this campus will showcase a variety of stormwater best management practices (BMPs), including numerous alternative energy systems. Through partnership with universities, the students on this site will be able to track, benchmark, and analyze performance data critical to industry leaders on the following BMPs:

- Rainwater Catchment System
- Green Roof Porous Pavements
- Biofiltration Swales
- Retention/Detention Basins
- Wetlands

Each of the green stormwater elements indicated in the master plan will incorporate educational opportunities, performance data, monitoring opportunities, and functionality to improve water quality and reduce water quantity leaving the site. Using a portion of the funding from the 319 grant, a 0.25-acre stormwater BMP was built at the campus entry way. This BMP features wetland filtration cells with native plantings, stormwater collection from roads and parking lots, three water quality monitoring locations, sediment traps, and a prairie of native grasses. Serving as one of Northern Kentucky's top assets, this campus is a national model in sustainability and education.

SECTION 1
ACKNOWLEDGMENTS

1.01 ACKNOWLEDGEMENTS

The following list of groups and people were instrumental in the development and implementation of activities associated with the *Kenton County School District Master Plan* Project.

A. Kenton County School District

- Sara Jackson, Business Liaison/Marketing Coordinator
- Rob Haney, Director of Support Services
- Chris Baker, Energy Systems Coordinator
- Tim Hanner, KCSD Superintendant

B. Kentucky Division of Water

- Brooke Shireman, Technical Contact
- Debra Day, Grant Administrator
- Lajuanda Haight-Maybriar, Licking River Basin Coordinator
- Jenny Howard, Environmental Education Coordinator

C. Visioning Committee Members

1. Banklick Watershed Council
   - Sherry Carran, President Banklick Watershed Council

2. Duke Energy
   - John Hill

3. Toyota
   - Kevin Butt

4. Sanitation District No. 1
   - Jim Turner, Project Engineer
   - Jamie Holtzapfel

5. PCA Architecture
   - Andrew Piaskowy
   - Mark Perry

6. Kentucky NEED
   - Pam Proctor

7. Turner Construction
   - Melanie Frey
   - Mike Hilton

8. KY Department of Education (PLTW)
   - Henry Lacy
   - Debbie Anderson

9. University of Kentucky
   - Dr. Carol Hanley
   - Jan Swauger

10. Northern Kentucky Chamber of Commerce
    - Nancy Spivey
    - Amanda Dixon

11. Cincinnati State University
    - Doug Bowling
    - Larry Feist

12. Northern Kentucky University
    - Cecila Baker

13. Kentucky Division of Water
    - Rosetta Fackler
    - Margi Jones

14. Kentucky Environmental Education Council, Education Cabinet
    - Jane Eller

15. Thomas More College
    - Chris Lorentz

16. Congressman Geoff Davis Office
    - Keith Knapp

17. OCTE
    - Michael Kindred

18. Boone and Kenton County Conservation Districts
    - Mary Kathryn Dickerson

19. Gateway Technical & Community College
    - Tony Clark

20. Wagstaff, Inc.
    - Carol Wicklund

21. City of Edgewood
    - Mayor John Link

D. <u>KCSD Faculty</u>

- Larry Tibbs, Dixie Heights High School
- Joe Chavez, Dixie Heights High School
- Lisa Dern, Caywood Elementary
- Renee Topmiller, Caywood Elementary
- John Popham, Simon Kenton High School
- Julie Whitis, Simon Kenton High School
- Shane Rogers, Scott High School
- Annette Boehm, Turkey Foot Middle School
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- John Christiansen, J.D. Patton Area Technical Center
- Ray Stanley, J.D. Patton Area Technical Center
- Debbie Obermeyer, Turkey Foot Middle School
- Dwight Raleigh, Caywood Elementary

E. <u>KCSD Student Groups</u>

- Scott High School Focus Group
- Caywood Elementary Students

F. <u>Strand Associates, Inc©</u>

- John Lyons, PE
- Michael Woolum, PE, PLS
- Kelly Kuhbander, LEED® AP
- Christopher Rust

G. <u>Human Nature, Inc.</u>

- David Whittaker, ASLA
- Christopher Manning, ASLA
- Jack McGlasson

H. <u>Construction Partners</u>

- Mike Weber, Century Construction, Inc.
- Todd Allison, Allison Landscaping

1.02 DEFINITIONS

BMP	best management practices
COD	chemical oxygen demand
Human Nature	Human Nature, Inc.
KCSD	Kenton County School District
KDOW	Kentucky Division of Water
SD1	Sanitation District No. 1 of Northern Kentucky
Strand	Strand Associates, Inc.®
TKN	total Kjeldahl nitrogen
TSS	total suspended solids
USEPA	United States Environmental Protection Agency

SECTION 2
INTRODUCTION AND BACKGROUND

2.01 PURPOSE, PROJECT GOAL, AND OBJECTIVES

This project was selected to provide a very unique opportunity to enhance and build upon all of the sustainable and environmental practices that Kenton County School District (KCSD) had already been actively pursuing. The campus is already raising the bar and setting new standards for energy efficiency and sustainable education practices; however, the site and the stormwater runoff had not been considered. With the completion of this stormwater master plan, this site will truly be one of the only school campuses in the nation to have accomplished a fully integrated green campus environment that is also integral to the education of the students.

The project goal, as defined in the project application, was to develop an innovative Campus Master Plan, highlighting green infrastructure techniques for the control of stormwater runoff. In other words, the goal was to manage the stormwater from a three-school campus in Kenton County in a way showcasing various green stormwater initiatives. The following objectives were set to achieve this project goal.

A. Identify the Stormwater Needs and Problems of the Campus

This objective included meeting with and engaging as many stakeholders as possible who could provide input and guidance for the vision of the campus. This included meetings with community leaders, area university representatives, students in the school district, school board representatives, area businessmen, and a variety of other stakeholders who would have input into the campus vision. This objective also included site visits, geographical information system (GIS) analyses, collection of existing design drawings, and similar tasks. The purpose of this task was to gather all available information and opinions so the most informed and representative vision for the campus could result.

B. Design an Aggressive and Adequate Solution

This objective was accomplished through a series of iterations that pushed the envelope and worked to change the way stormwater was controlled on the site. Throughout this visioning and design process, all possible best management practices (BMPs) were considered to appropriate for use on this site, and BMPs were incorporated throughout the campus. It was important for all aspects of the design encompassed the key elements of water quality improvement and volumetric reduction, as well as designed with monitoring and education in mind.

C. Implement Selected Water Quality and Quantity BMPs

This objective was to choose one BMP to represent the vision of the campus and the direction this new master plan was heading. The BMP to be selected needed to demonstrate water quality improvement, volumetric reductions, include monitoring, educational elements, engage the community, and be highly visible. The chosen BMP was designed and constructed as an entry feature to the campus surrounding a new entry sign. This biofiltration feature met all the desired requirements for the first constructed BMP and the first step to transforming the campus to meet its new green vision for stormwater control. In addition to this feature, KCSD installed a green roof with rainbarrels to collect water samples, a rainwater harvesting system, bioswales in the parking lot, and an outdoor classroom all as part of the construction of the new Turkey Foot Middle School building. All of these green features were part of the match that KCSD contributed to this grant.

D. Establish the Green Stormwater Design as an Educational Tool

The purpose of this objective was to explain the concept of green stormwater controls to the community, the students, staff, and stakeholders and to ensure education was a central component of this new campus vision. Not only was the goal to educate stakeholders in the visioning process, but also to incorporate educational elements into the site design so students and community members can continue to learn about green infrastructure and stormwater BMPs.

2.02 OTHER PERTINENT AND RELATED WORK

This campus is truly cutting edge and a one of a kind demonstration of green building practices, green energy practices, and now represents a full green campus with the green stormwater master plan. No other school or entity, to our knowledge, has created a vision like this that encompasses all aspects of the building and the site with green design principles while incorporating monitoring and educational practices. Although this campus is truly one of a kind, many of the elements of the site were inspired by Sanitation District No. 1 of Northern Kentucky's (SD1) Stormwater Park. This section discusses the other pertinent green work KCSD is engaged in thereby supplementing the stormwater work on-site, as well as the SD1 Stormwater Park site which displays many of the same principles and practices this stormwater master plan includes.

A. Other Green Projects on the Campus

KCSD has already established itself as a leader in building energy systems and green building design. The schools on this campus are some of the greenest buildings in the state of Kentucky. In fact, the new Turkey Foot Middle School is being constructed has a goal to be a net zero energy school. The following green building features are already in place on this campus.

1. Solar photovoltaic panels on roof.
2. Energy systems monitoring.
3. CO_2 monitors for fresh air.
4. Tight building envelope construction.
5. Insulated concrete formwork for external walls.
6. Foam insulation.
7. Solar tubes for natural lighting.
8. Lighting system controls to reduce energy use.
9. Efficient wall surface to building footprint ratio.
10. Geothermal heating and Cooling.
11. Triple glazing of windows.
12. Reflective roof surfaces.
13. Daylighting of all classrooms.
14. Energy Star Award Winning schools.

B. Sanitation District No. 1 Stormwater Park

SD1 Stormwater Park is a comprehensive stormwater master plan for SD1's headquarters in Fort Wright, Kentucky. Features constructed from the master plan include:

1. An internationally recognized green roof.
2. Permeable pavements (porous asphalt and porous concrete).
3. Wetland filters.
4. A small lake.
5. A stormwater garden.
6. An outdoor classroom.
7. An above ground aqueduct and cistern for the storage and reuse of rainwater.
8. Trails.
9. Two overlooks to the Banklick Creek.

Nearly all these elements include a method to monitor various elements of the BMPs and generate local performance data. The facility is open to the public and serves as a laboratory for teaching the next generations of children, developers, local communities, and public agencies for caring about our water resources. An aerial view of the park is shown in Figure 2.01-1. In 2002, the Kentucky Chapter of the American Society of Landscape Architects recognized SD1 with the Honor Award of Excellence. Today, the SD1 site serves as a regional model for stormwater BMPs and is a local guide for implementation of Phase Two of Clean Water Standards from the USEPA.

Figure 2.01-1 SD1 Stormwater Park

SECTION 3
MATERIALS AND METHODS

3.01 PROJECT AREA

The three-school campus is located in Kenton County, Kentucky in Bullock Pen Creek of Banklick Creek Watershed. Bullock Pen Creek is a 10.96 square mile (HUC_{14}) subwatershed. The runoff from this site eventually drains into the Licking River and then the Ohio River. Both Doe Run Lake and Banklick Creek are on Kentucky's 2008 Integrated Report to Congress Volume II 303(d) List of Impaired Waters. The three-school campus itself is 20 acres and is located adjacent to the heavily traveled five-lane Turkeyfoot Road. An aerial of the campus is shown in Figure 3.01-1, and the location of the site within the Banklick Watershed is indicated by a green asterisk in Figure 3.01-2.

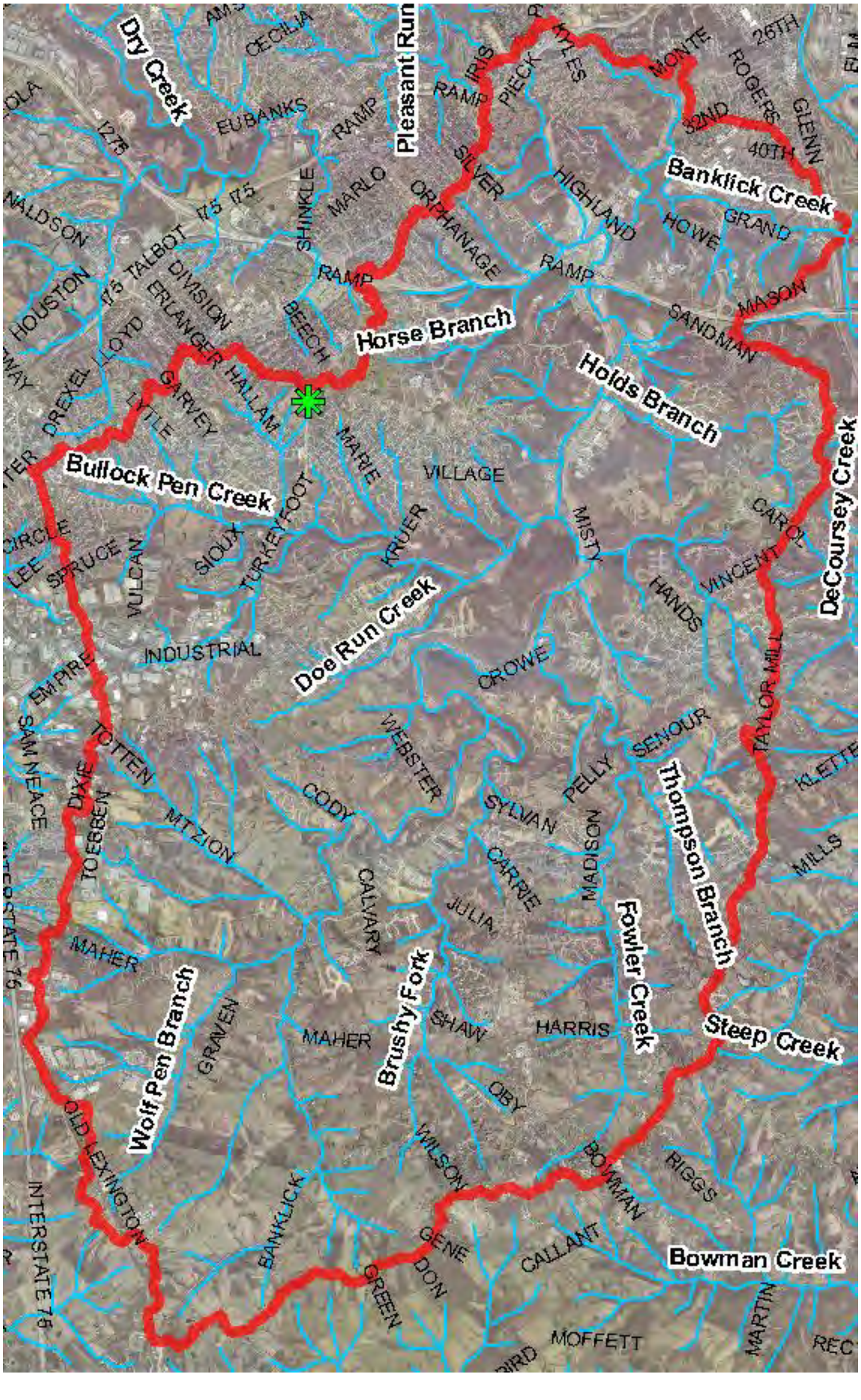
Figure 3.01-1 Campus Map

The three schools located on the campus include James. A. Caywood Elementary School, Turkey Foot Middle School, and J.D. Patton Area Technology Center (ATC).

Turkey Foot Middle School was being reconstructed at the time of this 319 grant. The incorporation of green stormwater elements into the construction of this new school building, to be used as match for the grant, is what made this project possible.

FIGURE 3.01-2

LOCATION OF CAMPUS WITHIN BANKLICK WATERSHED



3.02 MASTER PLANNING PROCESS

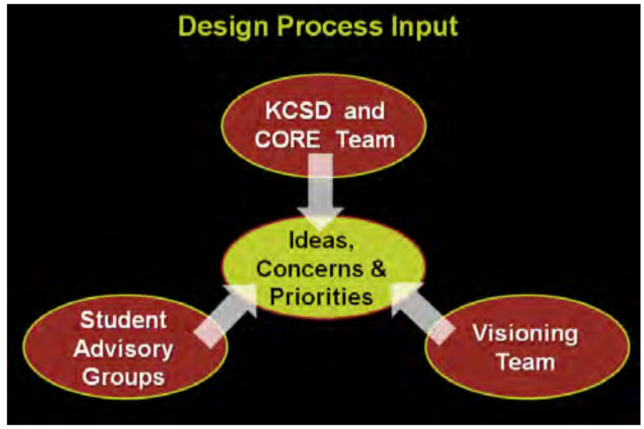


Figure 3.02-1 Stakeholders with Design Input

The master planning process for this project was led by Human Nature Inc. (Human Nature), an area landscape architecture firm with assistance from Strand Associates, Inc.® (Strand), an area civil engineering firm. Human Nature's defined master planning process consists of three steps: Awareness, Exploration, and Vision. These three steps were followed throughout the master planning process. Before the process could be implemented, it was very important to first form the stakeholder groups which included the visioning committee, the core group (a smaller subset of the visioning committee), and the student advisory group. Figure 3.02-1 shows a representation of the input process.

A. Stakeholder Groups

Stakeholder groups are important in a 319 process; however, because this project was a master planning process, it was especially important to have a large, diverse, and comprehensive group of individuals to drive the vision for the campus in the right direction.

1. Visioning Committee

The visioning committee was created by inviting who came to mind having some interest in the project, with some connection to the campus, some influence in the community, or similar interest. The purpose of the visioning committee was to provide a broad stroke of input, opinions, ideas, priorities, and concerns regarding the vision for the campus. The visioning committee gave the core group a wide base of information and knowledge upon which to make decision. Several letters of support were written by visioning committee members to support this project. These letters can be found in Appendix D. Ultimately the visioning committee was a group of more than 50 people representing the following entities:

- KCSD
- Kentucky Division of Water (KDOW)
- Banklick Watershed Council
- Duke Energy
- Toyota
- SD1
- PCA Architecture
- Kentucky NEED
- Turner Construction
- Kentucky Department of Education (PLTW)

- University of Kentucky
- Northern Kentucky Chamber of Commerce
- Cincinnati State University
- Northern Kentucky University
- Kentucky Environmental Education Council
- Kentucky Education Cabinet
- Thomas More College
- Congressman Geoff Davis Office
- OCTE
- Boone and Kenton County Conservation Districts
- Gateway Technical and Community College
- Wagstaff, Inc.
- City of Edgewood
- Dixie Heights High School
- Caywood Elementary
- Simon Kenton High School
- Scott High School
- Turkey Foot Middle School
- J.D. Patton Area Technical Center
- Strand
- Human Nature
- Century Construction, Inc.

2. Core Group

The core group was a subset of the visioning committee. The core group consisted of the project designers and decision makers. The job of the core group was to sort through all of the input from the other stakeholder groups and to make project decisions to move the effort forward. The information of the core group was instrumental to the success of this project. The core group allowed decisions to be made quickly and efficiently without having to reconvene the visioning committee each step of the way. Throughout the 16-month duration of this project, the core group met on average once a month. Members of the core group represented the following groups:

- KCSD
- KDOW
- Turner Construction
- J.D. Patton Area Technical Center
- Strand
- Human Nature

3. Student Advisory Groups

Obtaining input from student groups was very important in this process because the students not only bring a fresh perspective and new creative ideas but also utilize the campus grounds more than anyone else. Additionally, meeting with the student advisory groups allowed an opportunity to educate the students about the project, green infrastructure, and the importance of protecting water quality of surface waters.

B. Step 1: Awareness

The awareness phase of the master planning process is about gathering all available information about the site, project, problems, needs, and related information. All this information is important to consider and be aware of as you are designing a master plan. In this step, we answered the following questions:

1. How is the site currently functioning?
2. What defines a campus?
3. What defines a green campus?
4. What do we know about the site?
5. What are the opportunities and constraints?
6. What green site elements might be possible on this site?

The core group and the design team compiled all available information about the site. For example, one of the many things assessed in this process was the infiltration rates of the soils. Figure 3.02-2 is a soils map illustrating a tan area of poorly drained soil and shades of green indicating moderately drained soils are more suitable for infiltration.

Figure 3.02-2 Soils Map (Tan area is not suitable for infiltration)

The first visioning committee meeting was held to gather input and responses from the group. The agenda and meeting minutes from February 12, 2009, visioning meeting are included in Appendix B. At this visioning meeting, verbal feedback was collected during discussion, however a written survey was also utilized to collect information from the group. The survey contained the following six questions:

1. When you think of the qualities contributing to a great campus or better yet a great green campus, how would you describe them? Please feel free to provide specific green ideas, if you like.

2. When you think of the existing campus for Caywood, Patton, and Turkey Foot, what existing strengths should be accentuated, what existing weaknesses need to be improved, and what potential barriers might arise?

3. As you imagine the campus taking on some bold green dimensions, as the new high performance buildings have, what role(s) do you think the automobile, cars, and buses should play in the new campus organization? What ideas do you have to minimize the impacts of the automobile?

4. What skills and information need to be taught on this new green campus of the future to create a valuable future workforce?

5. What potential partnership between the campus and your organization might be created for mutual benefit?

6. Other questions and/or comments?

The outcome of the awareness phase of the project was opportunities and constraints diagram as shown in Figure 3.02-3. This figure conveys, in a graphical representation, many of the comments and input from the visioning committee and the core design group. Another outcome from the first step is the Green Infrastructure Planning Diagram which is shown in Figure 3.02-4. This diagram shows green infrastructure is the center of this project, with environment, green careers, community, students and curriculum, and campus identity as the branches that all tie together with green infrastructure. These two figures represent the outcome of the awareness step and they served as a guide for the rest of the master planning process.

Figure 3.02-3 Opportunities and Constraints Diagram

Figure 3.02-4 Green Infrastructure Planning Diagram

C. Step 2: Exploration

The exploration step is about pushing the envelope and exploring a variety of options for the campus vision. Exploration is also about prioritization and determining which elements are best suited for the campus and its ultimate vision.

In the exploration phase, several meetings were held with student advisory groups; meeting notes can be found in Appendix B. During meetings with the students, a presentation was given to inform the students about the project, green infrastructure, stormwater BMPs, opportunities, and constraints already identified in the awareness step. The student input ranged from suggestions of BMP types to incorporate into the site to recommendations on how to spread the message and keep people informed and aware of the project.

The visioning committee also met during the exploration phase and was asked to comment on and prioritize the following essential issues and components of the site:

1. Outdoor Learning Venues
2. Green Infrastructure
3. Pedestrian and Vehicular Systems
4. Green Space
5. Research
6. Community Interface
7. Campus Identity

This resulted in really good feedback and a clear guidance for the vision of the campus. The results of the prioritization are shown in Table 3.02-1. The visioning committee was asked to rank the essential components of the site with 1 as the highest priority and 7 as the lowest priority. The results of this process indicated outdoor learning venues were the highest priority, with green infrastructure as the second highest priority. Community interface and campus identity ranked the lowest.

Essential Issues and Components	**Priority Rating**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Outdoor Learning Venues	20	7	7				
Green Infrastructure	9	9	8	4	3	1	
Pedestrian and Vehicular Systems	4	8	1	5	8	4	4
Green Space	1	5	8	7	7	5	1
Research		5	7	6	3	8	5
Community Interface		1	2	8	5	8	10
Campus Identity		2	2	3	9	6	12

Table 3.02-1 Results of Visioning Committee Priority Ranking

D. Step 3: Vision

The visioning process is the last step in the campus master planning process as defined by Human Nature. This step is where everything comes together; all of the input and information from the awareness and exploration steps are considered in the visioning process. The visioning process is also iterative, so the core design group met several times to discuss the various elements as they were incorporated into the master plan. The discussions included considerations such as:

1. Space and monetary constraints.
2. Water quality benefits.
3. Impact on volumetric reductions.
4. Research and monitoring capabilities.
5. Educational components.
6. Priority results from the visioning committee.
7. Site information collected through the awareness process.
8. Impact on parking and traffic flow.
9. Visibility and public access to elements.
10. Connections to green building and energy practices.

Throughout the visioning step, a gradient of three concept plans was explored. Concepts ranged from high impact, lots of major changes to the campus, to low impact which left much of the campus structure and parking in place while fitting the stormwater features into the site. After multiple iterations, the final master plan was a hybrid of the low impact and the moderate impact concepts. The final master plan is discussed in more detail in Section 4 of this report.

Upon completion of the master plan vision, it was determined sketches of various segments of the campus would be helpful in visualizing the concepts shown in the master plan and would potentially help KCSD in future efforts to get funding for the campus to move forward with elements of the master plan. Three sketches were prepared to further refine this vision. During this phase of the process, the student advisory groups were engaged to provide feedback and input on the sketches. This feedback can be found in Appendix B. The results of these sketches are discussed in Section 4 of this report.

3.03 SELECT BEST MANAGEMENT PRACTICES IMPLEMENTATION

Upon completion of the master planning process, the next step was to determine which BMPs would be implemented. Several stormwater BMPs are being installed on the site by KCSD as match, while at least one BMP was to be designed and constructed using the 319 funds.

A. Green Stormwater Best Management Practices Installed As Match

KCSD was currently reconstructing Turkey Foot Middle School and as part of this reconstruction, KCSD was able to incorporate several green stormwater features to be counted as match. The following features were installed on the Turkey Foot site as part of the new school construction:

1. Green Roof and Rain Barrels for Monitoring

A green roof was installed on the southwest corner of the building near the future outdoor classroom. The green roof is approximately 1,000 square feet, and it was designed so that the runoff from the green roof would flow down into one rain barrel and the runoff from the traditional roof would flow down into a second rain barrel. These rain barrels are located next to the outdoor classroom so the students can conduct research and monitoring on the runoff from the two roofs to compare both water quantity and quality.

2. Rainwater Harvesting Cistern

A large rainwater harvesting cistern has been installed as part of the Turkey Foot Middle School construction project. The cistern is a 20,000-gallon below-grade tank that collects rainwater from part of the building roof. The rainwater will be recycled and used for all toilets and urinals in the basement except for those in the locker room. The recycled water also feeds a hose located on the green roof.

3. Biofiltration Swales

Biofiltration swales were incorporated into the parking islands in front of the new Turkey Foot Middle School. These islands have curb cuts to allow water to enter into the island and be cleansed by the plant material and engineered soil as it passes through the island and eventually into a conveyance underdrain. The underdrain will allow future opportunities for flow monitoring and water quality sampling.

4. Outdoor classroom

An outdoor classroom is being constructed on the west end of the new Turkey Foot Middle School. This classroom is being designed to engage students in the stormwater elements of the site. The classroom has seating for lectures, access to vegetated and traditional roof runoff, and serve as an outdoor place for students to gather, learn, and conduct experiments.

B. <u>Green Stormwater BMP to be Designed and Built with Grant Funds</u>

The core design team evaluated the various possible BMPs that could be installed with the grant funds. It was important to ensure the chosen BMP was representative of the campus vision and encompassed all the following important characteristics:

1. Demonstrated water quality improvement.
2. Demonstrated volumetric reductions.
3. Highly visible to all three schools and the public.
4. Affordable within the constraints of the grant.
5. Included various monitoring capabilities.
6. Included various educational components.

After much consideration, the core group determined a biofiltration swale in the new campus entryway and front yard would be most appropriate. Throughout the design process, the design team ensured all the important characteristics were taken into consideration and were incorporated into the design. A more detailed discussion of the design of this BMP can be found in Section 4 of this report.

SECTION 4
RESULTS AND DISCUSSION

4.01 RESULTS OF MASTER PLANNING PROCESS

Overall, the master planning process was hugely successful. Not only was a comprehensive green stormwater master plan completed for the campus, but the input and excitement generated from the various stakeholder groups was very impressive. The conceptual master plan that resulted from the process is shown in Figure 4.01-1.

Figure 4.01-1 Final Green Stormwater Master Plan

Some of the features incorporated into this master plan include:

- Wetlands.
- Habitat trails.
- Outdoor learning courtyards.
- Porous pavement test labs.
- Rain gardens.
- Bioswales.
- Vegetated roofs.

- Rain barrels.
- Water harvesting cistern
- Grasspave drive lanes
- Reforestation
- Detention basin retrofit/habitat restoration

All features have been conceptualized to incorporate water quality and volumetric improvements, monitoring, education, and research.

In addition to the conceptual master plan, a more detailed vision was created for three of the main areas of the campus: the campus front yard, the Caywood Courtyard, and the Turkey Foot Outdoor Classroom.

A. Campus Front Yard

The vision for the campus front yard is going to be the new face of the campus; it will be representative of what the campus is all about, and will to draw people in. A sketch of this vision is shown in Figure 4.01-2.

Figure 4.01-2 Vision of Campus Front Yard

Some of the elements incorporated into the front yard vision include:

- Learning terrace.
- Bioretention labs.
- Wetland lab.
- Solar totems.
- Solar umbrellas with seating.
- Interpretive signage.
- Forest and meadow restoration.
- Hydropower demonstration lab.
- Grasspave fire lane access.
- Habitat trail connection to rest of campus.
- Community trail access.

B. Caywood Courtyard

The vision for Caywood Courtyard was to take an unused space at the center of an elementary school and turn it into a learning opportunity and an outdoor classroom space the students could use and enjoy. A sketch of this vision is shown in Figure 4.01-3.

Figure 4.01-3 Vision of Caywood Courtyard

Some of the elements incorporated into the Caywood Courtyard vision include:

- Circular outdoor classroom/lab.
- Rain garden lab.
- Student-made artwork.
- Cistern.
- Raised planting beds.
- Interpretive signage.
- Outdoor tool/storage shed with green roof.
- Enhanced play area with natural play elements.
- Water feature/fountain.
- Famous quotes in pavers.
- Birdhouses and bat houses.
- Formal and informal paths through garden.
- Connection to campus-wide trail system.

C. Turkey Foot Outdoor Classroom

The vision for the Turkey Foot Outdoor Classroom is to make an area where students can truly be engaged with various elements of the site. This classroom is currently being constructed in basic form. However, the vision for the final classroom is much more elaborate. A sketch of this vision is shown in Figure 4.01-4.

Some of the elements incorporated into the Turkeyfoot Outdoor Classroom vision include:

- Outdoor classroom/lab.
- Rain barrels.
- Green roof.
- Student-made artwork.
- Biofiltration.
- Raised planting beds.
- Step pools.
- Interpretive signage.
- Enhanced retention area with meadow/wetland plantings and trails to access.
- Learning terrace with tree canopy overlook deck.
- Outdoor storage.
- Solar-powered cellphone/computer recharge station(s).
- Connection to campus-wide trail system.

Figure 4.01-4 Vision of Turkey Foot Outdoor Classroom

4.02 RESULTS OF BEST MANAGEMENT PRACTICES IMPLEMENTATION

A. <u>Campus Entry Biofiltration Feature</u>

The Campus Entry Biofiltration Feature was the chosen feature to be designed and built with the 319 grant dollars. This feature was designed to represent the vision for the campus and encompass all important elements of the site and the campus vision. The feature is located at the entry way to the campus in the front yard. It is highly visible to all three schools as well as the community passing by on Turkeyfoot Road. The feature celebrates a new entry sign that was put in as part of the school reconstruction project and is symbolic of the new vision for the school incorporating green stormwater controls. The conceptual vision for the feature is shown in Figure 4.02-1.

Some minor changes to the vision were made through the engineering and design process, the design drawings can be found in Appendix H. The feature was designed with three curb cuts, two along Turkeyfoot Road, and one along the entry drive to the campus. These curb cuts accept road runoff and channel it into sediment traps. This will allow for sampling and research of the pollutant load coming off the roadway as well as the volume and quality of the water coming off the roadway. The sediment traps are designed with an access hatch to allow for cleanout and sampling. The stormwater flows from the sediment traps through a rock lined swale and into a series of wetland micropools.

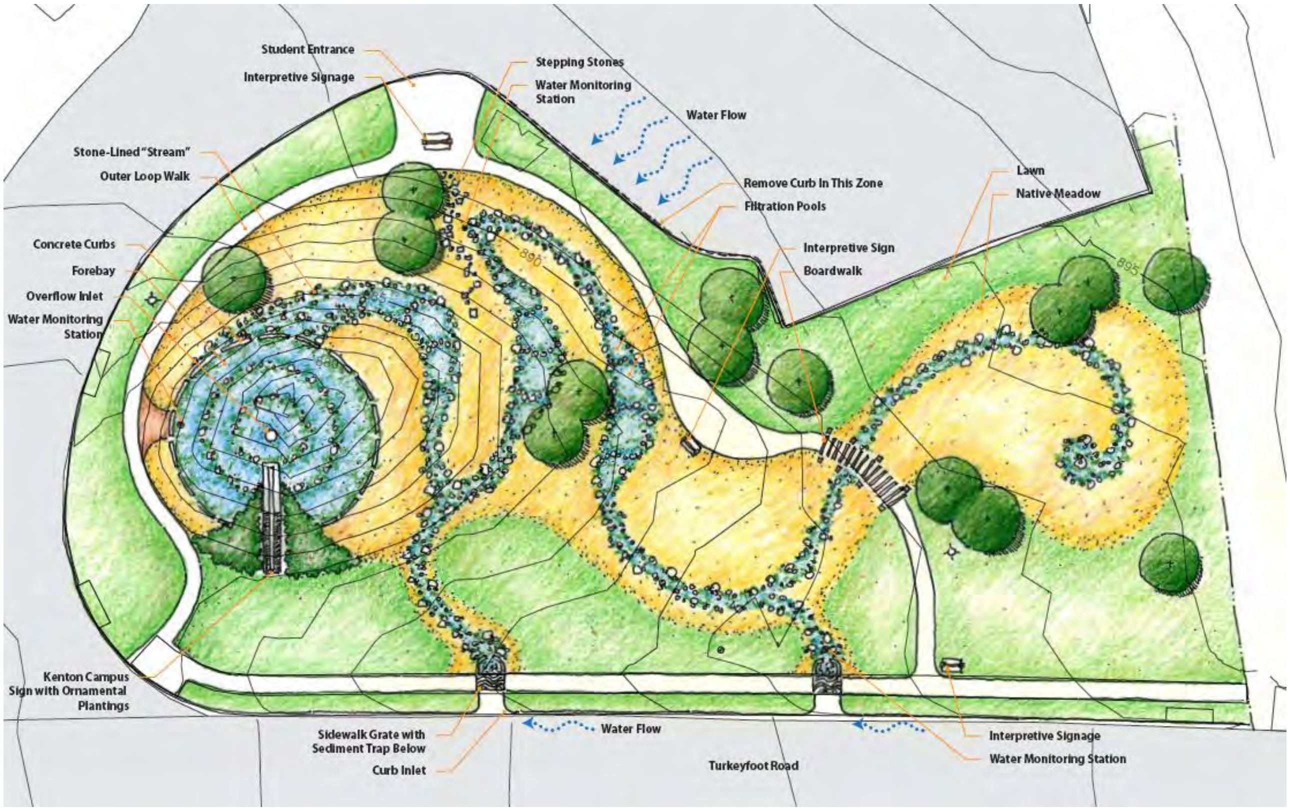


Figure 4.02-1 Conceptual Vision of Entry Biofiltration Feature

The wetland cells will slow the water and allow it to infiltrate through engineered soil, as well as be cleansed by wetland plantings. A gravel storage layer is installed at the bottom of each wetland with the capability of monitoring infiltration into native soils over time. The wetland cells are connected with gravel conveyance chambers with surface plantings; these zones will allow water to travel from one wetland cell to the next while reducing volume through plant uptake. After passing through the series of wetland micropools, the water will enter a large gravel storage chamber. The storage chamber will hold the water while giving it time to infiltrate into the native soils below the chamber. The chamber has a staged outlet control structure that allows for peak flow attenuation of various storm events. The conservative peak flow reduction of various storm events is shown in Table 4.02-1. These flow reductions are conservative because they do not account for the volumetric reductions of stormwater through evapotranspiration and infiltration.

	3-month 24-hour	6-month 24-hour	2-year 24-hour	100-year 24-hour
Peak Outflow Before Raingarden	1.24	1.9	3.98	13.31
Peak Outflow After Raingarden	0.85	1.21	3.38	11.67
Percent Peak Flow Reduction	31.45%	36.32%	15.08%	12.32%

Table 4.02-1 Peak Flow Reduction of Various Storm Events

The water quality benefits of the rain garden were calculated in various ways. One benefit of the rain garden is literature values were used to estimate the benefits of the feature based on known values as follows:

1. Total suspended solids (TSS) reduction over 80 percent.[1]
2. Nutrients and Metals reduction 25 to 90 percent.[2]

This information was utilized during the design process to ensure the feature was making a meaningful impact on the water quality. Upon completion of the design, the water quality benefits were modeled using WinSLAMM, which calculated the water quality benefits as shown in Table 4.02-2. It should be noted conservative parameters were utilized for water quality modeling to ensure the benefits were not overly optimistic.

Figures 4.02-2 and 4.02-3 show several photos of the feature while under construction. Additional photos can be found in Appendix I.

	Pounds Removed	Percent Removed
Phosphorous	4.12	36.8%
TKN	0.67	37.8%
COD	324.87	37.8%
Copper	0.12	40.8%
Lead	1.00	39.0%
Zinc	0.59	37.5%
TSS	706.29	38.4%

Table 4.02-2 Water Quality Benefit in a Typical Year

Figure 4.02-2 Construction Photos

B. Best Management Practices Installed at Turkey Foot As Match

Figure 4.02-3 Construction Photos

Another big result of this project was the BMPs installed as part of the Turkey Foot reconstruction project and, as such, a limited amount of information regarding their design and performance is available.

1. Green Roof and Rain Barrels for Monitoring

The 1000-square-foot green roof is being installed on Turkeyfoot Middle School. The construction is still underway. An in-progress photo is shown in Figure 4.02-4.

Figure 4.02-4 Green Roof under Construction

2. Rainwater Harvesting System

The rainwater harvesting system is almost fully installed at Turkey Foot Middle School. The construction progress photos are shown in Figure 4.02-5.

Figure 4.02-5 Rainwater Harvesting System under Construction

3. Biofiltration Swales

The biofiltration swales are designed to accept stormwater runoff from the parking lot in front of Turkey Foot Middle School. This element of the project will not be constructed until summer of 2010, so no photos are available.

4. Outdoor Classroom

The outdoor classroom is designed for the west end of the school building and incorporates several stormwater BMPs. This feature has not yet been constructed, so no photos of this element are available.

4.03 LONG-TERM RESULTS FOR THE SCHOOL DISTRICT

This project has produced a lot of immediate results on this campus in the form of various BMPs installed today. However, the long-term results of this project are much more far-reaching. The KCSD is now, without question, one of the greenest schools in the country. Not only does it have a showcase energy efficient green school building but also a sustainable stormwater plan for the campus as well. As the implementation of the master plan continues in future years as funding becomes available, more and more of the vision for the campus will be complete:

1. Students will now have opportunities to interact with green stormwater BMPs from elementary school through high school.

2. Universities will partner with the school district to conduct research and collect local performance data on the BMP elements.

3. Residents and community members will interact with the campus and become educated by the features on the site.

4. All stormwater falling on the site will be treated through some BMP. Water quality leaving the site will be improved and volume of water leaving the site will be reduced.

5. Teachers will utilize the outdoor classrooms as inspirational learning opportunities.

6. The features on the campus will be integrated into the curriculum of various grade levels so the future students will have the same opportunities to interact with and learn from the site as the current students do.

These are just a few of the potential long-term results the KCSD can expect to see from this project.

SECTION 5
CONCLUSIONS

5.01 CONCLUSIONS

This section provides an overview of the measures of success as outlined in the project application.

A. Identify the Stormwater Needs and Problems of Campus

1. Documentation of all stakeholder and school board discussions in the form of meeting minutes. All meetings were documented with meeting minutes which can be found in Appendix B.

2. Records including conversations and input from the community members and students (perhaps in the form of a survey). Surveys were conducted, and the results of the surveys can be found in Appendix F.

3. Water quantity data previously gathered by SD1 and calculations identifying the need for BMP and stormwater controls on the site.

    a. SD1's water quality data for Bullock Pen Creek provided a basis for assessing the surface water conditions of the subwatershed this site discharges to. All the water quality and source assessment data for Bullock Pen Creek has been summarized in Appendix K.

    b. The fecal coliform source assessment data indicated over 65 percent of the total fecal loading in Bullock Pen Creek comes from developed lands, such as the school campus.

    c. The phosphorous data indicated that over 51 percent of the total phosphorous loading in Bullock Pen Creek comes from developed lands, such as the school campus.

    d. The TSS data for Bullock Pen Creek attributed over 61 percent of the TSS loading to streambank erosion, often caused by excessive volumes of stormwater being discharged rapidly to the streams.

    e. All the water quality data supports the development of green stormwater BMPs on the campus to slow, reduce, and cleanse the water prior to discharging from the site.

B. Design an Aggressive and Adequate Solution

1. Complete Concept Plan (Master Plan) and Some Detailed Engineering Designs for Site

    a. The master plan was completed and can be found in Appendix G.

    b. The detailed engineering drawings were completed and can be found in Appendix H.

c. Design calculations for the biofiltration feature can be found in Appendix J.

2. Plan Approval from Facilities Director, School Board, and Other Key Stakeholders and Project Leaders

Plan approval was obtained throughout each phase of the design process.

3. Plan Approval from Kentucky Division of Water

KDOW approved all materials throughout the project.

4. Provide Projected Stormwater Pollutant Removal and Quantity Reduction

Modeled volumetric reductions and water quality benefits are provided for the biofiltration feature in Section 4 of this report.

C. Implement Selected Water Quality and Quantity Best Management Practices

1. Complete Best Management Practices Implementation Plan for the Selected Best Management Practices

BMP Implementation Plan was completed and is included as Appendix C of this report.

2. Best Management Practices Implementation Plan Approval from Kentucky Division of Water

BMP Implementation Plan was submitted to KDOW and approved in February 2010.

3. Completed Implementation of the Selected Best Management Practices

The selected BMP was implemented fully in April 2010.

D. Establish the Green Stormwater Design as an Educational Tool

1. Attendance Numbers at Educational Programs and Field Days During Project Duration

Education was incorporated into all meetings throughout the project.

2. Number of Students Providing Input Through the Design Process

Students were actively engaged in various steps throughout the design process. In total, more than 75 students (from grades 2 to 12) participated and provided input into the design of the master plan.

3. Number of Media Productions During Project Duration

Throughout the duration of this project, local news crews filmed two events. A video was produced to tell the story of the campus, various news articles were published, and the project progress has been posted on the school district Web site.

5.02 RECOMMENDATIONS AND LESSONS LEARNED

Throughout the duration of this project, our team was able to identify methods that worked really well, as well as some methods that were not as effective. This section outlines our recommendations based on what we have learned through this project.

A. Organization of Stakeholder Meetings

Our team organized the visioning committee, the student advisory group, and the core design team as three separate stakeholder groups. This method worked extremely well because it allowed the visioning committee to be inclusive and engage a huge number of people and organizations from different perspectives for brainstorming, information dissemination, and design input. However, because of the nature of this large group of diverse people, it would have been nearly impossible to come to a consensus and make decisions. Therefore, decisions were left up to the smaller core group of people who could quickly and easily make informed design decisions. The student advisory group was also kept separate. This worked well because the students were not put into an uncomfortable or intimidating situation by being combined with large groups of adults. As a result of this process, we received really impressive and relevant input from both the student advisory groups and the visioning committee. We would recommend this method of organization for future projects. Additionally, our team believes the more stakeholder input you can get on the front end, the better the end result will be.

B. Collection of Input from Stakeholders

Our team used multiple methods to collect information from the stakeholders we felt were very effective. We utilized prioritization surveys that collected rankings of various information. We utilized question surveys which prompted the respondent to provide a written response to an open ended question. This allowed people to voice their specific ideas or concerns as they related to their profession. We utilized open forum discussions that allowed for participants to bounce ideas and thoughts off one another, to get feedback, and draw out some of the ideas. We utilized a “sticky note” forum where students could shout out ideas for BMPs or campus amenities and they were documented on sticky notes. We would recommend the use of various methods to obtain information as it allows for everyone to have input and it reduces the chances of “group think” type of problems.

C. Construction of BMPs

Our team feels that upon completion of a planning effort, it is easy to lose momentum and the planning becomes difficult to implement. To prevent this from happening, our team ensured that upon completion of the Master Planning process, several of the BMPs were constructed. This not only started to allow the vision to come to life, but it allowed so many of the stakeholders to see that their input mattered and that this project and its impacts are real. This kept the momentum of the project going and inspired many involved to keep thinking in a way to improve water quality. We would recommend that even for planning efforts; if you can construct a component as well, it is highly impactful.

D. Designer Input and Review During Construction

One shortcoming our team identified was not allowing for enough input from the Design team during the construction process. Because of the unique nature of BMP construction, it is very important to monitor the construction process and ensure all elements are installed properly and all materials are appropriate. Our team has learned it is important to plan and scope adequate time for the designers to visit the site throughout construction to allow for these inspections.

SECTION 6
LITERATURE CITED

6.01 LITERATURE CITED

[1] EPA Menu of Stormwater BMPs, *Pollutant Removal Effectiveness of Two Bioretention Areas in Maryland*, http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm (May 16, 2007).

[2] North Carolina State University Cooperative Extension, *Urban Waterways*. *Bioretention Performance, Design, Construction, and Maintenance*. www.bae.ncsu.edu/stormwater/PublicationFiles/DesigningRainGardens2001.pdf

APPENDIX A
FINANCIAL AND ADMINISTRATIVE CLOSEOUT

Application Outputs

Kenton School's Milestones

Milestone	Expected Begin Date	Expected End Date	Actual Begin Date	Actual End Date
1. Submit all draft materials to KDOW for review and approval	Duration			4/2010
2. Submit advanced written notice on all workshops, demonstrations, and/or field days to the Cabinet.	Duration			4/2010
3. Submit Annual Reports	Duration			4/2010
4. Conduct meetings with project partners	12/2008	8/2009	12/9/2008	4/2010
5. Compile information and site data	12/2008	12/2009	12/5/2008	3/25/09
6. Review site data for green opportunities	12/2008	1/2009	12/5/2008	5/30/09
7. 2-3 meetings with students and faculty to gain input and encourage education	12/2008	7/2009	5/2009	9/2009
8. Perform site visits as needed	12/2008	7/2009	1/2009	4/2010
9. Develop recommendations for green site BMPs	12/2008	4/2009	1/2009	9/2009
10. Create stormwater conceptual plan (Master Plan)	12/2008	8/2009	3/2009	9/2009
11. Produce concept plan documents	2/2009	8/2009	7/2009	9/2009
12. Obtain approval of concept plan from stakeholders	5/2009	8/2009	5/2009	12/2009
13. Perform detailed design for small components of concept plan as budget allows	3/2009	7/2009	12/2009	2/2010
14. Submit the finalized conceptual designs (Master Plan), and the smaller detailed designs to KDOW for review and approval	6/2009	7/2009	11/2009	2/2010
15. Present green stormwater concepts to the community and students as an educational program	3/2009	8/2009	7/2009	4/2010
16. Select BMPs for implementation	7/2009	8/2009	8/2009	9/2009
17. Submit BMP Implementation Plan to Kentucky Division of Water for review and approval	8/2009	8/2009	2/2010	2/2010
18. Implement selected BMPs	9/2009	3/2010	4/2010	4/2010
19. Conduct field day(s) during implementation	10/2009	3/2010	3/2010	4/2010
20. Recommend future educational options for faculty and community	7/2009	3/2010	6/2009	4/2010
21. Submit three copies and CD of the Final Report and submit three copies of all products produced by this project	3/2010	3/2010	4/2010	4/2010

Budget Summary

ORIGINAL Budget

Budget Categories (Itemize all Categories)	§319(h)	Non-Federal Match	TOTAL
Personnel		$4,000	$4,000
Supplies			
Equipment			
Travel			
Contractual	$138,000	$88,000	$226,000
Operating Cost			
Other			
Total	**$138,000**	**$92,000**	**$230,000**

REVISED Budget

Budget Categories (Itemize all Categories)	§319(h)	Non-Federal Match	TOTAL	Final Expenditures
Personnel		$65,000	$65,000	$ 54,442.29
Supplies		$1,000	$1,000	$ 844.48
Equipment				
Travel		$500	$500	$ 319.00
Contractual	$195,086	$63,557	$258,643	$ 269,537.23
Operating Cost				
Other				
Total	**$195,086**	**$130,057**	**$325,143**	**$325,143**

This budget revision was approved by KDOW. The purpose of this revision was to increase the overall budget for the project as a result of additional funding that had become available for the project.

Kenton County School District was reimbursed $195,086 All dollars were spent; there were no excess project funds to reallocate.

ATTACHMENT A

Section 319(h) Nonpoint Source Project Progress Report

Reporting Period: 3rd Quarter **Grant No:** C9994861-02 **State:** Kentucky

Project Name: Stormwater Masterplan for Kenton County Schools

Contractor: The Kenton County School District
1055 Eaton Drive
Fort Wright, KY 41017

Budget Period Start Date: _01/01/10_ **End Date:** 04/30/10

Total Project Cost: _$325,143____

Expended this Period: __$92,201.55____
Total Expenditures to Date:_$325,143__

Waterbody/Watershed Identification: Bullock Pen Creek of Banklick Creek Watershed (Doe Run Lake) in Kenton County

NPS Category: Other: Continues watershed planning support and education

Purpose Statement: The goal of this project is to manage the stormwater from a three school campus in Kenton County in a way that will showcase various green stormwater initiatives. The project will result in the development of a campus master plan which will manage stormwater and minimize the potential for water quality impacts from the site. The plan will incorporate a variety of best management practices and will become not only an educational tool for the school district, but also a model for future stormwater management designs.

Kenton School's Milestones

Milestone	Expected Begin Date	Expected End Date	Actual Begin Date	Actual End Date
1. Submit all draft materials to KDOW for review and approval	Duration			**4/2010**
2. Submit advanced written notice on all workshops, demonstrations, and/or field days to the Cabinet.	Duration			**4/2010**
3. Submit Annual Reports	Duration			**4/2010**
4. Conduct meetings with project partners	12/2008	8/2009	12/9/2008	**4/2010**

5. Compile information and site data	12/2008	12/2009	12/5/2008	3/25/09
6. Review site data for green opportunities	12/2008	1/2009	12/5/2008	5/30/09
7. 2-3 meetings with students and faculty to gain input and encourage education	12/2008	7/2009	5/2009	9/2009
8. Perform site visits as needed	12/2008	7/2009	1/2009	**4/2010**
9. Develop recommendations for green site BMPs	12/2008	4/2009	1/2009	9/2009
10. Create stormwater conceptual plan (Master Plan)	12/2008	8/2009	3/2009	9/2009
11. Produce concept plan documents	2/2009	8/2009	7/2009	9/2009
12. Obtain approval of concept plan from stakeholders	5/2009	8/2009	5/2009	12/2009
13. Perform detailed design for small components of concept plan as budget allows	3/2009	7/2009	12/2009	**2/2010**
14. Submit the finalized conceptual designs (Master Plan), and the smaller detailed designs to KDOW for review and approval	6/2009	7/2009	11/2009	**2/2010**
15. Present green stormwater concepts to the community and students as an educational program	3/2009	8/2009	7/2009	**4/2010**
16. Select BMPs for implementation	7/2009	8/2009	8/2009	9/2009
17. Submit BMP Implementation Plan to Kentucky Division of Water for review and approval	8/2009	8/2009	**2/2010**	**2/2010**
18. Implement selected BMPs	9/2009	3/2010	**4/2010**	**4/2010**
19. Conduct field day(s) during implementation	10/2009	3/2010	**3/2010**	**4/2010**
20. Recommend future educational options for faculty and community	7/2009	3/2010	6/2009	**4/2010**
21. Submit three copies and CD of the Final Report and submit three copies of all products produced by this project	3/2010	3/2010	**4/2010**	**4/2010**

STATUS OF KENTON SCHOOL'S MILESTONES

Provide a brief sentence or two explaining the progress of each milestone. Highlight the new work completed.

1.) The draft power point presentation, and agenda was submitted to KDOW for approval prior to the visioning committee meeting. KDOW representatives were also invited to join the Core group so that they could be involved in the process, as well as view the materials prior to the visioning meetings. This process has been mutually beneficial by allowing greater interaction with KDOW officials and involved them and their input throughout the design and development processes. **All draft materials were reviewed by KDOW for the duration of the project. This task is complete.**

2.) Written invitations were provided to KDOW staff members for all visioning committee meetings, as well as CORE meetings that were held this quarter. **Invitations were extended for all pertinent events. This task is complete.**

3.) **Our project final report is being submitted 4/30/10 in lieu of an annual report. This task is complete.**

4.) An internal kick off meeting was held with Strand Associates, Kenton County School District, and Human Nature to begin formulating a strategy for the development of the campus masterplan. Two key groups have been created; the first is a core working group which includes representatives from Turner Construction, Kenton County School District, Strand Associates, and Human Nature The second group is a Visioning Team with includes over 40 individuals from partnering organizations such as Duke and Toyota, KCSD faculty members, political representatives, as well as members from the core group. The idea is for the visioning group to provide input, guidance, suggestions, and ideas so that the core work group can utilize this input to formulate the actual campus masterplan. Currently meetings are scheduled in Jan for the core group, and Feb for the visioning group. The first core meeting was held Jan 13 at Caywood, and the first Visioning meeting was held Feb 12 at Toyota. The visioning meeting was attended by over 40 critical people in Northern Kentucky who will be instrumental to the advancement of this effort. This meeting was viewed by many as a huge success that added support, momentum, and stakeholder input to this master planning process. An additional core meeting was held Friday March 13th at Piaskovy's (architect) office. Additional visioning and core meetings are scheduled for the second quarter. The core/visioning process has been working very effectively to solicit input from a large group of important stakeholders, and then to digest and process that information with a small core group of individuals close to the implementation of the plan. A core group meeting was held April 14 to preview materials and discuss the format of the upcoming visioning meeting. The visioning meeting was held April 23 at Turkeyfoot which occurred in conjunction with the school disctricts "Green Million" Earth Day celebration. An additional Core meeting was them held on May 7 at the SD1 board room to review all of the feedback from students and the visioning committee – the result of this meeting was choosing the alternative master plan design for the campus. On June 24 a core group meeting was held to review the master plan vision, and provide feedback before it was finalized. On Sept 22 a core team meeting was held to finalize the masterplan concepts and provide feedback. On Dec 2, 4 representatives from KDOW came to the school site for a site visit and project review. The conceptual plan for the BMP as well as the overall campus masterplan were presented. All KDOW representatives in attendance approved of the conceptual plan. **Various meetings were conducted with project partners during the completion of the design drawings and the construction of the BMP. This project is complete.**

5.) Strand Associates and Human Nature have acquired site plans, calculations, site photos and site information. Additional data is being collected from Kenton County School District. A great deal of site data and information has been compiled including property lines, adjacent property owners, building layouts and future plans, traffic flow data, parking spaces available and planned, future site usage, locations of known constraints (geothermal wells, exist buildings, non-cooperative property owners, etc.) The visioning and core meetings allowed opportunities for stakeholders, staff, and other community members to voice their opinions about the site, and add additional information. At this point, almost all of the data that could be gathered about the site has been. This task is complete.

6.) Strand Associates and Human Nature have begun a preliminary brain storming session to determine where the opportunities for green infrastructure may exist, and which areas of the site were not available as a result of previously planned construction. The site information has been more thoroughly reviewed for green opportunities – a wide variety of options will be proposed based on topography, soil types, available space, and functional needs, this grant will fund at least 1 in place BMP. Also, after reviewing the site for green opportunities, the Kenton County School District is able to fund a rainwater catchment system, parking lot bioswales, an outdoor green classroom, and a green roof demonstration. All of the design costs and construction costs of these features will go toward the match for this grant. In this quarter, only design fees have been included for match. Additional site data was collected periodically throughout this quarter as the design progressed – we obtained feedback and input from student groups, stakeholder groups, and faculty that was useful for developing the master plan vision. This task is now complete.

7.) 2 meetings were held this quarter with students to gain input, Human Nature met with a student group from Kindergarten through high school to present the overall project to them, and solicit their input and ideas. Another meeting was held with Mr. Hanner's Superintendent Student Advisory Group. All high schools, the Success Academy, and Patton were involved. Turkey Foot Middle School and Caywood Elementary were also involved. The comments, without a doubt, will provide great insight to what our students are thinking and will shape the future of the campus. Faculty input is being gained through the visioning committee meetings which include several staff members from the campus. This quarter, students were invited to attend the visioning meeting where they provided feedback along with the stakeholder group. Also, the faculty engagement has increased tremendously. Several faculty members have been involved with the core group as well as with the visioning committee, but in addition, KCSD has been working very hard to gain teacher input to create the appropriate curriculum that works with the green infrastructure elements that have been incorporated into the site. The school district is working within the required core content structure to create opportunities for students to learn from the site. This quarter on July 21, a meeting was held that allowed the students to review the masterplan and each concept sketch to provide feedback and ideas. Secretary Miller was present at this meeting to encourage the students and witness their ideas and suggestions.

About 35 students from various classes and grade levels were invited to this event to provide input. All of the student suggestions were meaningful and impressive, these suggestions were documented, and were incorporated into the masterplan. The way that student input shaped the masterplan is one of the most impressive elements of this project. Also in attendance at this meeting were news crews and newspaper writers to document the event.

8.) Several site visits have been made to the site to take photos, explore opportunities, and evaluate the site. Future visits are planned as this project is further developed. No major site visits were needed this quarter, though meetings on the campus did allow for multiple visits to stay in tune with the construction progress. Various site visits were performed this quarter to obtain survey information and site photos. **Various site visits were conducted during the design and construction phases of this project. Construction photos are included in the final project report. This task is complete.**

9.) Recommendations for green site BMPs are being solicited from the visioning committee, the students, the core group, and they are being filtered through the engineering/LA team of Strand and Human Nature. All of the suggestions, and ideas for the site are being incorporated together to develop a unique vision for this site that will include educational, and functional BMPs for students of all grade levels. Green BMPs have been recommended as part of the master plan throughout the site. The final remaining piece is to choose which BMP will be carried forward to full design. All BMPs have been included in the masterplan, the core groups choose the BMP to be implemented as a raingarden feature in the front entry way to the campus. This raingarden will hold the campus entry sign (not part of this grant), and it will showcase green stormwater controls on the site. The raingarden will have gravel subsurface storage, wetland treatment cells, monitoring locations, a sediment trap, and our hope is to direct runoff from the turkeyfoot roadway into the BMP to cleanse the water. This task is now complete.

10.) The stormwater master plan is one of the end results of this process, it is evolving and developing out of the meetings with the core group, visioning, committee, students, regulators, etc. The master plan is in progress. The master plan has been created, and has received feedback from the core group, now it is getting its final revisions, and will be revealed to the public next quarter. The master plan as been finalized, and three conceptual sketches have been prepared to help sell the idea for the campus and solicit funding. This task is complete.

11.) Concept plan documents are the documentation of the master plan – these documents are being produced in draft form along with the development of the master plan vision. These documents are being finalized. The documents showing the concept plan and the site sketches have been completed. These were delivered to KCSD as mounted poster boards, and also as electronic files for future use to market the campus. This task is complete.

12.) As ideas and concepts are generated, they are presented to the visioning committee and the core group for feedback and direction. The final approval from the stakeholders will occur after the final masterplan vision is complete. This quarter both the core group and the visioning committee have has input into the master plan and have seen the vision for the campus as it is developing. The concept plan has been approved by the core group, and has received positive feedback from the visioning committee throughout the meetings. This task will be finalized when we circle back with the visioning committee one last time to wrap up the project. The concept plan was presented to KDOW in December 2009, and was approved. This task is complete.

13.) Detailed design of the raingarden began after the concept plan was approved by stakeholders including KDOW. A site survey was conducted by the design engineer in December. **The engineering design for the biofiltration BMP was completed in January and February. This task is complete.**

14.) Masterplan and concept plan were submitted to KDOW for review and approval. **The design drawings were submitted to KDOW for review and approval. This task is complete.**

15.) The stormwater concepts have been presented as educational opportunities all along. The school has engaged Kentucky state educators to try to work the educational elements into the core curriculum, and the masterplan has presented options for educational stormwater lessons throughout its development. **The BMP was designed with educational elements incorporated into it – KCSD is working with local universities to develop an educational program that meets core curriculum while utilizing the site as an educational tool. This task is complete.**

16.) The BMP that will be constructed is being chosen – this has been discussed at several meetings, and we will make a decision in the third quarter and then proceed with design. The BMP selected for design is the raingarden at the entry way to the campus. This task is now complete.

17.) **The BMP Implementation Plan was submitted to KDOW in February for review and approval. This task is complete.**

18.) **The biofiltration BMP that was designed began construction in March of 2010. The BMP is fully functional as a stormwater feature by the completion of this grant in April 2010. Finishing elements that have been funded through a partnership with SD1 may be completed in May of 2010. This task is complete.**

19.) **A field day and celebration event will be held on May 19th. This event will celebrate the completion of the BMP with a ribbon cutting ceremony, as well as celebrate an energy grant that the school received. This event will invite all stakeholders that were involved throughout the process. This task is complete.**

20.) As the masterplan is being developed, the future usage of the site is being considered, the potential expansion of Patton into a STEM academy, the inclusion of the military SUCCESS academy on site, the additional functions of the site for a community amenity, the maintenance needs, and the future BMPs that may need to be funded piece-meal and not as a part of this grant are being called out and included in the master plan for the future of the site. All of these future uses will present educational opportunities from this site – another future effort will include the development of green curricula that supports the site functionality, and will ensure continued use of these facilities through the years. The faculty is working very closely with the campus master planning staff to develop curriculum to support the site elements – this will make BMP education very easy to integrate into the site. This has been ongoing, and the faculty are working to incorporate the stormwater BMPs and outdoor classrooms into their future curriculum. **Future educational options were recommended throughout the design and implementation process. KCSD has already begun acting on some of these recommendations. This task is complete.**

21.) **The final report (3 hard copies and 1 electronic file) will be submitted to KDOW on April 30th, 2010. This task is complete.**

PREPARED by:

______________________________ ________________

Kelly M. Kuhbander, Project Engineer Date

INVOICE

Section 319(h) Nonpoint Source Project

Reporting Period: 1st Quarter 2010 Grant # C9994861-02

Project Name: Kenton County School District Campus Stormwater Masterplan

Contractor: Kenton County School District / Strand Associates
1055 Eaton Drive Fort Wright, KY 41017

BILLING THIS PERIOD:

Budget Categories	319(h) Dollars	Match	Total
Personnel			$ -
Supplies			$ -
Equipment			$ -
Travel			$ -
Contractual	$ 92,201.55		$ 92,201.55
Operating Costs			$ -
Other			$ -
TOTAL:	**$ 92,201.55**	**$ -**	**$ 92,201.55**

REIMBURSEMENT AMOUNT (60% of Total) = $	**$ 55,320.93**

CUMULATIVE BILLING:

Budget Categories	319(h) Dollars	Match	Total
Personnel	$ -	$ 54,442.29	$ 54,442.29
Supplies	$ -	$ 844.48	$ 844.48
Equipment	$ -	$ -	$ -
Travel	$ -	$ 319.00	$ 319.00
Contractual	$ 195,086.00	$ 74,451.23	$ 269,537.23
Operating Costs	$ -	$ -	$ -
Other	$ -	$ -	$ -
TOTAL:	$ 195,086.00	$ 130,057.00	$ 325,143.00

APPENDIX B
AGENDAS AND MEETING MINUTES

THE KENTON COUNTY SCHOOL DISTRICT
A System of Excellence
1055 EATON DRIVE / FORT WRIGHT, KENTUCKY 41017
TELEPHONE: (859) 344-8888 / FAX (859) 344-1531 / WEBSITE: WWW.KENTON.KYSCHOOLS.US
Tim Hanner, Superintendent of Schools

The Kenton County School District
STEM Visioning Meeting
February 12, 2009
3:00 p.m. – 5:00 p.m.

- Welcome
- Introductions
- Overview of the Kenton County School District
- Overview of Design Process
- Presentation on Campus Design
- Q&A and Visioning Survey
- Overview of Next Steps

Human Nature, Inc.
990 St. Paul Place
Cincinnati, OH 45206
T: 513.281.2211 F: 513.281.2243
www.humannature.cc

Meeting Notes

DATE: February 20, 2009	FROM: David Whittaker & Chris Manning
PARTICIPANTS: See Sign-in Sheet	
DISTRIBUTION:	PAGE 1/11
RE: Kenton County Green Campus Visioning Meeting	MEETING DATE: February 12, 2009

The following notes outline the survey feedback results and notes taken during the Visioning Team meeting.

Tim Hanner, superintendent for the Kenton County School District, gave a brief overview of the District's green initiatives and activities and outlined the vision for the STEM campus.

Human Nature presented the following topics in a slide presentation:

- Overview of the design process
- Overview of campus design elements
- Overview of green campus elements
- Inventory and analysis diagrams outlining the opportunities and constraints for design
- List of existing/potential green components that may be incorporated into the campus plan
- Survey for feedback about green campus

Campus Vision Survey Results

1. When you think of the qualities that contribute to a great campus, or better yet a great green campus, how would you describe them? Please feel free to provide specific green ideas, if you like.

- Need to consider waste management of the students, how to capture/recycle or eliminate waste; how are you going to measure your progress i.e. energy reduction, water reduction, waste reduction, CO2 reduction, GHG reduction.
- Outdoor classrooms, wetland classrooms, wind generation, solar, better vehicular patterns, "green" icon.
- I think of grass and trees, gardens, and fountains. Geothermal, solar and solar thermal systems are a must. They should be installed in a way they serve as laboratories for students. Use solar thermal to collect water and heat it for use by campus. Recycling.

- I think of a place which is appealing to eye as well as functional. A place which draws students and teachers outside to learn rather than area to just pass through on the way to class.
- Easy access to all buildings – plenty of opportunities for students to be outside (safely) learning about flora/fauna and the powers of nature – wind/soar.
- Green spaces with pedestrian ways meandering to specific buildings or activities – good social gathering included.
- Landscaping should be incorporated throughout parking lots, walkways, drive, etc.
- Green areas and design of landscaping, waterfalls and plants that grow within the area.
- Use of outdoor space – outdoor classrooms, learning from the environment.
- Live plants, green leaves, trees, flowers, etc.
- Greenspace; features that provide various environmental benefits: air quality, water quality, solid waste management/recycling, energy efficiency.
- Hands on learning for the students/Interaction of the older students teaching the younger students/possible compost for wasted food from breakfast and lunch.
- I would like to make sure that the campus would be beneficial and include opportunities for all students (elementary/middle and high-school). A way to update students using technology (website).
- Use of renewable energy to power the school and save the school money. Green space, walking paths.
- Functional – needs to safely meet needs of all students, faculty and visitors. Forward thinking – should be built to incorporate future technology/ideas. Fun – we are talking about kids, they need to be able to have fun.
- Lots of trees, free of visual clutter, quiet, wind breaks so one can walk across campus in colder weather.
- Cohesive designs and functional green space are both very important elements. Creating useful areas that provide educational and aesthetically pleasing functions.
- Green buildings, wetlands, good campus design to encourage pedestrian movement and discourage vehicular movement, vegetation (native), permeable concrete, good environmental education to better utilize these campus modifications. Energy and water conservation, waste reduction; informed teachers that utilize space; research/data collection; good air quality; energy production; use less paper.
- Sustainability – students should understand where energy, food, and water come from as well as where they go. 100% recycling in cafeterias, maybe even be actively involved in growing the food served at lunch as well as being in charge of cistern maintenance and energy sources upkeep. Every student should have a daily job!
- There are plenty of opportunities for student movement safely and orderly through the campus while utilizing unnecessary space for items that enhance the attraction of the campus.
- Parent and student friendly. Campus maintenance.
- Highly visible signage directing pedestrian/auto flow as well as informing (educating) students/visitors about the campus they are on. Zero landfill.
- A site that provides a learning experience for the students and the surrounding community. This site is at a key location and could be used to educate people beyond the student body.
- Ensuring that students are fully aware and exposed to the unique/innovative learning opportunities available and bringing on board “adjunct-like” faculty/educators into the curriculum.
- Aesthetics, state-of-the art technology, BMPs, local flavor, sense of ownership; hub of activity; overall sense of master plan rather than a piecemeal look.

- Hands-on and traditional learning. Opportunity for students to understand green and their contribution to the environment while also introduction them to careers in green industries. Plus campus is a role model for conservation, efficiencies, etc. A model for other employees, schools, etc. to replicate.
- A campus that can be used by the whole communities. Other schools, colleges, green technology industries.
- A connection, keeping a flow from point A to point B. I would also like to see a courtyard that incorporates a landscape that is useable as an outdoor classroom or meeting area.
- Connectivity to the community, enabling students, teachers, others to access without driving. Use each component (both built and natural) as a learning opportunity. Incorporate maintenance as part of learning strategy, and sustainable practices that can be replicated at homes and businesses in the community.
- A great, green campus helps students holistically understand how human and natural systems interact. Example student should have garden/orchards to grow local food as an energy saving strategy.
- Inviting, easy in-easy out, provides visitors/user reason to linger. Recycling in all aspects.
- Solar, wind, hydro? Green construction – bamboo, water collection and storage – maintenance, recycling capabilities, waste management (grease, etc.).
- Using open, well lighted rooms, solar and geothermal HVAC, wind generated electric. Runoff water for flushing commodes. Plants and grasses, trees for shade and windbreaks
- Visually beautiful.
- Cohesive design; themed campus.
- Accessibility for students to use as natural learning labs. Incorporate as many different aspects as possible even if it is on a small scale. Wind, solar, recycling.

2. When you think of the existing campus for Caywood, Patton, and Turkey Foot, what existing strengths should be accentuated, what existing weaknesses need to be improved, and what potential barriers might arise?

- The greenspace should be accentuated, wetlands, wildflowers, etc. Eliminate mowing.
- Strengths – the buildings (Caywood & Turkeyfoot). High performance features esp. day lighting. Weakness – lace of landscaping, disjointed traffic patterns. Barriers - funding and compact side.
- Accentuate the water body. Strength is quite simply the unique approach you are taking to build this campus. Weakness is lack of existing trees and foliage.
- One weakness is a lack of wildlife habitat. Mainly attractive flowering landscape plants were used but not very wildlife friendly. Even the grass is not the type wildlife would use. A large outdoor activity area out of traffic areas is needed (or with a low wall barrier). Let’s use a variety of wildlife attracting trees – not “matching”.
- The greenspace in front of campus should be utilized. However, the house in the middle is a barrier. Additionally, it appears from the road as though you only see the back of Caywood. Turkeyfoot’s design may pose this same problem. We need a circle drive or something?
- Strong consideration to buffering site along Turkey Foot Rd. and residential area behind. Stormwater management needs to be more than just detention/retention areas. Ball field needs to be given strong consideration/BMPs.
- Buildings are currently very disjointed. Entrances to buildings for public are poor. I do think the buildings want to be clearly defined as separate facilities, but also part of the larger campus.

- Walking paths, curb appeal to improve parking space area. Overall looks.
- Weakness – lack of parking at Caywood – when there are special programs there is not enough parking. Strength - proximity to universities, H.S., park, water. Need – more playground area for Caywood.
- Strength – Access each by walking. Weakness – They sit isolated. Doesn't blend together well.
- Strength – location, great access to regional employers that may have interest in STEM – SD1, NKY Water, SEMC, Fidelity, Toyota, NKY, CVG Airport, Thomas Moore. Weakness – traffic/pedestrian accessibility, reliance on cars
- Weakness at Caywood is the Styrofoam trays used at lunch. If we are going to be a green campus we need to find a solution to this habit harming the environment.
- The shelving that Caywood has and that Turkeyfoot will have is beneficial because it allows the light to be evenly disbursed in the room, but sometimes we receive too much of a glare in the classroom.
- Co-location increases the chances of building a strong STEM interest. Vehicular traffic is throughout the campus.
- Need to build on success – energy efficiency and green infrastructure. Need to change things that are not working – traffic flow/front door appeal.
- Strengths – building occupants (students, teachers, staff) who understand their campus and how to use it. Excellent location in the community, high visibility, easy access for I275.
- The existing body of water on the adjacent property can be used in proper relationships are formed with the property owner that neighboring property has great potential.
- The good central location to neighborhoods and community buildings – makes pedestrian travel/bus transport easier; greenspace surrounding the campus. Weakness is traffic and current lack of greenspace usage. Teachers need to be taught how to use these greenspaces while still teaching current curriculum (environmental education)
- Strengths – areas that retain water should be wetlands, nearby streams should be restored, and reforestation of natural areas. This will provide students with major ecosystems to be studied. Weakness – is the "front yard" area being utilized?
- Strengths would be the wide area of frontage to provide safe vehicle traffic. Weakness would be the building set up as it exists now for creating a green campus which leads to the barrier of creating this campus while at the same time not interrupting the current school day.
- I think the possibilities are unlimited. I do think space will be of issue and the amount of environmentally sound ideas that can be incorporate. Campus maintenance?
- There are some old growth trees on site that if at all possible need to the saved. Personal property sits directly in front of the campus (facing TF Rd.). Possible negotiations with owners to acquire.
- Strengths: location, location, location - use this site's location as a benefit, convenient to many communities and visible from a main road. Another strength is that learning communities of many backgrounds and areas are all located on this site. This site is also close to other environ. Organizations: SD1, Tank, TMC, etc.
- A lack of "traditional" high school on this campus – although Patton serves this student population, it doesn't touch all its students.
- Strengths – 2 new buildings, all 3 grade levels, great vision. Accentuations - whole environment as a learning opportunity. Barriers – space considerations, surrounding structures

- Space seems to be obstacle – not much room with housing all around. Model – Caywood is a great start. Funding is barrier – and distance from this site to Dixie with major hwy. Student pedestrian issues if connectivity to high school.
- Drainage – I would like to see storm drainage used to power a small hydro electric plant that would continually circulate the water through the pond systems.
- The land around the area should be highlighted and sued as education area. Trees that have names on/around them so they can be easily identified.
- Strengths – natural features, esp. woodlot (about 15-18 yrs. ago this area was being developed as an outdoor learning area, as were courtyards, etc at the school. The effort enjoyed litter support from administration). Weakness – traffic flow, both pedestrian and automotive. Involve the immediate community in decision on redirecting access.
- The major strength is the commitment you have to a green campus. Also, existing land and water feature are a plus. The amount of impervious surface is a major issue.
- Its visibility, enhance the image, provide easy access from/to high school, redesign of TD Patton building to be more inviting.
- Are athletic fields going to limit what you can do? How can they be made green?
- Not familiar enough with campus.
- Strengths are the students. Weakness, I'm not sure. Barriers, I'm not sure.
- Potential barrier – setting up a cohesive structure so everyone utilizes the campus. Designing everyday instruction around campus.
- Strengths – New buildings containing green technology. Different levels of students nearby (elementary, middle, high school nearby). Blank canvas allows us to create. Weakness – great deal of vehicular traffic with 3 buildings (parking needs, etc.). Potential barriers – financing to do it the right way in a timely manner.

3. As you imagine the campus taking on some bold green dimensions, as the new high performance buildings have, what role(s) do you think the automobile (cars and buses) should play in the new campus organization? What ideas do you have to minimize the impacts of the automobile?

- Limit the idle time, good flows, provide prime parking for carpools and hybrids.
- In many ways the automobile should not be minimized, but used as a teaching tool. The society is currently automobile driven, but needs education. The automobile is and will evolve. Encourage car pooling, have bike trails, and shuttles from around the community.
- A no idle zone would help clear our air. Bus and parent pickup could turn off the vehicles. The parking lot swales would be terrific. I'd like to see a staff car (bus?) powered by and plugged in to a solar panel or wind generators on site: community recycling dumpster in parent pickup zones. Students could take recyclable from car on Fridays to encourage drop off – glass, plastic, cans.
- Currently at TF parent parking is a distance from the campus and parents park and walk to pickup or students are dropped off in walk. However, students do cross what could be a busy driveway. I'd love to see parking at a distance but in a safer way.
- Vehicular traffic should be limited to certain areas – have drop off areas that add interest to site design – paths from parking areas should also be interesting.
- I like the ideas of some sort of pedestrian connection to the Dixie campus, but don't know how that could work.

- Reduce automobile movement on campus and use screening materials to reduce sight of bus and cars.
- Automobiles should be minimal. Aside from staff and student drives at Patton, there is not a lot of traffic (once parked, cars usually aren't accessed for hours at a time).
- Carefully analyze need for parking, provide incentive to teachers for carpooling and students for busing, think about options for overflow event parking, alternative paving and grass pavers materials.
- Parking is already an issue at Caywood. I am not sure how it would be fixed unless more land was purchased.
- Parking is already "tight" at Caywood, so I would just want to make sure there would be spaces available for teachers, parents, visitors, etc.
- Should be minimized – can't say how.
- Vehicle traffic should play a minimal role – trying to route traffic away from the "front door" and "hide" parking as practical. Still needs to be functional – maybe consider parking garage to limit footprint on parking lot.
- Have grass-covered parking lots using pavers or other new technology. Promote carpooling – reward it. Promote walking – "walking school bus" office in Frankfort, provides safe way for students to walk to school.
- The roles of auto need to be virtually eliminated, creating an NKU-esque design that would allow a free pedestrian space encircled by auto traffic/parking.
- You need to reinforce and possibly give incentives to cut back on individuals driving separately. Parking should be decentralized and give more area and improvements to pedestrian walkways.
- I think vehicle entrance into campus should be as minimal as possible, even kept on the exterior of the campus.
- Parking could be concentrated in specific areas. The less traffic the better the campus.
- With 3 schools on this site automobile traffic will be an issue. Try and keep automobile traffic isolated to one or two areas on this site could help with air quality.
- Incorporate a parking garage to serve all the three buildings, this would have possibility to double greenspace. Roof of parking garage could double as outdoor science lab area with demonstrations of solar/wind, etc.
- Carpool, green vehicles, partnerships with transit system use this as an opportunity to educate future drivers about air pollution.
- Buses should be green. Cars should be parked on the outside. Programs such as carpooling, bike riding, walking, and public transportation could be encouraged.
- Offer bicycle racks, encourage carpooling, etc. Put lots behind and a nice distance from buildings to further encourage walking. Have easy drop off/pickup system.
- Limit cars on campus and encourage mass/pedestrian transportation.
- Parking that is not attached to the main building. Have the amount of automobile on Turkeyfoot and on the campus measurable and usable for student data collection. Measuring carbon footprint of cars.
- Minimize the role of automobile. Schedule school evens so students can ride provided mass transportation. Consult community (parents, students, teachers) about the school schedule.
- I would ban automobiles from the campus, constructing some sort of rail-line or other mass transit to more people from parking areas to campus. Also, organize walking school bus, etc. so kids get exercise walking to school.

- Parking designs that incorporate landscaping, walkways that provide easy access to buildings but protection from the weather.
- Hook-ups for electric cars? Buses more environmentally friendly. Producing biofuels for buses. Using used oil for heating. Biking trails.
- Invest in modern clean fuel buses. Encourage carpooling and incentives to use them.
- Not sure.
- Vertical parking garage structure.
- There is a need for parking for employees of all 3 buildings. Bus loop for student drop off.

4. What skills and information need to be taught on this new green campus of the future to create a valuable future workforce?

- How to make/measure the impact of the school, the consequences of the greenspace; how can you be zero carbon? What is sustainability?
- Solar and wind generation, geothermal technology, wetlands, new technologies for cars. Energy efficiency, diversion from landfills, recycling.
- Energy efficiency should be taught to everyone. Students interested in these areas should get exposure, but don't underestimate the basics of reading, writing, and lots of math.
- How is what we have in the new site different from old (gather before and after data), why is it better?
- Not only do study, need to understand about renewable energy, they need to learn to design greenspace – how to maintain greenspace – how to appreciate greenspace.
- Green site design is as important as green building design.
- Could it be planned so that annually the one area of the campus was "re-envisioned" or maybe every other year so students planned the area and then "built" it? Definitely, the green roofs will require annual work that the students should work on.
- To show benefits of what green campus can offer in savings from the different areas.
- Use of solar panels, geothermal – get H.S. students involved in the new technology.
- Conservation. Energy wise.
- Too many to list: energy conservation, alternative energy sources, role of planning in developing sustainable development, smart growth, read Tom Friedman's latest book "Hot, Flat, Crowded".
- The skills of being green. These skills will allow the students to bring this to their family which have an impact on the community. Workforce. Solar, geothermal, greenhouse effect. Environmental science.
- Having the students actually complete hands on activities and be a part of the production process so that they understand what is really going on and why it's important.
- The foundational skills for advanced manufacturing – electrical technology, hydraulics/pneumatics, mechanics.
- Need to ensure education is "science" based and practical. Needs to encompass broad spectrum of STEM, kids need to understand that there is not a solution to every problem and encourage them to think and solve problems.
- The building blocks for future workforce require training the teachers, special PD to address this. How core content connects to various new technologies.

- Continuing to instill values of preservation and conservation in younger generations is extremely important. Just providing the opportunities for students to learn about green initiatives will promote increased interest.
- Environmental education should be taught to all teachers and implemented across the curriculum. Teaches, admin., and students first need to discover the value of greenspace. Adding green infrastructure will lead to a better informed student body.
- Current environmental jobs such as environmental engineering, habitat restoration, wetland delineation, data analysis, etc.
- Inform students why this is important and how the process is designed.
- Soil and water conservation. Wildlife management. Alternative power. Landscape Architecture.
- Students will need to learn how to use information about the campus/how it was designed/why it was designed in this manner to apply principles to/future employers. Being a good steward of resources/always looking how to improve.
- How to design green – this is a career that will grow as NKY becomes more on board with green initiatives. What can be done at home, school, work to go green every day. Students need to learn how to go green in their everyday lives in order to go after or be interested in green careers.
- A hands on learning environment tailored to growing industries. Creation of programs and “real world” job shadows or internships that meet the students interest areas. Engaging female students in this learning.
- Life cycle analysis. Energy production / use stormwater management. Ecological impacts.
- Relativity – how green saves environment, stats on cost savings, jobs in green fields, how knowledge is transferred to all phases of life, home, work, etc.
- Solar, wind, geothermal, hydro electric, green area maintenance.
- GIS and remote sensing.
- Data collection. Observable workable labs and outdoor classrooms. Conservation, land management as well as real-world examples of how they impact the environment and other environments around.
- Science and technology behind the innovations at the site. Don’t forget education of teachers, too.
- The district needs to ensure that all students have a strong base of environmental literacy that goes beyond just studying the green features of the campus.
- Design, maintenance of infrastructure, projects designed to teach, making more with less.
- Welding, chemical engineering, industrial maintenance, automotive robotics, construction, mechanical engineering, CAD, civil engineering.
- Need environmental courses for students to complete a career pathway to postsecondary programs. Math and science courses should integrate environmental activities. Look for dual credit courses.
- Math and science skills for those who live within walking distance of the campus.
- STEM related jobs. Green technologies.
- All aspects of problem solving (using practical/real world situations). Data collection, engineering, robotics, true culinary program, interactive technology (web based).

5. What potential partnership between the campus and your organization might be created for mutual benefit?

- Dixie Heights would utilize campus as a support for STEM programs as well as extension of our programs. Mini fieldtrips.
- Learn from your initiative to share with other schools in the state and nation.
- We can help with programs and curriculum.
- Interdisciplinary curriculum, project based learning activities.
- Our organization is the state agency that oversees EE for the state. We can help with curriculum, green schools inventories, outdoor classroom idea/feature, teacher training, etc.
- Partnership on land management, and any conservation elements, (conservation district) many of the schools in the district could benefit from better land management.
- Dixie Heights would use the facility regularly as an education lab area. A hands on approach to education. This facility would benefit may students.
- The KY Girls STEM Collaborative can work with Kenton County to improve STEM opportunities for girls. chanley@uky.edu.
- UK could help professional development training for Kenton County teachers. UK students and graduate students could interact with campus & students (engineering, landscape architecture, architecture, etc.). Create a culture of STEM initiatives and learning to produce students interested in STEM disciplines at the college/university level. UK has many programs including healthcare that would benefit from well educated K-12 students.
- Would like Kenton Co. to speak to business community on the going green concept and how it has impacted, how to track savings, etc.
- Summer STEM camps for high school students. Dual credit programs, research collaborations with high school students and college mentors.
- We would be interested and could offer assistance in the area of connecting the learning to current or future employers, ensuring students off-campus experiences are met.
- Stormwater credits, job shares/shadows, partner to fulfill community projects.
- Not sure – make sure Kenton Co. Soil & Water Conservation is involved as well as local EPA along with college and university personnel. Look for the real-world connection.
- Greater learning experiences for students.
- Being a high school teacher – students should run this campus. Every student should have a job to complete everyday to help with the upkeep and sustainability of this campus.
- More teachers need to take advantage of the graduate level environmental education endorsement offered at NKU. This might be encouraged by the district. Teacher education is key to truly utilize green infrastructure around a campus.
- Please feel free to call Congressman Geoff Davis' office for any assistance we may be able to provide. 859-426-0080.
- I envision strands of signage/curriculum for each category science, tech, eng., math/
- The NEED Project can assist in this curriculum and in teacher training. Jus at we trained Energy Wise teachers, we can train on solar and wind energy w/kits.
- Energy efficiency and green infrastructure focus.
- Bring JD Patton seniors to Gateway's campus to complete college courses as Gateway students. Coursework in advanced manufacturing, mechatronics, CAD, machine tool, welding, industrial maintenance, electrical technology, HVAC are possibilities.
- I would just like to have opportunities for our students to interact / use the campus as much as possible.

- As a teacher it will give my students the opportunity to learn hands on. Instead of just reading the students can see it!
- Internships / work-study options may be possible with SD1.
- Community coming together and working together now and in the future.
- Not sure, but we are open to ideas.
- Plenty of opportunities for learning about watersheds – also urban forestry / forestry.
- Rumpke / can we get free recycling service if we become part of an ad campaign for them?
- Establish pathways for a student to pursue degrees in these areas. A well established (published) and affordable path for K-16.
- As energy systems coordinator for the district, I would like to see the partnership of energy and the environment.
- Technical information, lectures and real life experiences.

6. Other questions and/or comments?

- Why would a green school continue to use Styrofoam trays and plastic silverware on a daily basis? The kitchen staff would support use of a dishwasher and convenient glass/plastic recycling.
- This is a fabulous opportunity to prepare students for the workforce of the future. Favorite quote (not sure of source) "The future is not what it used to be". We have to make sure they (students) are ready!
- Very exciting potential/project.
- Consider uses of facilities after hours/weekends to maximize use of campus; encourage STEM study of campus by nearby colleges/universities. Make sure you get input from a younger crowd – this meeting today (Lexis Rm, 2112) skews older.
- I am happy to be a part of this and can't wait to see the outcomes. The students are our FIRST Priority!
- I think it would be neat to have some sort of website or web-cam that could be focused on the progress of the construction site or maybe even focused on a specific aspect of the site to where teachers and students who may not be able to show up on campus will still be able to log on to a site and see what's going on.
- Would like to be involved/informed of green curriculum/careers that JD Patton is considering.
- Checkout www.vitalcommunities.org/valleyquest/valleyquest.htm. Create self-guided tour using maps and clues. Students and/or teachers could create multiple quests for the campus e.g. water quest, energy quest, stormwater, etc. You might consider making one of the elective classes at Turkeyfoot a course on the campus itself-a STEM class that integrates curriculum with the measures in place outside. Be sure to include Cooperative Extension Agencies, too.
- Seek outside suggestions from the community at large. The NKY community may be of considerable benefit to design and development teams. Perhaps a hotline or community email address.
- I'm more than happy to help in the education of educators regarding environmental education and how to incorporate green spaces into the curriculum.
- How will students from other Kenton County schools benefit and be transported to these areas?
- This is such a great concept and I am happy to be a part of a community where schools are taking the lead in green efforts. Education is key to change.

- Some of the language can be changed e.g. Landscape Zones to ecotypes, e.g. environmental to ecological. What is the student population like at Patton? Great Plans! Thanks for the opportunity to get involved.
- Applaud the innovation!
- What about radon as an environmental issue? Will buildings be built to be radon-free? Students need to know the dangers of radon – 3rd leading cause of lung cancer, high rate of radon in KY.
- Look at all systems; food, trash, books and materials, sports events. Work toward making all these sustainable. Health Dept. would be helpful for ideas on incorporating healthy lifestyle alternatives. Many ideas can be implemented at other schools (and maybe they are) without building new buildings or revamping at campus.
- There is new and growing body of research that shows children are both physically and mentally healthier when allowed to spend time in green spaces. ADHD, depression, obesity could all be addressed with more time outdoors.
- Good start! Program and courses should be defined to support green school.
- As we continue to work together, what type of communication do we need to keep everyone informed?
- At some point need student input and ideas. Ultimately, it will be their campus so they must have a great deal of input at all phases of the project.
- Would it be possible to utilize any of the facilities at night for astronomy or other type classes, or have areas to accommodate such activities?

Other Comments/Suggestions (Post-it Notes During Q&A Segment)

- Reduce the amount of cars; make the campus walkable
- Incorporate biking trails
- Make the site a tree campus USA candidate
- Current traffic patterns difficult; make system coherent but with separate zones for each school
- Meet with the students who were involved in the design of Turkey Foot Middle School
- Consider connection to Thomas More College
- Consider the soils at the ballfields
- Make GIS part of curriculum
- Provide 3D models of site/environment for the students to use
- Monitor metrics to show benefits and impact of green site improvements (like what is being done with the buildings)
- Gather “before” data for the site and compare it to the “after” data
- Make the campus a zero waste facility
- Show the connection between greening the campus and effects on energy consumption and air quality
- Consider Radon testing on site; Radon is a contributing factor for cancer
- Policy changes are required for car pooling and other ways to minimize vehicular impact on the campus
- Look into carbon footprint data for cars
- Teach land/environmental ethics at school; not just technologies
- Provide a visible electric car demonstration area
- Connect green curriculum to the kid’s home and family lifestyles
- Campus is a community outreach opportunity

- Educate the educators about green thinking, technology, and techniques

The statements above summarize the essential contents of the meeting. If there are any mistakes or misinterpretations, please notify Human Nature immediately. If Human Nature is not notified within 5 working days of the date of this correspondence, we will assume that the contents are acceptable to all recipients.

Human Nature, Inc.
990 St. Paul Place
Cincinnati, OH 45206
T: 513.281.2211 F: 513.281.2243
www.humannature.cc

Meeting Notes

DATE: April 8, 2009	FROM: David Whittaker
PARTICIPANTS: Students from Caywood, Turkey Foot, Patton, Dixie, Simon Kenton, and Scott; Sara Zepf (KCPS)	
DISTRIBUTION:	PAGE 1/11
RE: Kenton County Green Campus Student Input Meeting	MEETING DATE: March 26, 2009

The following notes outline the survey feedback results and notes taken during the Student Input meeting.

Human Nature presented the following topics in a slide presentation:

- Overview of the design process
- Overview of campus design elements
- Overview of green campus elements
- Inventory and analysis diagrams outlining the opportunities and constraints for design
- List of existing/potential green components that may be incorporated into the campus plan
- Solicited input from the students

Student Suggestions

The students provided the following comments and suggestions regarding potential improvements to the site:

- Butterfly Garden (shared)
- Wind / Solar Energy in Courtyard
- Lake / Stream with Waterfall and Trees
- Outdoor Labs for Science
- Water Plans with Built-in Holes
- Outreach and Opportunity for Students to Give Back
- Eco Events / Fair
- Morning Announcement Tells What is Going On at Other Schools
- Wind Power at Elementary School
- More Job Awareness at Schools
- Students Participate in Building and Designing Campus
- Keep Students Involved / Meetings
- Sensors in Classrooms for Light Control

- Earlier Job Awareness
- Student Art as a Focal Point and Panels / Themed Garden
- Disconnect with Grade Levels, Too Long, Sustainable Research Campus
- Students Take Ownership of Landscape / Trees
- Central Activity Area that all 3 Campuses Could Use
- The Green Ground
- Articles and Campus Newsletter / Eco-Events, Students Participate
- Presentations to Community
- Trail Lined with Flowers Connecting all 3 Schools
- Bring in Eco-Jobs Career Counselors – Make Students Aware
- Webcams / Outdoor Marquee Green Letters
- Monthly Principal's Meeting, Share What They are Doing
- Eco-Vision, Eco-Campus (home)
- Students Involvement with Building, Regular Activities
- Recycled Water for Fountain
- Each Class Plant a Tree. Students Take Ownership of Plantings / Landscape
- Symbol with Flowers Combining All Three Schools
- Please Don't Say "Going Green"
- Keep Students Involved thru Meetings
- Windmills near Playground
- Vision, Green Campus Technology, Energy-Efficient
- Provide Updates via Broadcasting and Technology
- Natural Play Area
- One Central Entrance with Archway
- Art by Students
- Courtyard Learning Area
- Plant Vegetation on the Roof
- Go to Businesses and Educate Community on Campus Features
- Students be Involved in the Choices
- Large Trees, Welcoming Space, Incorporation of Plants and Colors
- SOS Projects and They Can Talk About what's Going On
- Wind Generation Project
- Water Re-use
- Patton Feels Like a separate entity. Incorporate Students into Patton
- Residential and Community Member Education
- Butterfly Garden – Focal Point – Everyone Contributes
- Road Noise Buffers, Turkeyfoot Rd. Busy
- Incorporate in Morning Announcements
- Awareness Campaign on Features
- Highlight Opportunities
- 3 Eco Campuses
- Wetland(s)
- Electro Class Connection other Schools, Other Schools Visiting Other Schools, Schools Working Together
- Students Give Back. Flower Delivery at Nursing Homes. Give Back what is Grown. Make Community Green and Aware
- Patton Doesn't Blend In
- Room Displaying Wind Energy and Other Items in Action to Experience It
- Biology Students Could Do Experiments at Patton
- 1 Day per Week 1 Big Morning Announcement for All Schools
- Make Technology Visible and Accessible

- Educational Display Room to Highlight Campus Features
- Patton is Dull Right Now. This Process Could Provide Nice Areas for Breaks
- Viewable Solar Areas
- Trail with Trees and Flowers
- Central Rain System. Filter the Water for Projects. Pond Use
- Trail with Trees with Flowers
- Demonstrate Progress After School Programs and Affairs
- SK/Scott. Plant Trees near Walkways. SK=Pavement Everywhere
- Solar Panel Grants
- “The Way of the Future”
- Internet Presence
- Student Led Tours
- Hands-on Interaction and Maintenance
- Parent Nights
- Welcoming Center
- Rainwater Fountain and Focal Point for Irrigation
- Windmills near Playground
- Trees to Separate Sidewalk from Cars
- Don’t name campus STEM Campus; too limited; maybe “Eco-campus” or “Eco-learning Center”

The statements above summarize the essential contents of the meeting. If there are any mistakes or misinterpretations, please notify Human Nature immediately. If Human Nature is not notified within 5 working days of the date of this correspondence, we will assume that the contents are acceptable to all recipients.

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990 St. Paul Place
Cincinnati, OH 45206
T: 513.281.2211 F: 513.281.2243
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Meeting Notes

DATE: July 30, 2009	FROM: David Whittaker & Chris Manning
PARTICIPANTS: Students from Turkey Foot, Secretary Johnathan Miller, Ann Randolph, and KCSD staff	
DISTRIBUTION:	PAGE 1/3
RE: Kenton County Green Campus Student Input Meeting	MEETING DATE: July 21, 2009

Human Nature presented the preliminary site master plan and related sketches to several middle school students and the Kentucky Secretary of Finance. The following notes outline the comments and notes taken during the meeting:

Caywood Courtyard
Bird bath (overflows) or fountain in middle of learning area
Shade trees near benches
Mosaic opportunities in paving
Sculptures out of bottles or cans to promote recycling
Bird feeders
Inscribed pavers in patio – sponsorship opportunities
Different sections/ rows for different grades/ ages
Sundial
Make letters on signs big and colorful
Bat houses
Plenty of color use gray on walk
Color hand prints of children on walls
Butterfly garden
Fruit trees (snacks)
Pictures adjacent to writing for non-readers
Small stream with bridges
Use rain water from roof and water garden
Could sculptures bear weight of children for school pictures?
Inscriptions in stones and teachers can stop there – other curriculum
Alphabet along wall cap

Caywood Front Yard
Peninsula on pond
Step pools

Green Roof(s) on Caywood in future?
Solar panels send a message along Turkey Foot
Hydropower mill or water course – waterfall
Rest areas around trail loop – benches and small structures
Educational signage throughout for students and/or public
Technology

Outdoor Classroom Option 1
Sundial
Make it feel more in the woods, more natural
Speakers outside for announcements
Green retaining wall
Green house for plants in the winter
Outdoor presentations and related infrastructure
Geese and duck control?
More benches and seating nearby
Bug trap
Bridge(s) over water course
Path(s) through the step pools?
Logs and stones for seating
Removable grates? Controlled access to water
Pergola or troths with overhead plants
Signage about animals and games about how to find them
Capacity questions about number of outdoor classrooms and scheduling management
Signs with plants, sign idea, and info about it
Handprints and painted flow patterns

Outdoor Classroom Option 2
Combo of two studios
Evolving forms
Feels more roomy and looks better
Angled study is better – has more room
More abstract and unique shapes for raised planters
Could you mix amphitheater with flow lines and patterns?

Preliminary Master Plan Concept
Green house
Walk around loop trail at end of gym class
Fish and aquatic life? Feed fish
Marked distances on loop trail
Fitness stations
Different trees labeled on loop walk
Groupings of benches

The statements above summarize the essential contents of the meeting. If there are any mistakes or misinterpretations, please notify Human Nature immediately. If Human Nature is

THE KENTON COUNTY SCHOOL DISTRICT

A System of Excellence

1055 EATON DRIVE / FORT WRIGHT, KENTUCKY 41017

TELEPHONE: (859) 344-8888 / FAX (859) 344-1531 / WEBSITE: WWW.KENTON.KYSCHOOLS.US

Tim Hanner, Superintendent of Schools

The Kenton County School District
STEM Visioning Meeting
April 23, 2009

11:15 a.m. – 1:30 p.m.

Welcome / STEM Campus Video (**Tim Hanner**)

KCSD Introduction of Project Context (**Sara Zepf**)

Project Background and Summary of Survey Input (**Human Nature**)

Fundamental Issues and Prioritization Exercise (**Human Nature**)

Design Process and Conceptual Exploration (**Human Nature**)

Feedback on Conceptual Objectives for the New Campus Vision (**Human Nature**)

Open Discussion

Adjourn

Special thanks to

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for serving as the title sponsor for today's luncheon!

Summary Observations for Kenton Co. Green Campus Visioning

Vehicular Circulation and Parking: The tension between the need to accommodate cars on site and the impact they have on the use and character of the campus is a major issue. Much like our team's observations, people feel that automobile facilities dominate the campus and have some inherent circulation problems that need to be addressed. Currently, the most challenging times for cars and buses on campus are during morning and afternoon drop-off/pick-up and during the evening when large events occur or when multiple events occur simultaneously. Apart from these focused uses, the amount of parking is more than adequate during the day, but some people feel that there is still not enough parking. The amount of parking may also increase if the STEM Academy grows as anticipated from 400 students per day to 700 students per day. Based on the comments we received, the amount of potential change for the vehicular parking and circulation system runs along a gradient from minor modifications that improve existing conditions to the creation of parking structures on site to minimize the impact footprint. Some individuals suggested removing cars from the site entirely, but that would require substantial policy and lifestyle changes.

Green/Open Space: The general consensus was that opportunities to maximize green space would improve the appearance and use of the campus, giving it a unique identity. Open space should be as important as the buildings and should provide a pleasant environment for learning, socializing, and enjoyment. Several people mentioned the desire for a meandering informal path along the perimeter and between buildings that enables students and staff to easily access green space. Landscaping should be included throughout the campus, including the parking lots, walkways, and driveways. The green space in front of the site should be used and/or visually improved to screen the backs and sides of the building and to provide a welcoming appearance from Turkeyfoot Rd.

Pedestrian Circulation: Some people believe that the existing pedestrian network is fine as-is while a majority of others believe that a more coherent and improved network is needed to help the site function as a campus. A strong pedestrian core that links the three schools together is important. In addition, a network of walking paths, and possibly a bike path, should weave throughout the campus and connect it to the surrounding neighborhoods. The design should encourage people to walk or bike to the campus.

Aesthetics, Campus Character, and Organization: The campus should look green, not just be "green". Add more trees and landscaped areas, and improve the vehicular and pedestrian approaches to the buildings. Create viable habitats. Add more trees along the western edge of the site to create windbreaks. The campus should have a cohesive design (maybe themed?) that is functional, safe, and aesthetically pleasing. The overall campus organization should look as if it were master planned versus a piecemeal appearance. The buildings need their own identities and functions but they need to be integrated with the rest of the site elements.

Learning Opportunities and Curricula: There is considerable interest in outdoor classrooms that support various curricula and that provide gathering spaces for contemplation, socializing, performances, and other activities. The site should be a living laboratory for students and faculty where they can gain firsthand knowledge about green technologies, practices, and ethics. Before-and-after monitoring of green elements and their impact on site health and function is very important. Hands-on learning is also encouraged. As a green campus, the site should help students, teachers, and visitors understand how human and natural systems interact.

Sustainable Technologies and Practices: The campus should be a model of sustainable design and practices. State-of-the-art green technologies should be incorporated into all aspects of the campus—from stormwater BMPs to the latest solar, wind, geothermal and monitoring systems. It is also vital that landscape management and stewardship be part of the curricula to both maintain the site long-term and to teach the students skills related to the care of sustainable landscapes. This includes waste management and recycling, CO_2 reduction, water use reduction, and energy use reduction. Stormwater management on site needs to be more than just detention/retention areas. Some green strategies include bike racks, carpooling, and electric or hybrid car/bus facilities.

Outreach: Both the Visioning Committee and the students would like to see the campus provide more opportunities to bring visitors to the site to educate them about green technologies and lifestyles. Some potential strategies include special events, education fairs, and on-site amenities that attract and educate visitors.

Green Careers: Solar and wind generation, geothermal, new car technologies, energy efficiency, environmental science, landscape preservation/conservation, soil and water conservation, geographic information system (GIS), stormwater management, green building design (Architecture), and green site design (Landscape Architecture). Other careers include welding, chemical engineering, industrial design, automotive robotics, construction, mechanical engineering, CAD, and civil engineering.

Strengths: Location, walkable connections to neighborhoods, long frontage creates presence along road, existing/proposed green buildings, students, faculty, and staff

Weaknesses: Traffic and vehicular circulation, lack of parking, pedestrian circulation system, small site, lack of play space(s)

APPENDIX C
BEST MANAGEMENT PRACTICES IMPLEMENTATION PLAN

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January 27, 2010

Ms. Debra Day
Energy and Environment Cabinet–DEP DOW
200 Fair Oaks, 4th Floor
Frankfort, Kentucky 40601

Re: Kenton County School District 319(h)
Best Management Practices Implementation Plan

Dear Ms. Day:

Enclosed is the Best Management Practices Implementation Plan for the Kenton County School District 319(h) Green Campus Master Plan. Please let me know if you have any questions.

Sincerely,

STRAND ASSOCIATES, INC.®

Kelly M. Kuhbander

Kelly M. Kuhbander

Enclosure: Report

c/enc: Sara Zepf, Kenton County School District

The following report describes the Green Infrastructure Best Management Practice (BMP) to be implemented on the Kenton County School District (KCSD) under the 319(h) grant.

TECHNOLOGIES TO BE INSTALLED

This project consists of converting an existing shallow grassed basin into a biofiltration system. Curb cuts will be installed along Turkeyfoot Road and along the entry drive to Caywood Elementary. These curb cuts will route roadway runoff into a sediment trap to capture debris and then through a series of micropools to slow, infiltrate, and cleanse the water. Native plantings will be used throughout the rain garden. All detailed engineering designs will be submitted to KDOW upon completion. Attached are a concept plan of this BMP along with the concept plan for the entire school campus showing where this element is located.

DESCRIPTION OF SELECTION PROCESS

This Best Management Practice (BMP) was chosen as the most appropriate element of the overall Green Campus Master Plan. Implementation of this BMP is targeted at Urban Runoff, the main pollutant source identified in this 319(h) grant. This rain garden BMP can be expected to reduce the total suspended solids by over 80 percent, and nutrients and metals by 25 percent to 90 percent. These values are estimated based on literature values for biofiltration pollutant removal. More detailed pollutant removal calculations will be performed for the final report. Life expectancy and cost were factored into the BMP selection process. This BMP is the first major component of implementing the Green Campus Master Plan, and as such it sets the tone for the development of the rest of the site elements. The construction cost of this feature is anticipated to be approximately $80,000. For the BMP to operate efficiently, maintenance crews will trim the native plantings once a year, and students will clean out the sediment traps and test the composition of the road sediment. To implement the BMP, an encroachment permit is necessary with Kentucky Transportation Cabinet because of the curb cuts along Turkeyfoot Road. This BMP is the entryway to the campus and incorporates educational opportunities into a functional water quality feature. This piece of the Master Plan was selected due to the high visibility it will have in the front yard of the school on a heavily traveled roadway.

HOW BEST MANAGEMENT PRACTICES ARE TARGETED TO SPECIFIC LOCATIONS

The location of the biofiltration system was chosen based on a prioritization process. Upon completion of the Green Campus Master Plan, the design team selected four BMPs from the Master Plan that could feasibly be implemented on the site within the budget and time constraints. These BMPs were discussed, and the advantages and disadvantages of each were considered. The entryway biofiltration system option was chosen because it could meet the time constraint of the 319 grant cycle and be constructed in the Spring of 2010. The biofiltration system represents many of the ideas in the Master Plan including community engagement, educational opportunities, research potential, water quality benefit, and high visibility. This BMP did not present any conflicts with the existing construction project of Turkeyfoot Middle School, and it provides a larger water quality impact than several of the other alternatives. The area selected for the BMP is in the campus “front yard” and there is minimal risk of development or changes to the area that would affect the life of the feature.

FINANCIAL PLAN OF ACTION

The 319(h) grant is a 60/40 match-style grant. Forty percent of the total value of the grant comes from the in kind contributions and 60 percent comes from federal funds. KCSD has met its match requirement for the grant by installing a green roof, a rainwater catchment and reuse system, bioswales in the parking lot, and through in kind contribution of their time. Because the match has been met, the biofiltration system will be funded through the 319(h) funds. KCSD will be allowing the use of its land and will realize efficiencies by bidding this work as a change order for its existing on-site construction crews.

MAINTENANCE AGREEMENT WITH LANDOWNER

KCSD will assume responsibility for the maintenance of the BMP. The maintenance will include annual pruning, sediment trap cleanout, and irrigation and plant replacement as needed in the first 2 years. KCSD has a vested interest in maintaining the rain garden for functionality and visual appeal as it is the entryway to the campus.

NOTIFICATION PROCESS TO KENTUCKY DIVISION OF WATER

Communication with Kentucky Division of Water (KDOW) has been open from the start of this project. KDOW representatives are invited to visioning committee meetings and are kept informed throughout the process. A site visit and debrief meeting was held with KDOW in November to discuss the rain garden BMP, answer questions, and to gain approval. The Technical Advisor, Grant Administrator, and Basin Coordinator will be notified by email of the installation dates and upon completion of the BMP installation.

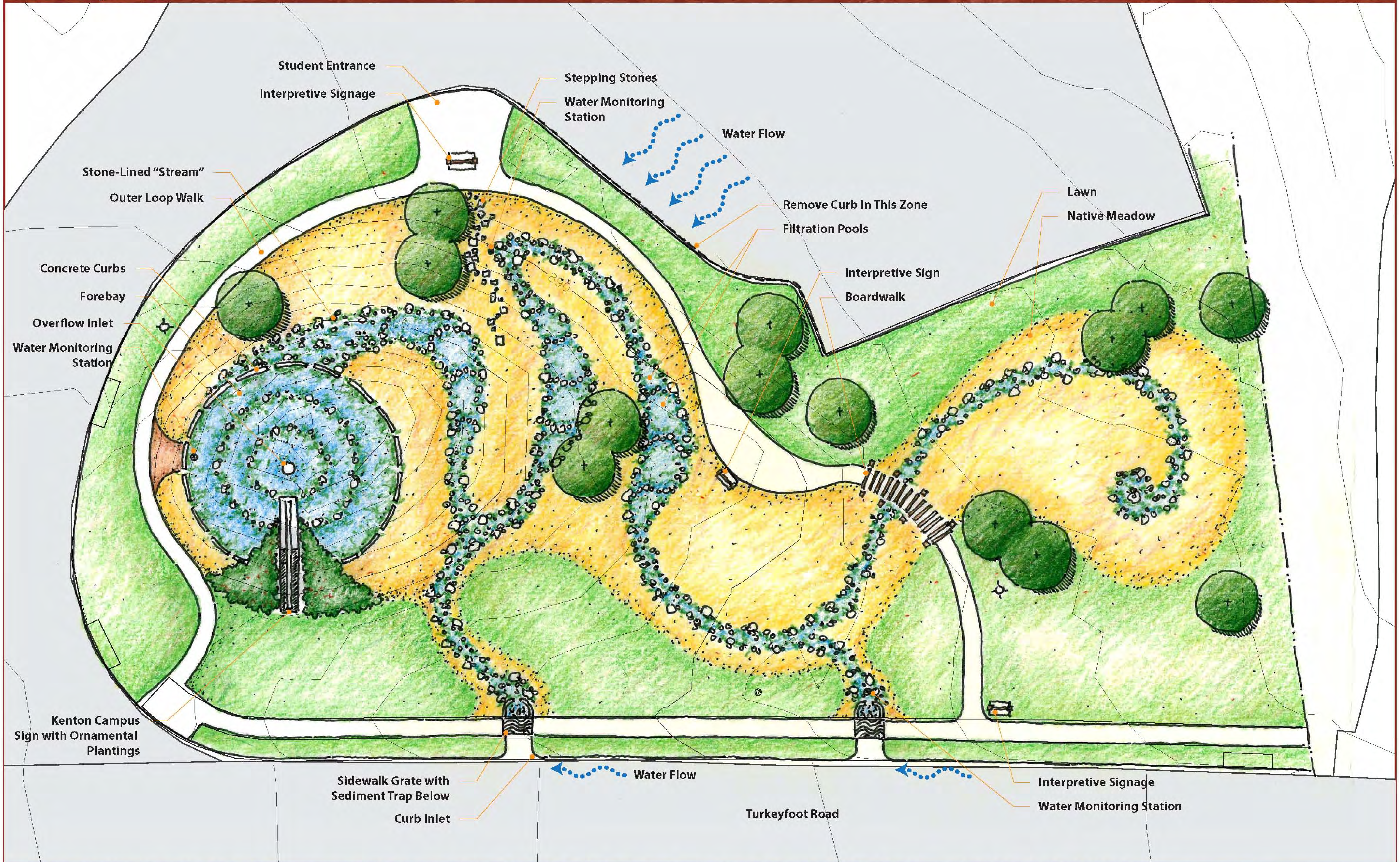
Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Educational Rain Garden

The Kenton County School District
A System of Excellence

Concept Plan

Project Funded by EPA 319 Grant



Strand Associates • Human Nature

December 2009

0' 10' 20' 30'

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

THE KENTON COUNTY SCHOOL DISTRICT
A System of Excellence

Site Master Plan

Project Funded by EPA 319 Grant

Strand Associates • Human Nature

September 2009

0' 100' 200 300

APPENDIX D
LETTERS OF SUPPORT

Northern Kentucky
Chamber of Commerce

June 25, 2009

To Whom It May Concern:

On behalf of the Northern Kentucky Chamber of Commerce. I extend this **letter of support** for the proposed sustainable research campus within the Kenton County School District, focused on increased learning opportunities for students (K-12) in the STEM (Science Technology Engineering and Math) areas of study.

The funding requested to support this innovative campus will allow Kenton County Schools to lead our region and state in providing a rigorous curriculum to students that emphasizes green infrastructure, renewable energy and sustainable design. Beyond the exposure students will have to growing energy needs in our community, the campus and accompanying curriculum will prepare students for green technology careers of the future. The training and education that will be provided through the STEM campus in Kenton County Schools is a critical piece to the economic sustainability of our region and supports the development of a future workforce in this growing industry.

The Northern Kentucky Chamber of Commerce is proud to support Kenton County Schools in this request and looks forward to partnering with the District in their efforts to prepare students with the 21st century skills needed to compete nationally and globally.

In closing, it is with pleasure that I submit this letter of commitment to Kenton County School's STEM campus grant proposal.

Sincerely,

Steve Stevens, CCE
President
Northern Kentucky Chamber of Commerce

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300 Buttermilk Pike, Suite 330
P.O. Box 17416
Ft. Mitchell, KY 41017
859.578.8800
859.578.8802 fax

Staff
Since 1946

June 9, 2009

Dear Sir or Madam:

The reality of today's world often leaves one overwhelmed. While Visions are about the future, education is about securing those future Visions. Visions are only words, education is necessary for the Visions to become reality. The development of learning environments, emerged in the reality of current technology, improves the ability of everyone, not just students, to learn. This type of learning is the only way we can be the cutting edge of the new Global Emerging Social/Economic world.

For Kenton County, the area, the State of Kentucky, and America to move to the top, is development of these learning centers, in the Secondary School Environment. This is the most productive path to a good education, sound economic future, and solid tax base that make Kentucky and America successfully completive in the Global world today.

The efforts to develop a prototype Turkey Foot campus, piloting this long past due need, is a critical step in elevating this task. The work is underfunded and two to five years late in reaching maturity. We are at a critical point, as we near completion of the ground work, but lack the additional funding and support, to complete this task. This prototype will be a leading example for all of Kentucky to follow, allowing them to capitalize on the work that is completed. A failure to support and complete this work is the start of the fall of an economic preparedness for Kentucky.

We cannot wait for others to develop and provide the knowledge to us. The knowledge of today's ever changing world is by then old. This put us in the middle of the pack using the same knowledge others are using, leaving us two to five years behind those who move forward and support these learning campuses. So we must support this effort and be the sound economic engine Kentucky needs to be. We owe it to ourselves, the older generations, those less fortunate, and above all it is a debt we must pay to the future generation.

The old analogy (in place of the nail for the shoe we have the knowledge for the worker) applies;

Progressive involved learning technology makes good education systems.

Good education systems produce knowledgeable employees.

Knowledgeable workers make a productive work force.

A productive work force makes successful businesses.

Successful business generates a stable economy.

A stable economy produces stable revenue.

Stable revenue funds progressive technical education.

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Genuine wagstaff Since 1946

June 9, 2009

A lack of support indicates you have no desire to continue a successful economy. While other things may demand dollars for support, this is the only investment where revenue spent, can show a true ROI, the truly knowledgeable output, for your investment of the peoples dollars.

As a business member, with a true interest in education of our future work force, I really must ask, "Why does it take such a drawn out effort to provide the education tools we need, to prepare our work force in the current Technology? Are we really trying to improve our status or just delivering lip service to the squeaky wheels?"

Lack of support is a statistical proven path to failure of our economy, so I know people of your statute will not let this happen at a time when it is critically needed to secure the future for every player. You will lead the effort to provide what is needed for success.

Sincerely,

Carl Wicklund
Plant Manager, Wagstaff Hebron

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Banklick Watershed Council
927 Forest Ave.
Covington, KY 41016

9/9/08

Brooke Shireman
Kentucky Division of Water
200 Fair Oaks
Frankfort, KY 40601

Re: Kenton County Public Schools 319(h) Non Point Source Partnership

Ms. Shireman:

At the request of Kenton County Public Schools (KCPS), Banklick Creek Watershed Council (BWC) agrees to act as a project partner for the KCPS stormwater master planning effort that is to be funded by a 319(h) grant.

BWC has conducted several watershed educational programs at Simon Kenton High School in the past and Judy Gammon, BWC Board Member, is a teacher at Scott High School; therefore BWC looks forward to being a project partner on KCPS's 319 Grant Project.

BWC will assist in this effort through information sharing and project collaboration.

Sincerely,

Sherry Carran

Sherry Carran - Chair
Banklick Watershed Council

Northern Kentucky
Chamber of Commerce

June 25, 2009

To Whom It May Concern:

On behalf of the Northern Kentucky Chamber of Commerce, I extend this **letter of support** for the proposed sustainable research campus within the Kenton County School District, focused on increased learning opportunities for students (K-12) in the STEM (Science Technology Engineering and Math) areas of study.

The funding requested to support this innovative campus will allow Kenton County Schools to lead our region and state in providing a rigorous curriculum to students that emphasizes green infrastructure, renewable energy and sustainable design. Beyond the exposure students will have to growing energy needs in our community, the campus and accompanying curriculum will prepare students for green technology careers of the future. The training and education that will be provided through the STEM campus in Kenton County Schools is a critical piece to the economic sustainability of our region and supports the development of a future workforce in this growing industry.

The Northern Kentucky Chamber of Commerce is proud to support Kenton County Schools in this request and looks forward to partnering with the District in their efforts to prepare students with the 21st century skills needed to compete nationally and globally.

In closing, it is with pleasure that I submit this letter of commitment to Kenton County School's STEM campus grant proposal.

Sincerely,

Steve Stevens, CCE
President
Northern Kentucky Chamber of Commerce

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www.nkychamber.com
300 Buttermilk Pike, Suite 330
P.O. Box 17416
Ft. Mitchell, KY 41017
859.578.8800
859.578.8802 fax

SANITATION DISTRICT NO. 1

September 12, 2008

Ms. Brooke Shireman
Kentucky Division of Water
200 Fair Oaks
Frankfort, KY 40601

Re: Kenton County Public Schools 319(h) Non-Point Source Partnership

Ms. Shireman:

At the request of Kenton County Public Schools (KCPS), Sanitation District No. 1 ("District") agrees to act as a project partner for the KCPS storm water master planning effort that is to be funded by a 319(h) grant. The District will assist in this effort through the sharing of substantial monitoring and water quality data that is collected by the District. This information will be beneficial to the project to determine the needed controls and also to evaluate their potential effectiveness. The District will also provide any feasible project collaboration that may be identified.

Sincerely,

Jeffery A. Eger
General Manager

1045 EATON DRIVE • FT. WRIGHT, KENTUCKY 41017-9681 • PH: (859) 578-7450 • FAX: (859) 331-2436

APPENDIX E
POWERPOINT PRESENTATIONS

Meeting #2- Student Interaction

Growing a Green Campus:

Sharing Ideas for Making Your School Landscape Fun, Educational, and Ecologically Healthy

Our Master Planning Process

Awareness

↓

Exploration

↓

Vision

Today's Topics

- How is the Site Currently Functioning?
- What is a Campus?
- What is a Green Campus?
- What Do We Know About the Site?
- What Should We Keep in Mind When We Begin Design?
- What Green Site Elements Might be Possible Here?
- What Would You Like to See and Do at the School Site?

How is the Site Currently Functioning?

- New buildings are energy and water efficient
- The surrounding landscape is underused
- Lots of pavement
- Existing stormwater management
- More?

What Defines a Campus?

- Organization
- Gateways
- Focal point
- Pedestrian system
- Gathering spaces
- Interactive and useable landscape

Project Funded by EPA 319 Grant

What Defines a Campus?

Organized appearance

Stanford University

University of Virginia

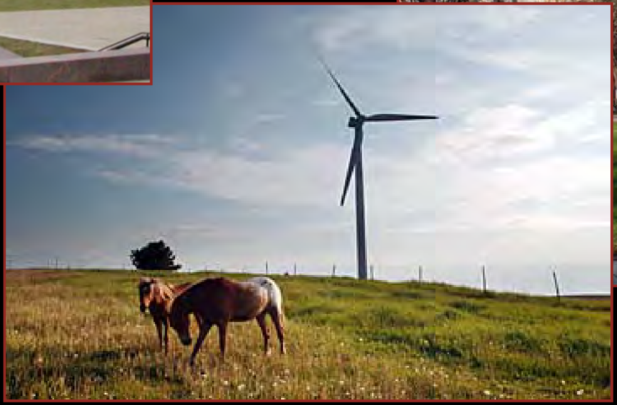
What Defines a Campus?

Gateways welcome students, teachers, and visitors

What Defines a Campus?

Focal point creates a well-defined image for school





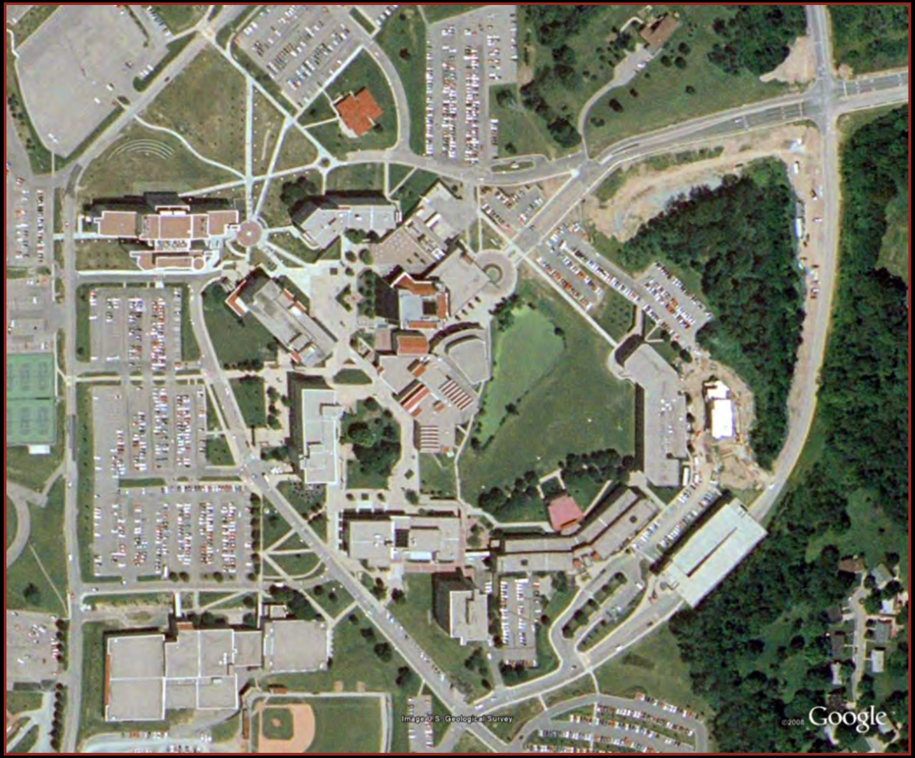

What Defines a Campus?

Strengthened pedestrian sidewalk and path system

What Defines a Campus?

Strengthened pedestrian sidewalk and path system

Foothills College



Northern Kentucky University

What Defines a Campus?

Balance of large and small gathering spaces

What Defines a Campus?

Landscape is a place for learning, recreation, relaxation and contact with nature

What Defines a Green Campus?

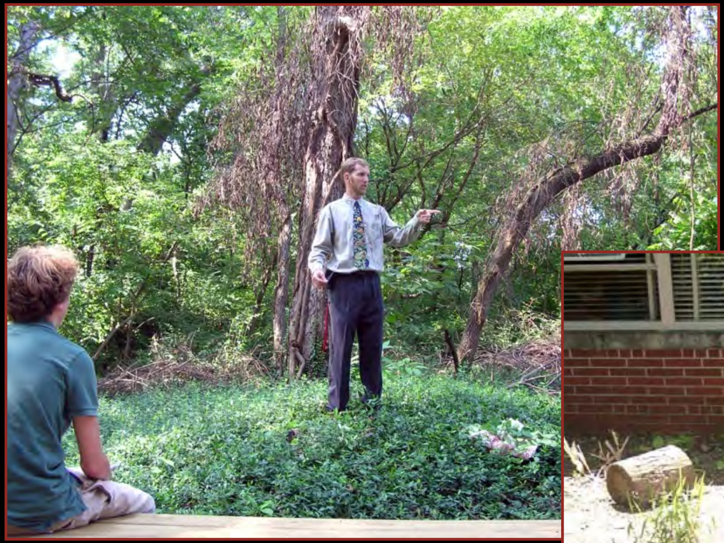
- Natural areas and habitats
- Interaction with nature
- Educational features and activities
- Green technologies
- Stewardship

What Defines a Green Campus?

Protected/restored natural areas and habitats

What Defines a Green Campus?

Lots of chances to interact with and learn about nature and natural systems



What Defines a Green Campus?

Take care of and learn about stormwater runoff

What Defines a Green Campus?

Include green technologies in campus buildings and landscape

What Defines a Green Campus?

Long term care of landscape features and places

What do we Know About the Site?

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

Aerial Image

Project Funded by EPA 319 Grant

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

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Site Plan with New Turkey Foot Middle School

Project Funded by EPA 319 Grant

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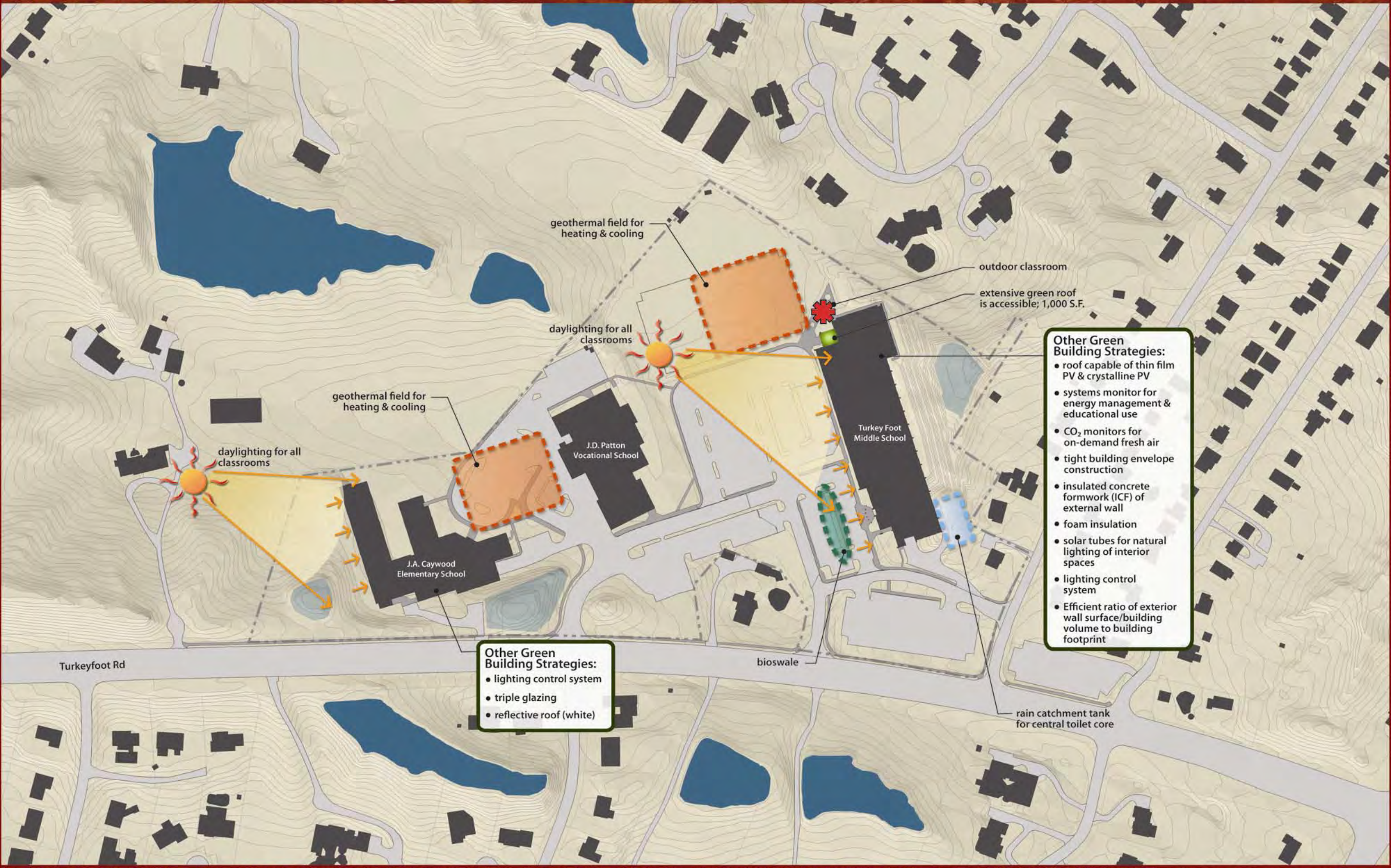
Current Green Features & Strategies

Project Funded by EPA 319 Grant



Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

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Soils

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The Kenton County School District — A System of Excellence

Site Drainage

Project Funded by EPA 319 Grant

Wind Direction

Project Funded by EPA 319 Grant

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

Circulation

Project Funded by EPA 319 Grant

Major Landscape Zones

Project Funded by EPA 319 Grant

What Should We Keep in Mind When We Begin Design?

- Campus appearance
- Pedestrian network
- Vehicular network
- Outdoor learning and play areas
- Green features

What Green Site Features Might be Possible Here?

- Rain gardens and bioswales
- Cisterns & rain catchment
- Permeable paving systems
- Wetlands
- Reforestation & habitat restoration
- Sub-surface water storage facilities
- Green roofs
- Solar panels
- Wind power

What Green Site Features Might be Possible Here?

Rain gardens and bioswales

What Green Site Elements Might be Possible Here?

Cisterns & Rain Catchment

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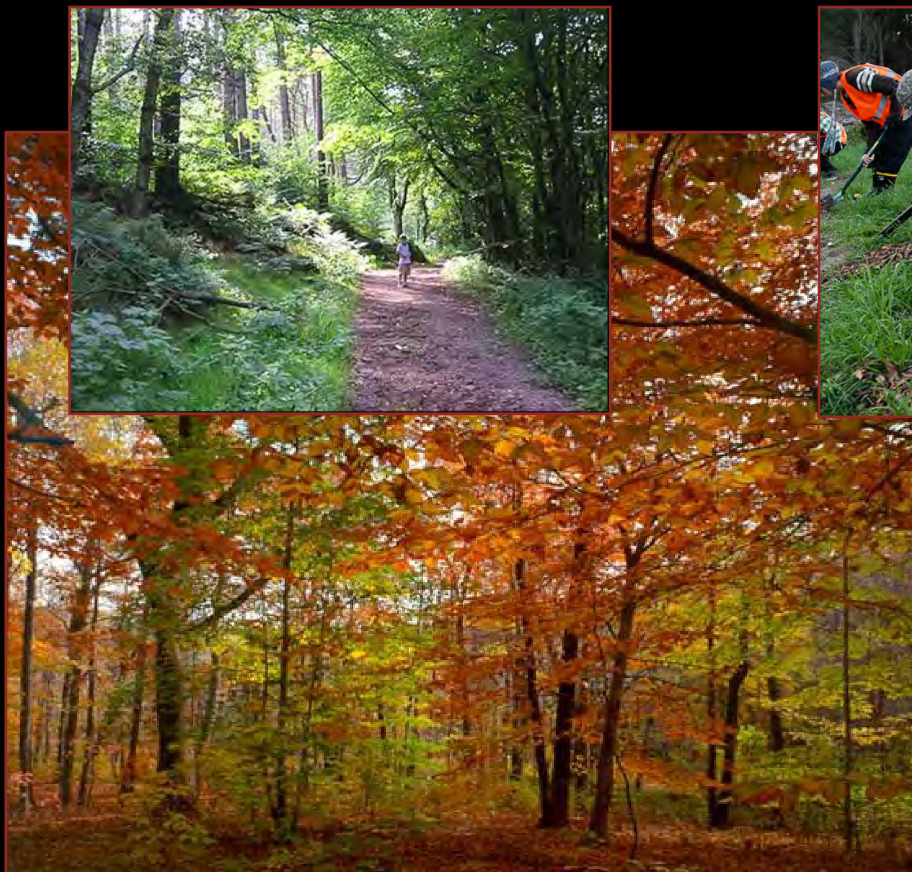

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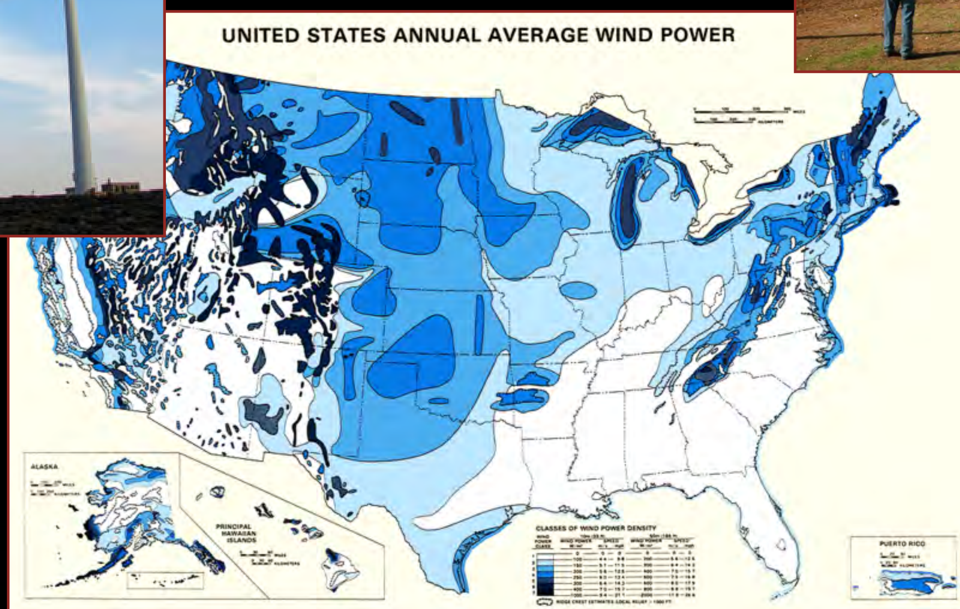

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Wetland Science Lab?

Plaza?

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Trails?

Fountain?

Student-Made Art?

What's Next?

- Take your comments and use them to explore design options for the campus
- Pick the best option(s) and create a single master plan map for the campus
- Start building some or all of the campus as money becomes available

Meeting #2- Student Interaction

Growing a Green Campus:

Sharing Ideas for Making Your School Landscape Fun, Educational, and Ecologically Healthy

Our Master Planning Process

Awareness

↓

Exploration

↓

Vision

Project Funded by EPA 319 Grant

Today's Topics

- How is the Site Currently Functioning?
- What is a Campus?
- What is a Green Campus?
- What Do We Know About the Site?
- What Should We Keep in Mind When We Begin Design?
- What Green Site Elements Might be Possible Here?
- What Would You Like to See and Do at the School Site?

How is the Site Currently Functioning?

- New buildings are energy and water efficient
- The surrounding landscape is underused
- Lots of pavement
- Existing stormwater management
- More?

What Defines a Campus?

- Organization
- Gateways
- Focal point
- Pedestrian system
- Gathering spaces
- Interactive and useable landscape

What Defines a Campus?

Organized appearance

Stanford University

University of Virginia

What Defines a Campus?

Gateways welcome students, teachers, and visitors

What Defines a Campus?

Focal point creates a well-defined image for school



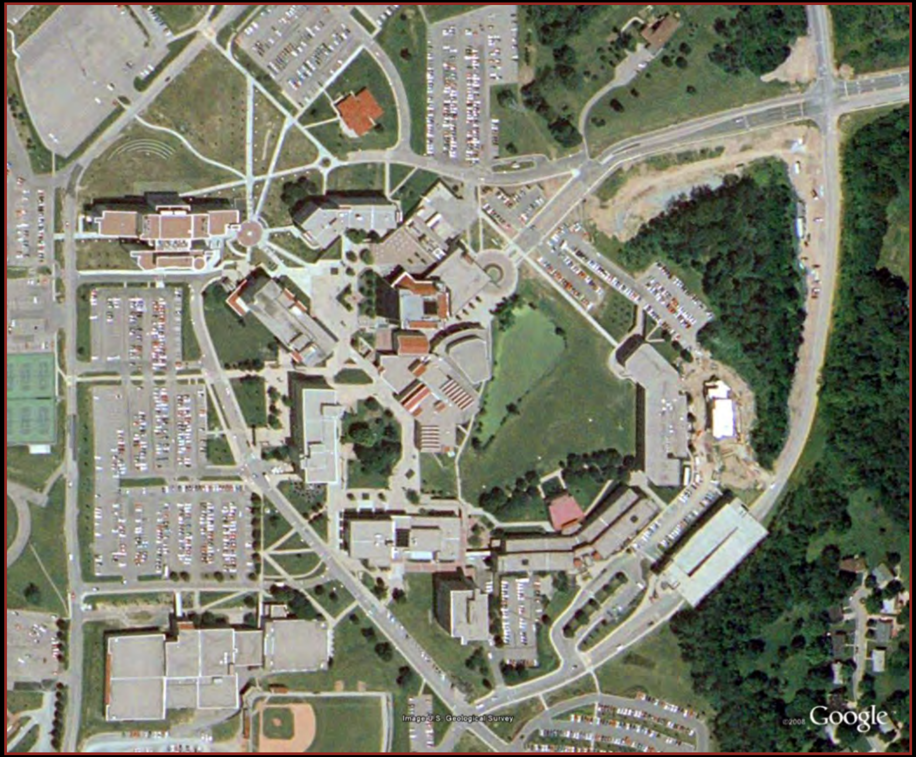

What Defines a Campus?

Strengthened pedestrian sidewalk and path system

What Defines a Campus?

Strengthened pedestrian sidewalk and path system

Foothills College



Northern Kentucky University

What Defines a Campus?

Balance of large and small gathering spaces

What Defines a Campus?

Landscape is a place for learning, recreation, relaxation and contact with nature





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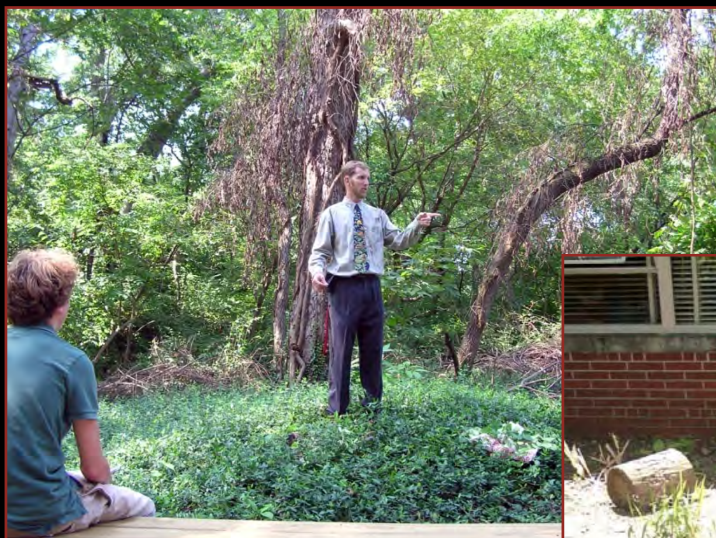

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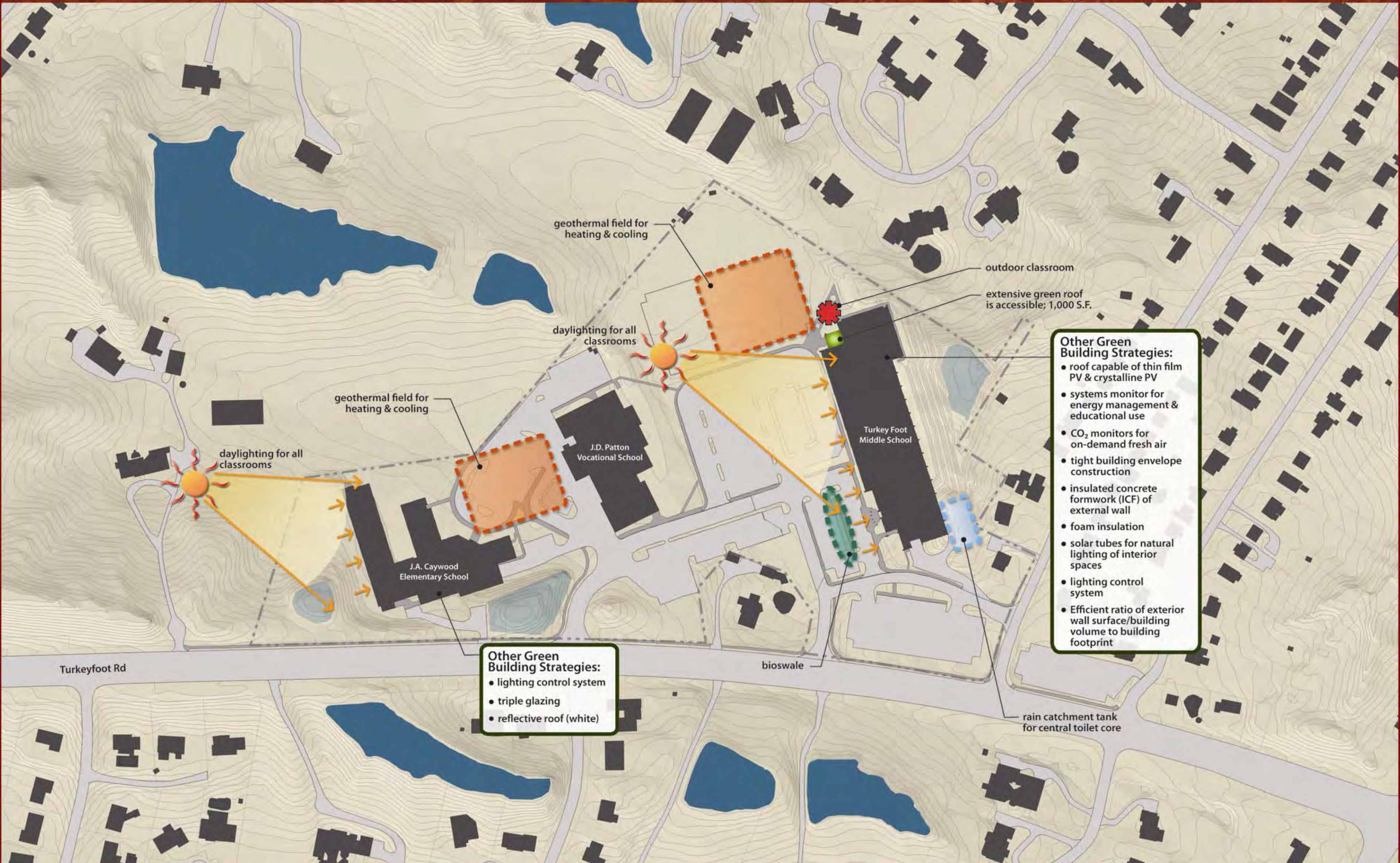

Strand Associates • Human Nature

0' 100' 200 300

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Green Campus & Stormwater Master Plan

Soils

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THE KENTON COUNTY SCHOOL DISTRICT A System of Excellence

Major Landscape Zones

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Strand Associates • Human Nature

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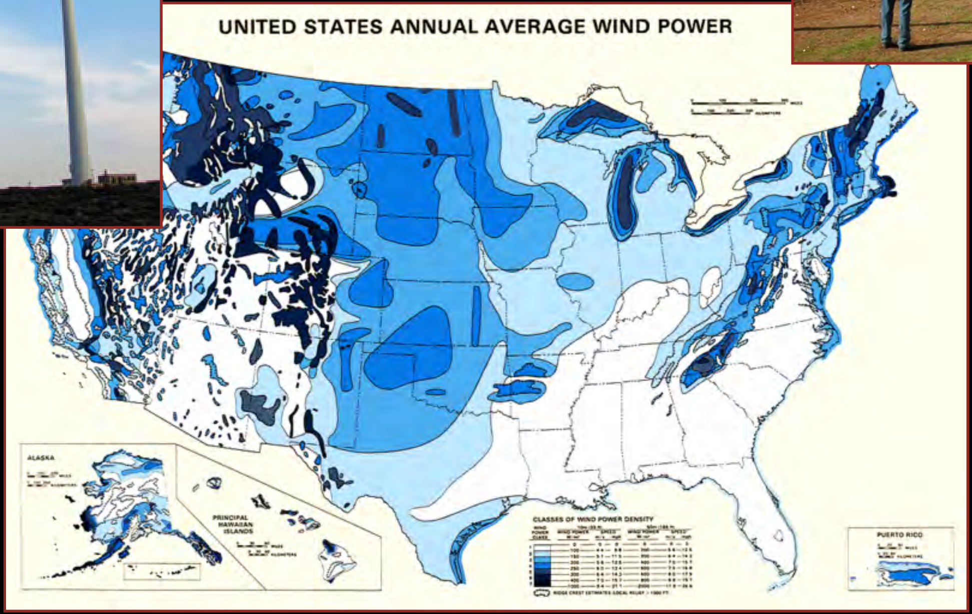

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- Pick the best option(s) and create a single master plan map for the campus
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Meeting #2- Conceptual Alternatives

Growing Leadership from Green Buildings to Green Campus:

Sustainability, Community, and Learning Through Shared Awareness and Visioning

This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act.

Today's Agenda

- Overview of previous meeting
- Summary of survey results
- Prioritization exercise
- Design alternatives
- Feedback exercise and discussion

Our Master Planning Process

Awareness

↓

Exploration

↓

Vision

Overview of Previous Meeting

- Defined and discussed some basic elements that characterize a school campus and a green campus
- Listed observations about the existing site
- Described the opportunities and constraints on the site
- Listed several green features that could be incorporated into the site landscape

Site Inventory

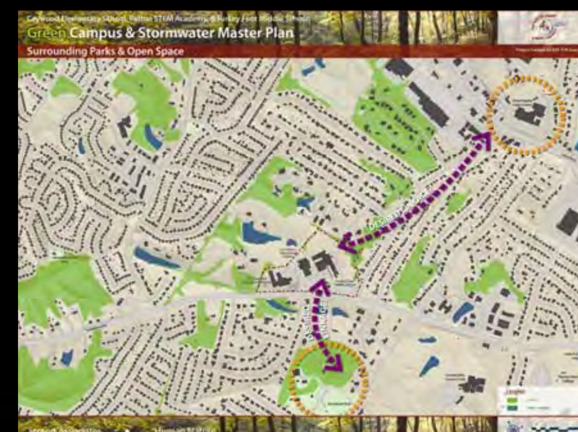
Existing Green Features

Vehicular & Pedestrian Circulation

Wind Direction

Site Drainage

Soil Permeability

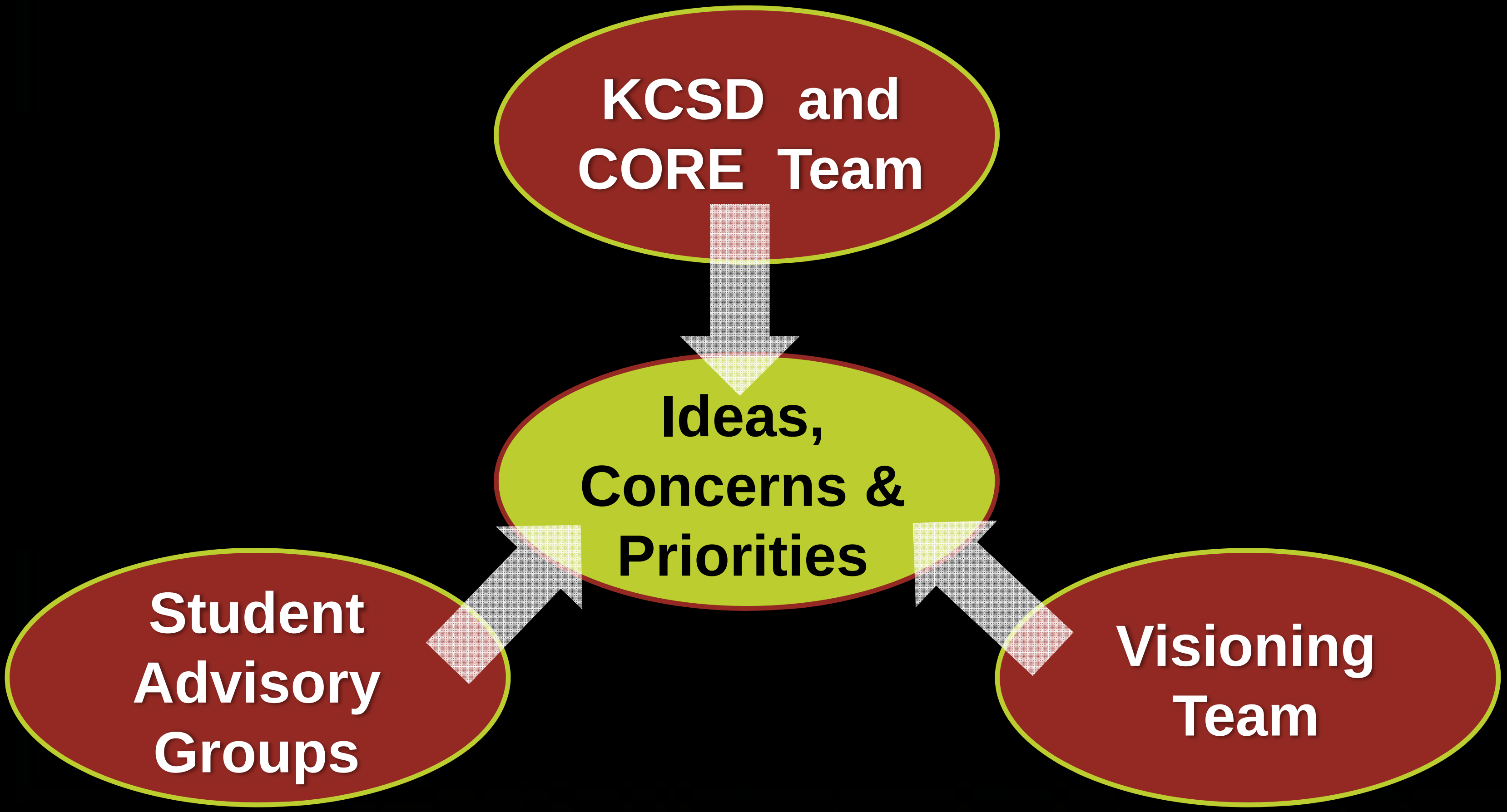


Open Space & School Connections

Site Opportunities & Constraints

- Lots of opportunities for green infrastructure elements and outdoor learning and use areas
- Potential for enhanced connections to nearby neighborhoods, schools and parks
- A unified "front yard" and enhanced greenbelt for the campus could tie it together
- A pedestrian spine could connect the campus elements and add clarity to the pedestrian circulation system
- The existing vehicular circulation could benefit from reorganization and integration with pedestrian and green infrastructure systems

Design Process Input



Survey Summary

Comments from the last Visioning Team meeting and from a subsequent student brainstorming workshops fall into the following broad categories:

- **Vehicular Circulation and Parking**
- **Pedestrian Circulation**
- **Green Space**
- **Campus Character, Organization & Aesthetics**
- **Learning Opportunities and Curricula**
- **Sustainable Technologies and Practices**
- **Green & Technology-Based Careers**
- **Community Outreach**
- **Policy and Programming**

Survey Summary

Vehicular Circulation & Parking

- Tension between the need to accommodate cars and the impact they have on the use and character of the campus.
- Most feel that vehicular facilities dominate the site and have some inherent circulation problems that need to be fixed
- Most challenging times are during morning/afternoon drop-off/pickup and when evening events happen simultaneously
- Amount of parking might increase if STEM Academy expands
- Ideas for improvement ranged from minor modifications that enhance existing conditions to the creation of parking structure(s) that can minimize impact footprint

Parking Analysis

Current anticipated parking is 465 surface spaces
Per zoning code, site should have 680 spaces

Edgewood Zoning Code Used for Guidance Only (KCSD is Exempt)

Survey Summary

Pedestrian Circulation

- One respondent said that the existing circulation is fine but most respondents feel that a more coherent, safe, and improved network is needed to help the site function as a campus
- Strong pedestrian core linking all three schools is desirable
- Walking paths should weave through the campus
- Bike/walking path should connect the campus to the surrounding neighborhoods

Survey Summary

Green Space

- Site should be as important as the buildings and provide a pleasant environment for learning, socializing, and enjoyment
- Maximizing green space would improve the appearance and use of the campus, giving it a unique identity
- Students want more plants, water features, and outdoor learning opportunities (i.e. viable wildlife habitats, wetlands, labs, etc.)
- Strong interest in a path system throughout the entire site that provides access to nature
- Landscaping should enhance the campus, especially at parking lots, walkways, driveways and the front yard on Turkeyfoot Rd.

Survey Summary

Campus Character, Organization, and Aesthetics

- Campus should have a cohesive design that is functional, safe, and aesthetically pleasing
- Campus should look green, not just be green
- Campus should look cohesively planned, not fragmented
- Each school needs its own identity and functionality but the entire site (buildings and landscape) needs to be integrated
- Students want more trees and other plants instead of just lawn

Survey Summary

Learning Opportunities and Curricula

- Considerable interest in outdoor classrooms that support curricula and provide gathering spaces for contemplation, learning, socializing, performances, and other activities
- Site should be a living laboratory to gain firsthand knowledge about green technologies, practices, and ethics
- Campus should help students, teachers, and visitors understand how human and natural systems can interact positively
- Before-and-after monitoring of green elements and their impact is important learning tool for students, faculty, and community
- Hands-on learning is desirable
- Students are interested in natural play areas

Survey Summary

Sustainable Technologies and Practices

- **Campus should be a model of sustainable design and practices**
- **State-of-the-art green technologies should be incorporated throughout the campus—from stormwater Best Management Practices (BMPs) to the latest solar, wind, geothermal, and monitoring systems. Students said that would like physical access to these elements**
- **Landscape management and stewardship should be part of the curricula to both maintain the site and teach students skills related to the care of sustainable landscapes**
- **Stormwater management on the site needs to be more than just detention/retention basins**
- **Design should include bike racks and alternative vehicle facilities**

Survey Summary

Green & Technology-Based Careers

Respondents listed interest in the following careers at STEM:

- Alternative energy
- New car technologies
- Energy efficiency
- Environmental science
- Landscape preservation/ conservation
- Soil & water conservation
- Geographic Information Systems (GIS)
- Stormwater management
- Culinary arts
- Green building design (Architecture)
- Green site design (Landscape Architecture)
- Welding
- Chemical engineering
- Industrial design
- Automotive robotics
- Construction
- Mechanical engineering
- Computer Aided Design (CAD)
- Civil engineering

Survey Summary

Community Outreach

- Both Students and Visioning Team members want to bring visitors to the site to educate them about green technologies, methods, and ethics
- Potential strategies include lectures, environmental education fairs, a welcome/visitor center, parents night, and on-site amenities that attract and educate visitors
- Students want opportunities to give back to nature and to their communities

Survey Summary

Policy and Programming

- Carpooling to reduce cars on campus and using alternative fuel buses
- Environmental education should be taught to all teachers and implemented across curricula, including collaboration with regional universities, colleges, corporations, and non-profits
- Internships and work-study opportunities with local businesses
- Evaluation of the environmental impacts of material choices, waste management (for example: use of styrofoam cups and plastic utensils), and building/site systems
- Inter-school websites for sharing event schedules, activities, awards, and other important information

Survey Summary

Existing Campus Strengths

- Existing/proposed high performance buildings
- Excellent location
- Walkable connection to neighborhoods
- Long frontage establishes a presence on Turkeyfoot Rd.
- Students, faculty, and staff
- STEM curricula

Survey Summary

Existing Campus Weaknesses

- Vehicular circulation
- Lack of parking
- Pedestrian circulation system
- Small site with lots of structures and associated hardscape
- Lack of programmed outdoor spaces

Kenton Co. School District Considerations

- Funding and budget
- School equity throughout district (resources and facilities)
- Maintenance & operational support
- Building on the momentum of green building already in process
- Making the campus a flagship STEM learning environment

Design Exploration Process

- Review and understand survey and meeting feedback as a starting point for conceptual design
- Draw on our professional experience creating functional and beautiful campuses that incorporate stormwater BMPs
- Develop concepts that illustrate a gradient from minimal to extensive changes to the site landscape
- Evaluate the merits of each concept
- Engage the Visioning Team to help the design team determine the essential elements of the campus

What are the Essential Elements of the Campus?

- Outdoor learning venues
- Green infrastructure
- Green space
- Campus identity
- Pedestrian and vehicular systems
- Community interface
- Research

What are the Essential Elements of the Campus?

Outdoor Learning Venues

- **Why?**
  - ➢ Nature boosts children's attention, creativity, activity levels, environmental ethics, & self-discipline
  - ➢ Nature encourages exploration and discovery
  - ➢ Nature promotes full-body learning: mind, body, and spirit
- **What?**
  - ➢ Functional and beautiful outdoor classrooms and labs
  - ➢ Gardens (demonstration, food, herbs, etc.)
  - ➢ Habitats (wetlands, meadows, and forests)
  - ➢ Research, monitoring, and site stewardship

Outdoor Learning Venues

What are the Essential Elements of the Campus?

Green Infrastructure

- **Why?**
  - Natural stormwater infiltration and evapotranspiration
  - Opportunities for students to learn about hydrologic systems and watersheds
  - Access to cutting-edge green technologies and methods prepares students for future careers
- **What?**
  - Stormwater Best Management Practices (BMPs), such as rain gardens, bioswales, wetlands, and green roofs
  - Sustainable technologies, such as solar, wind, and geothermal

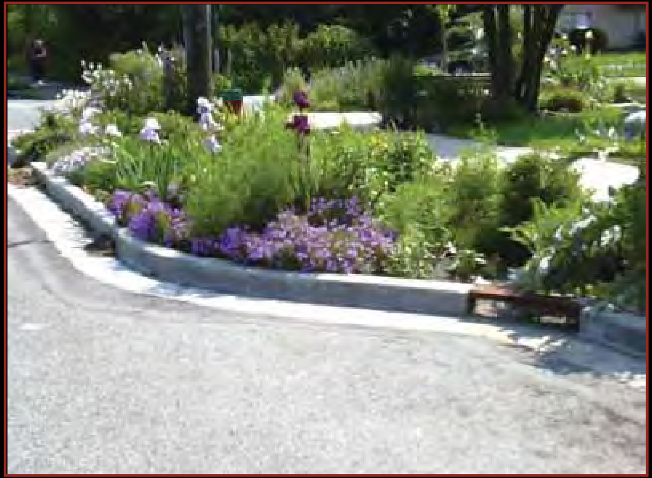
Green Infrastructure

Vegetated Green Roof

Students could compare the water quality and water quantity of runoff from a vegetated roof to a conventional roof.

Green Infrastructure

Green Streets



The right of way along Turkeyfoot could be transformed into a green street for pollutant removal, and pedestrian safety.

Green Infrastructure

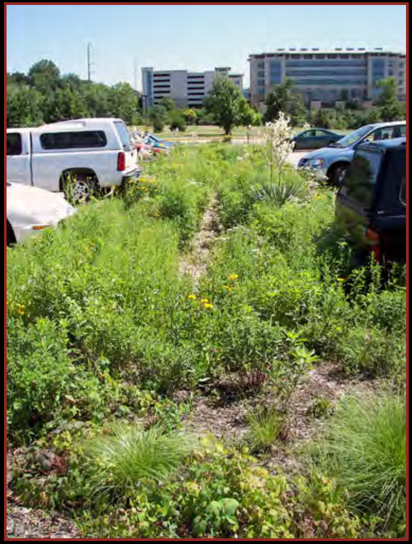
Porous Pavement Demonstrations

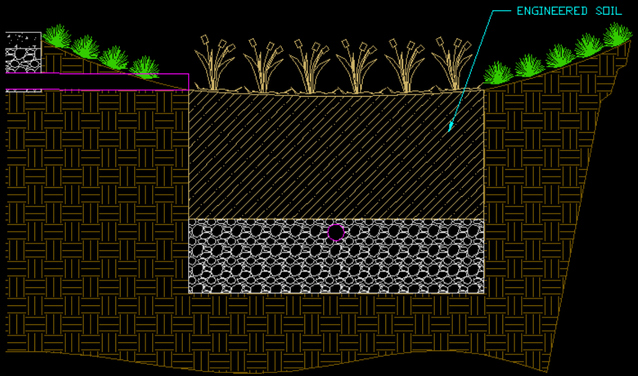
Unique pavements display would allow students to view the functions of different paving systems, as well as monitor and test their performance.

Green Infrastructure

Biofiltration Swales in Parking Lots

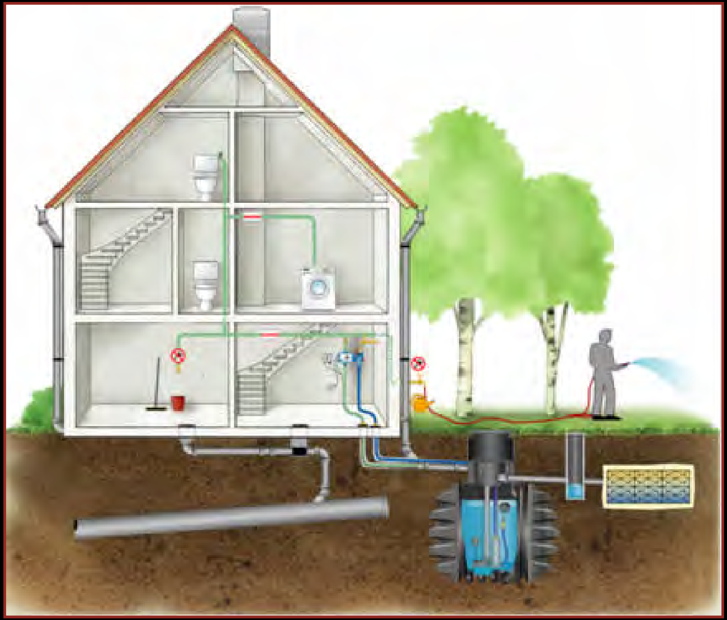
Biofiltration swales in the parking lots will allow students to monitor pollutant removal capabilities of plants, and better understand pollution from vehicles.





Green Infrastructure

Cisterns/ Rainwater Reuse



Rainwater harvesting facilities are planned for the campus – students could learn about the importance of conserving water, and the concept of capturing and reusing rainwater. Students would monitor water consumption rates.

Green Infrastructure

Downspout Disconnection and Rain Barrels

Similar to rainwater reuse, students could learn the applications of downspout disconnection and rain barrel installation for small scale applications like their homes.

Green Infrastructure

Wetland Systems

Wetland systems on site would allow students to interact with a unique natural treatment system. This would open up opportunities for advanced research and chemical testing. This would also allow ecology studies.

Green Infrastructure

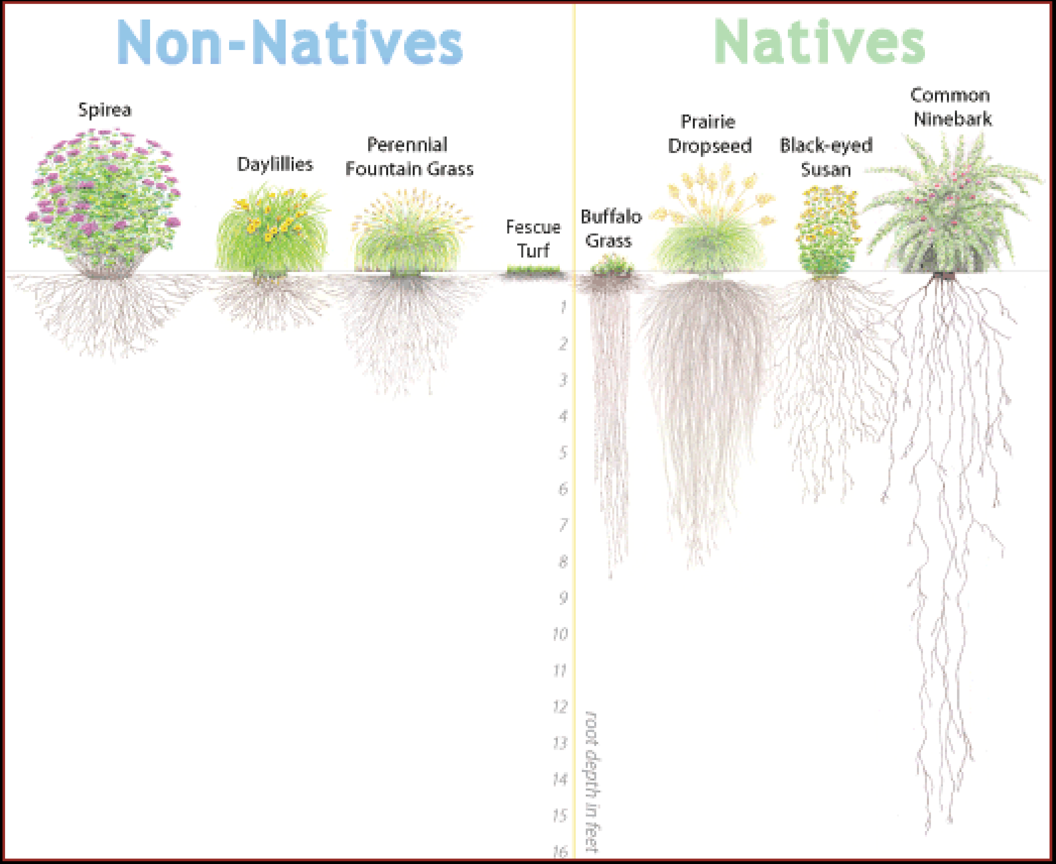
Reforestation and Restoration

Students would learn the concepts and the importance of reforestation and restoration through the examples throughout the site.

Green Infrastructure

"Lyons Chamber" Plantings Display

Students will learn about the importance of plant selection, and various root types. Students will visually assess root displays as well as test plant uptake.



Green Infrastructure

Rain Gardens

Students could learn the importance of rain gardens for water quality, air quality, and infiltration opportunities. Students would test and monitor rain gardens, as well as maintain native plantings.

Green Infrastructure

Step Pools

Students could learn about the power of water, and the importance of energy dissipation for stream protection against scour, etc.

Green Infrastructure

Energy Demonstrations

Tying the energy theme into the site plan, energy demonstrations could allow students to interact, hands on with different alternative energy technologies.

What are the Essential Elements of the Campus?

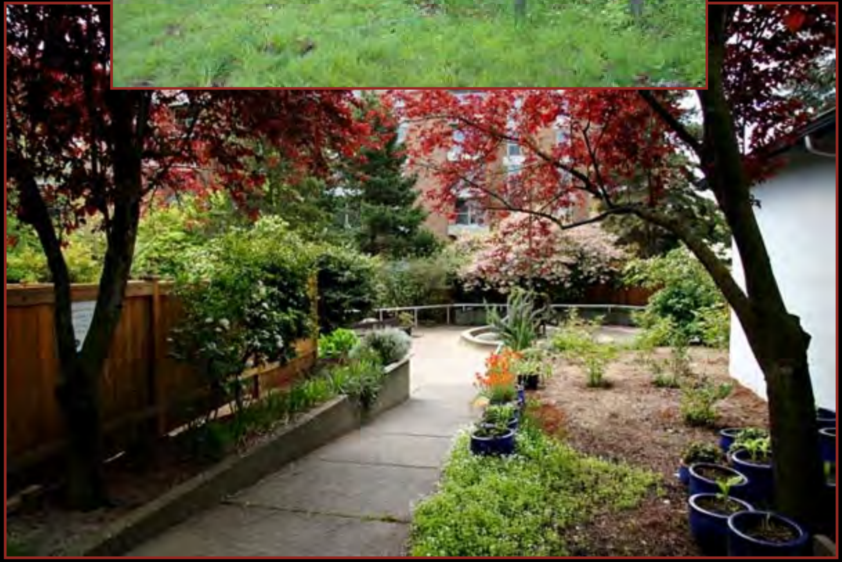
Green Space

- **Why?**
  - Natural areas have a positive impact on people's intellectual, emotional, social, spiritual, and physical growth and health
  - Green space provides a living, dynamic setting with year round interest and buffers adjacent properties
  - Green space reduces the heat island effect, pollution, and glare
- **What?**
  - Natural play environments
  - Active recreation facilities
  - Trails
  - Functional landscaping (buffers, street trees, flowers, etc.)

Natural Play Environments

Active Recreation

Trails & Paths



What are the Essential Elements of the Campus?

Campus Identity

- **Why?**
  - **Unified and integrated campus creates a memorable and identifiable image**
  - **Identifying elements and spaces help make the campus more legible for pedestrians and vehicles**
  - **Campus features express mission of innovation and education**
- **What?**
  - **Focal points, such as towers and art**
  - **Shared gathering spaces, such as plazas and courtyards**
  - **Significant architectural features and gateways**

Focal Point(s)




Shared Gathering Spaces

Gateways

Project Funded by EPA 319 Grant

What are the Essential Elements of the Campus?

Pedestrian and Vehicular Systems

- **Why?**
  - ➢ Efficient and effective pedestrian and vehicular circulation should be safe, functional, and legible
  - ➢ The amount of site dedicated to parking and vehicular circulation directly affects the amount of useable green space
  - ➢ Pedestrian movement between buildings and other site elements should minimize vehicular conflicts and be a pleasant experience
- **What?**
  - ➢ Parking
  - ➢ Vehicular drives, drop-off areas, and bus loading zones
  - ➢ Walkways, trails, and gathering areas
  - ➢ Neighborhood and regional connections

Surface Parking

Structured Parking

Pedestrian Network

Project Funded by EPA 319 Grant

What are the Essential Elements of the Campus?

Community Interface

- **Why?**
  - **Schools are often places for community gatherings and events**
  - **If the campus becomes a model for green technologies, methods, and ethics, it could be a logical place to host demonstrations and disseminate information on sustainable living to the community**
  - **This campus is a growing career training facility that could extend its services to the larger community**
- **What?**
  - **Shared facilities for sporting events and educational lectures**
  - **Amenities, such as gardens, demonstration areas, and interpretive elements**
  - **Meeting and conference facilities**

Project Funded by EPA 319 Grant

What are the Essential Elements of the Campus?

Research

- Why?
  - Study of on-campus technologies, habitats, and amenities promotes understanding of their function, effectiveness, and sustainability over time
  - Encourages multi-disciplinary interaction and collaboration
  - Students are exposed to a range of professions and knowledge
- What?
  - Other Kenton County schools can visit the campus and learn from its elements
  - Universities and colleges can research and monitor the effectiveness of stormwater BMPs
  - Corporations and non-profits can learn about green technologies

Feedback

Essential Issues and Components	Priority	Comments and Suggestions
Outdoor Learning Venues • Functional and beautiful outdoor classrooms • Gardens (demonstration, food, herbs, etc.) • Habitats (wetlands, meadows, and forests) • Researching, monitoring, and maintaining site elements		
Green Infrastructure • Stormwater BMPs (rain gardens, bioswales, etc.) • Sustainable technologies (solar, wind, and geothermal)		
Green Space • Natural play environments • Active recreation facilities • Trails • Landscaping (buffers, trees, flowers, etc.)		
Campus Identity • Focal point(s) (towers, art, etc.) • Shared gathering spaces • Significant architectural feature(s)		

Project Funded by EPA 319 Grant

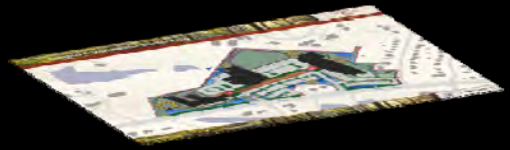
Feedback

Essential Issues and Components	Priority	Comments and Suggestions
Pedestrian & Vehicular Systems • Parking (quantity, character, etc.) • Drives, drop-off areas, & bus loading zones • Walkways & trails • Neighborhood & regional connections		
Community Interface • Shared facilities (sports, events, etc.) • Amenities (gardens, demonstrations, etc.) • Meeting spaces		
Research • Other Kenton County schools • Universities and colleges • Corporations and non-profit organizations		

Design Exploration Gradient

Concept 1:

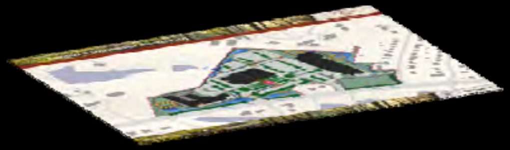
Maximizing Opportunities within the Existing Framework



- Maintain current/proposed locations of buildings
- Consider minor changes to existing paving but improve pedestrian network and integrate small stormwater BMPs
- Maximize and link greenbelt enhancements and gateway arrival experience, including upgrades to existing stormwater detention facilities

Concepts 2:

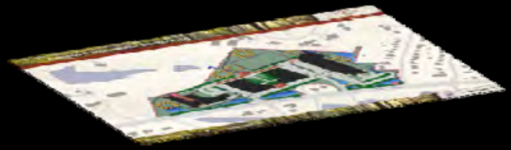
Modifying the Existing Framework



- Recommend minor changes to Patton/STEM building
- Reorganize vehicular & pedestrian networks for improved efficiency, legibility, & connectivity
- Enhance community interface & linkages with site with walkways, shared facilities, and amenities

Concept 3:

Creating a Bold, New Green Campus Vision



- Celebrate the new STEM Academy building as the central, iconic feature of a bold, new campus organization
- Promote the campus as a visible, regional model of sustainable design, curricula, technologies, & community education
- Establish a new, cohesive campus structure to accommodate the full needs of all of the schools
- Maximize the density & efficiency of parking, including the potential use of structured parking

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Existing

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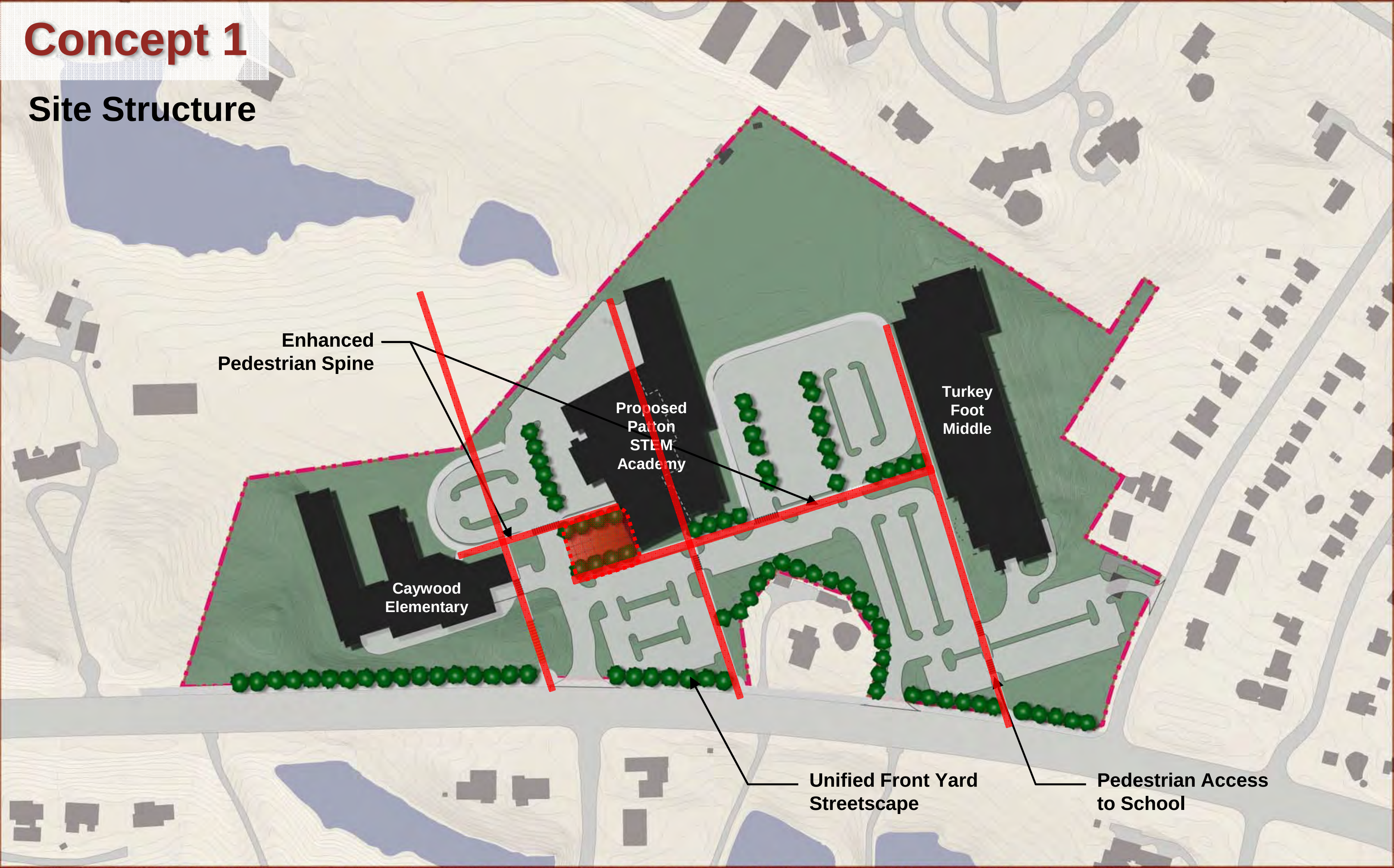
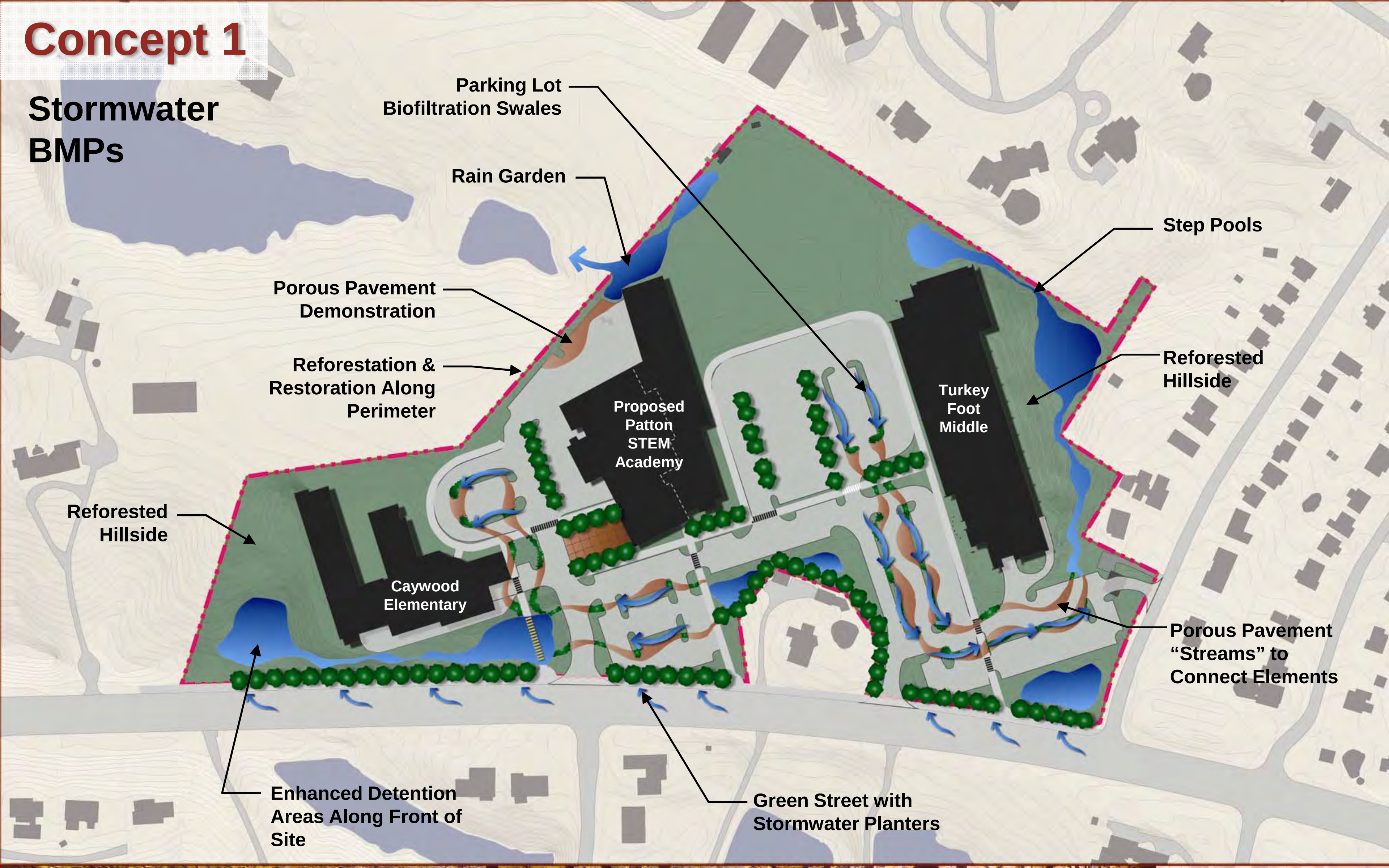
Concept 1

Site Structure



Concept 1

Stormwater BMPs

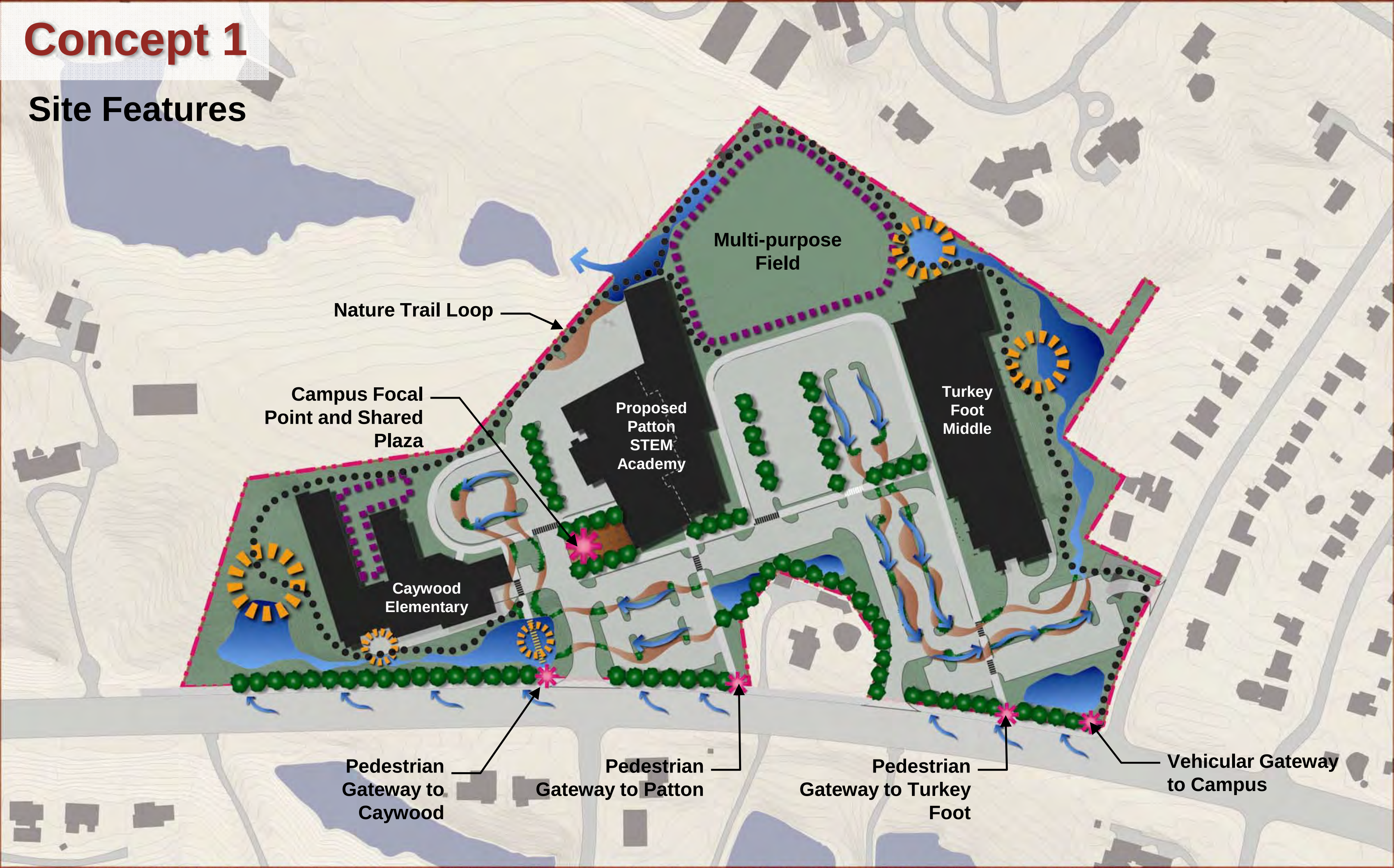


Concept 1

Outdoor Education

Concept 1

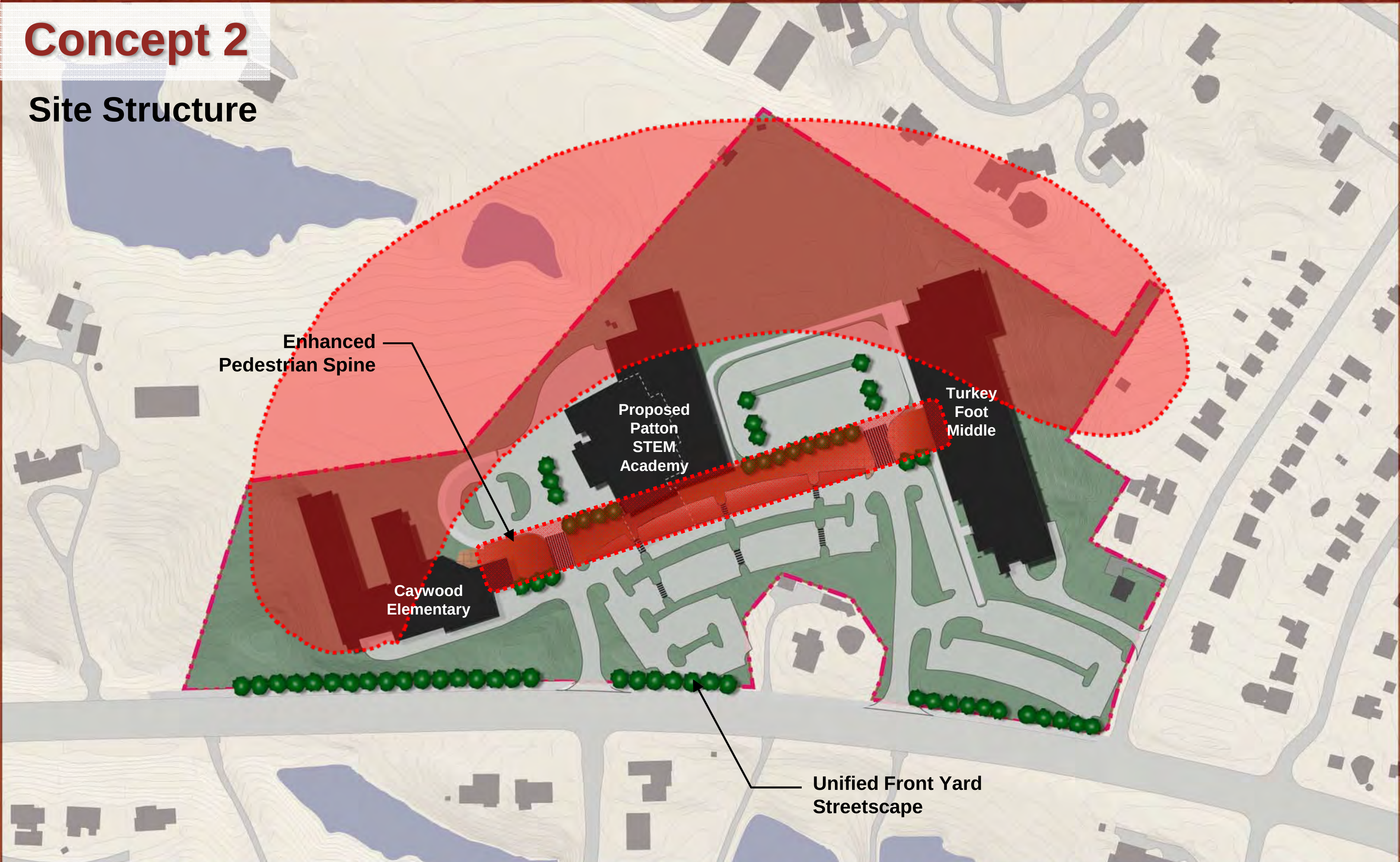
Site Features



Existing

Concept 2

Site Structure



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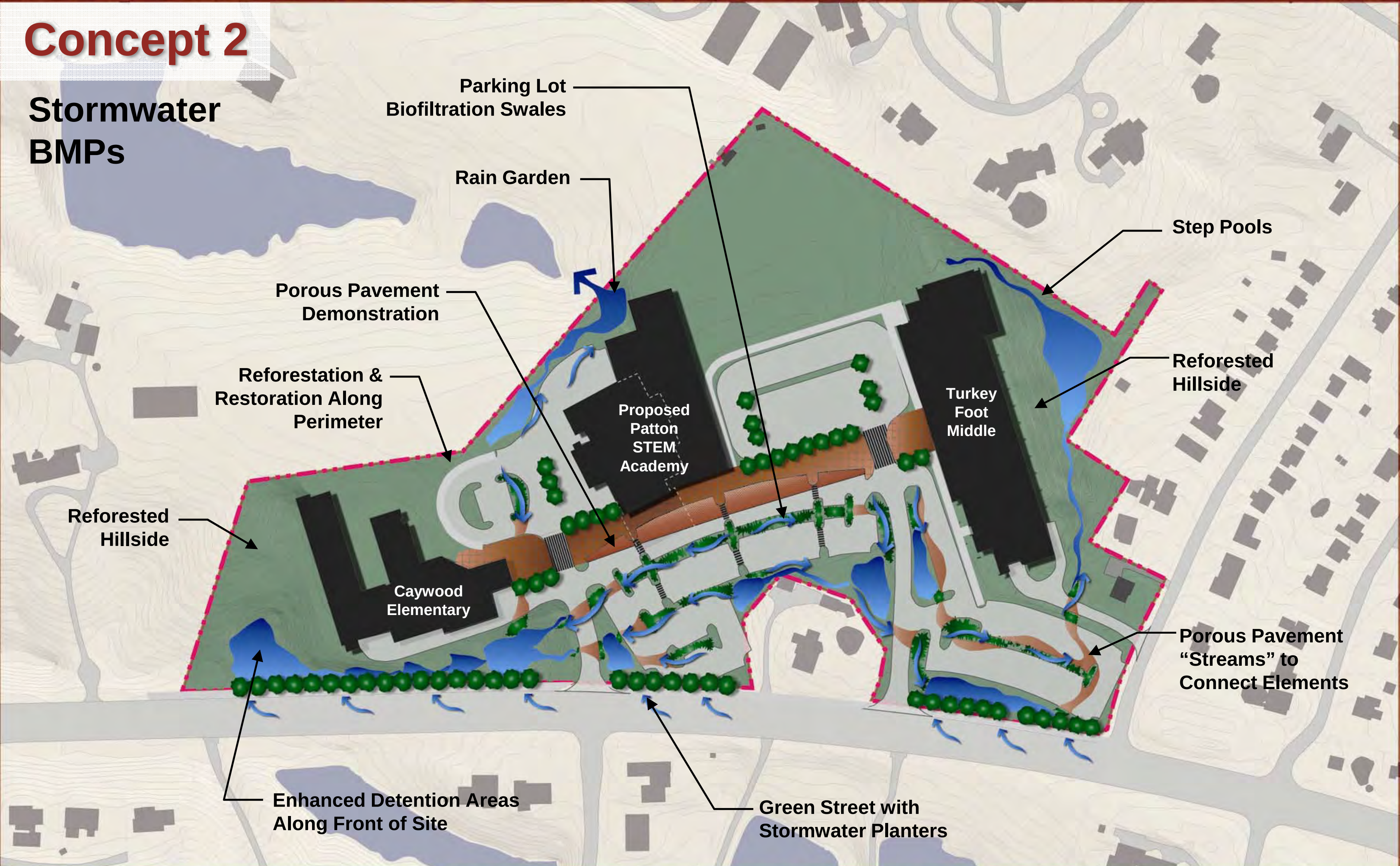
Concept 2

Stormwater BMPs



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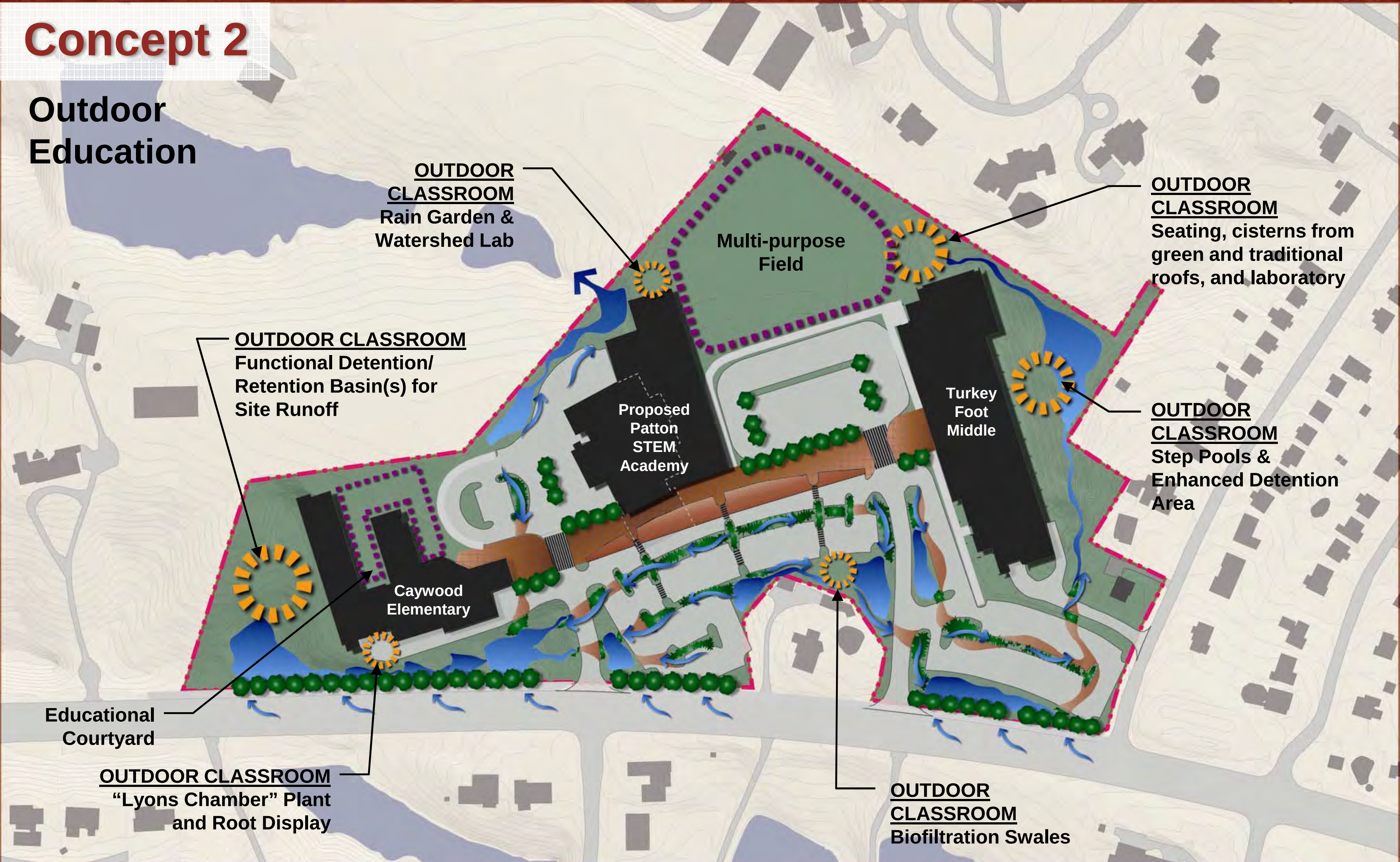
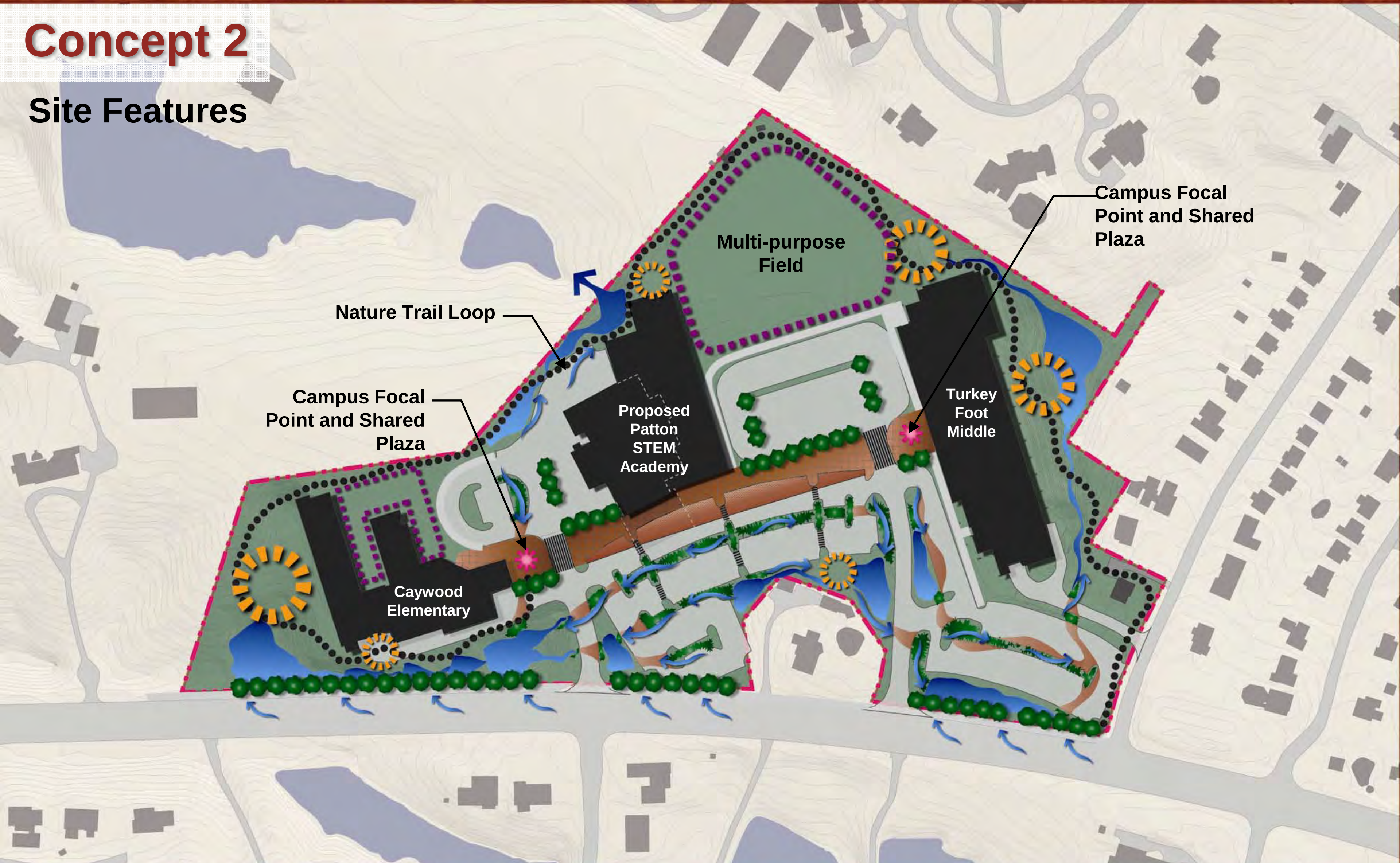
Concept 2

Outdoor Education



Concept 2

Site Features



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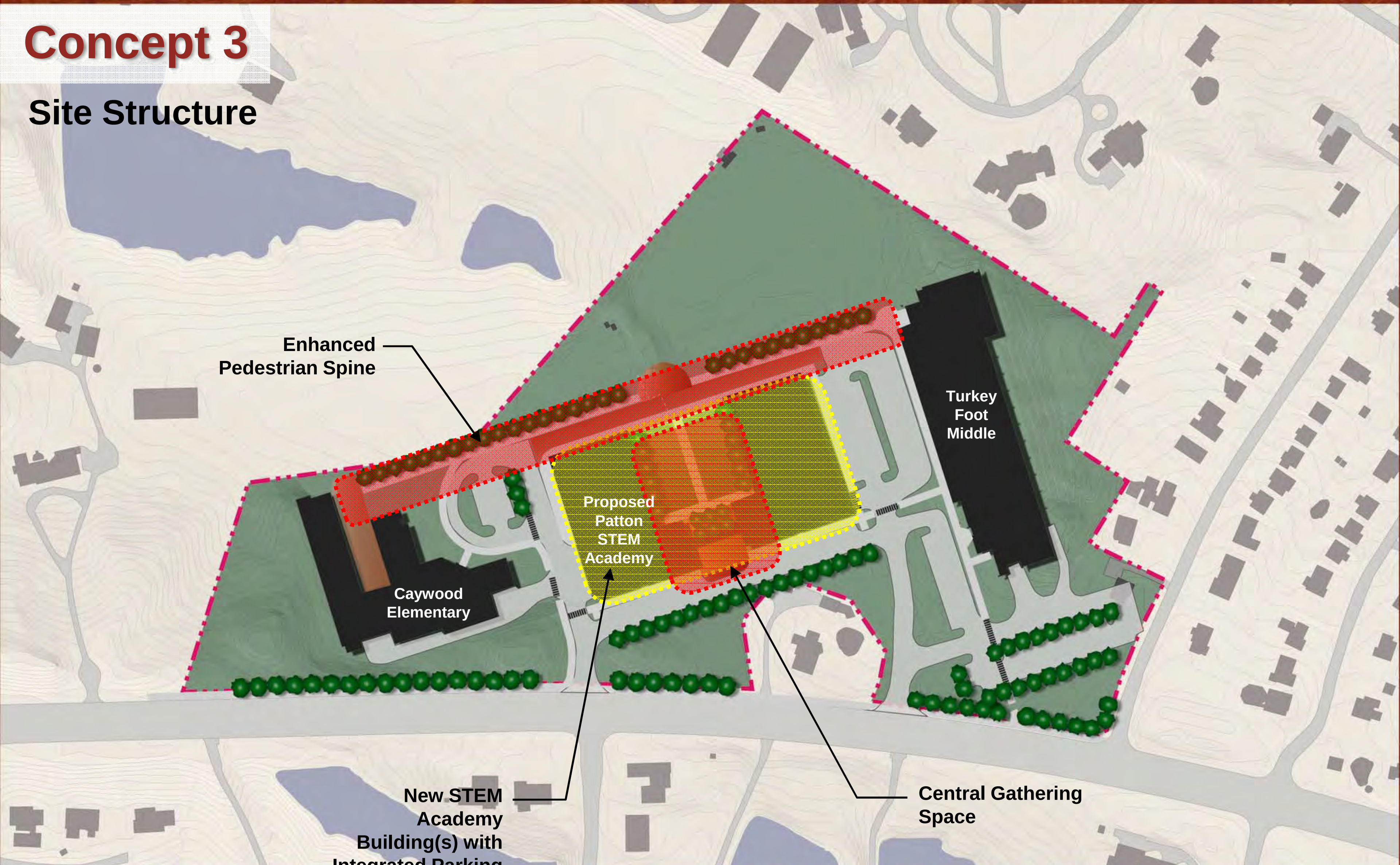
Concept 3

Site Structure

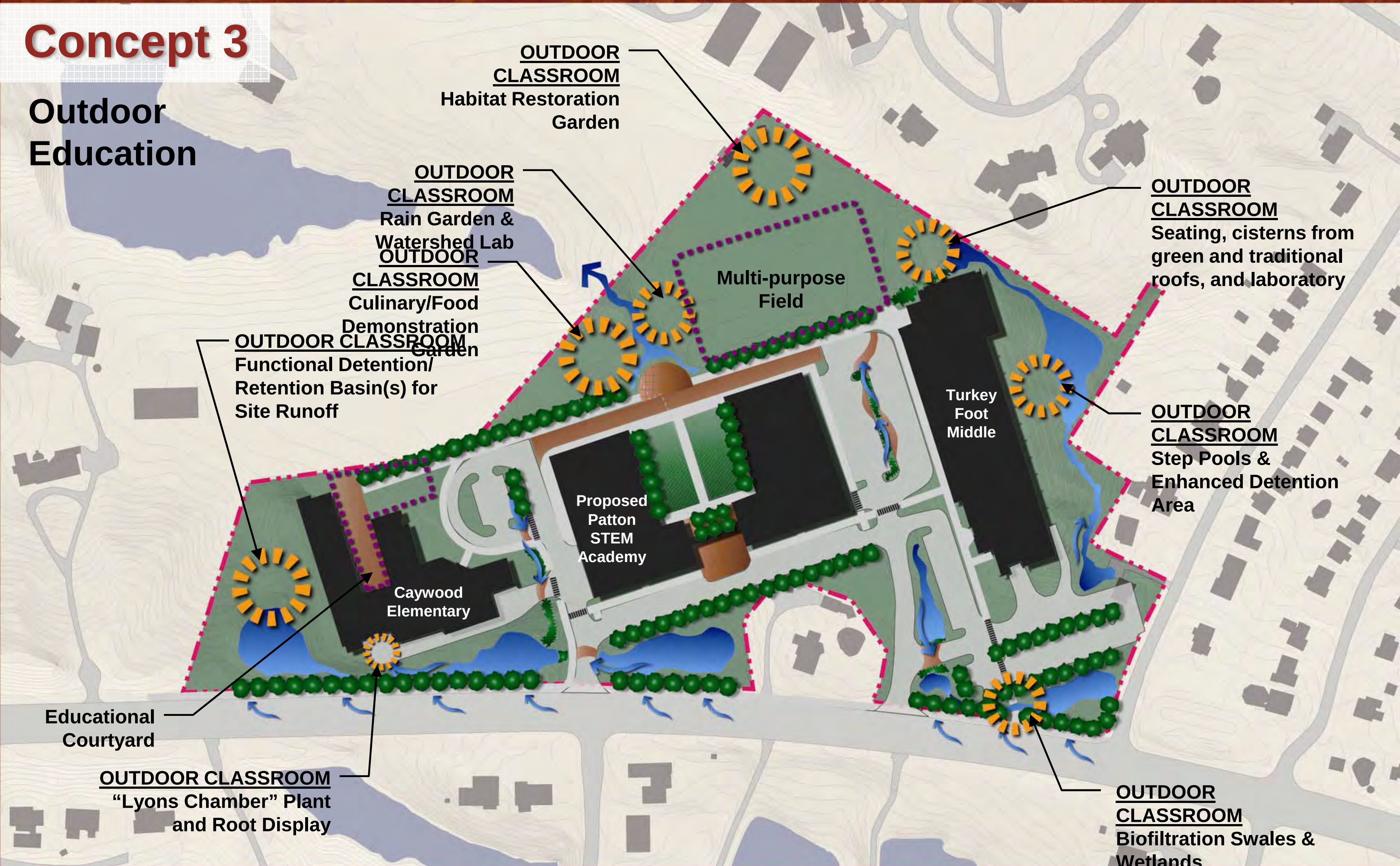


Concept 3

Stormwater BMPs

Concept 3

Outdoor Education



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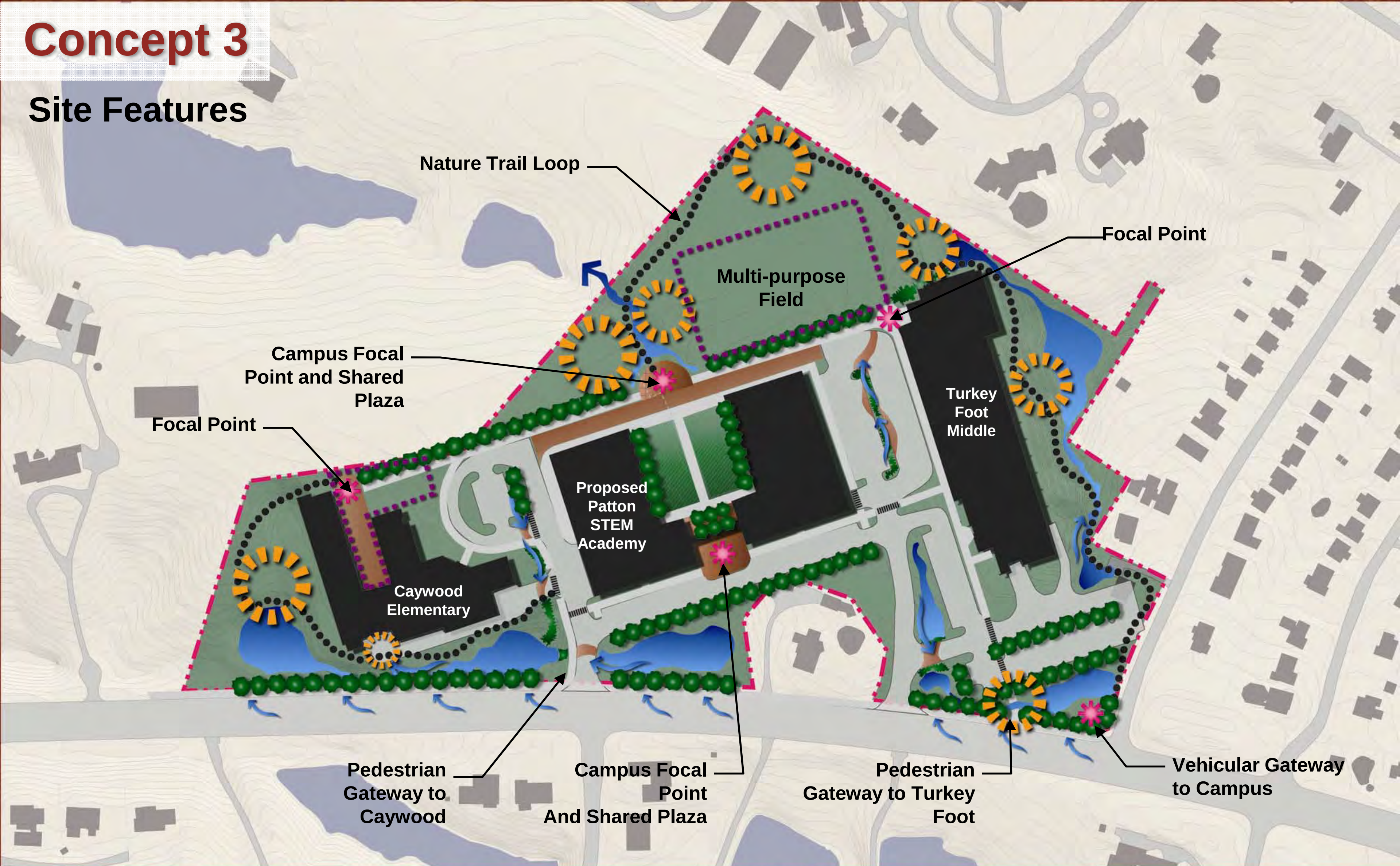
Concept 3

Site Features



What are the Essential Elements of the Campus?

- Outdoor learning venues
- Green infrastructure
- Green space
- Campus identity
- Pedestrian and vehicular systems
- Community interface
- Research

Feedback

Essential Issues and Components	Priority	Comments and Suggestions
Outdoor Learning Venues • Functional and beautiful outdoor classrooms • Gardens (demonstration, food, herbs, etc.) • Habitats (wetlands, meadows, and forests) • Researching, monitoring, and maintaining site elements		
Green Infrastructure • Stormwater BMPs (rain gardens, bioswales, etc.) • Sustainable technologies (solar, wind, and geothermal)		
Green Space • Natural play environments • Active recreation facilities • Trails • Landscaping (buffers, trees, flowers, etc.)		
Campus Identity • Focal point(s) (towers, art, etc.) • Shared gathering spaces • Significant architectural feature(s)		

Feedback

Essential Issues and Components	Priority	Comments and Suggestions
Pedestrian & Vehicular Systems • Parking (quantity, character, etc.) • Drives, drop-off areas, & bus loading zones • Walkways & trails • Neighborhood & regional connections		
Community Interface • Shared facilities (sports, events, etc.) • Amenities (gardens, demonstrations, etc.) • Meeting spaces		
Research • Other Kenton County schools • Universities and colleges • Corporations and non-profit organizations		

Comments & Questions

How can your organization help implement this vision?

What’s Next?

Thank You for Your Interest and Participation!

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CORE Meeting – Draft Preliminary Master Plan

Growing Leadership from Green Buildings to Green Campus:

Sustainability, Community, and Learning Through Shared Awareness and Visioning

This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act.

Today's Agenda

- Update on project interest/funding status
- Summary of curriculum/programming meetings
- Discussion about draft preliminary master plan
- Discussion about character sketches
- Other items…

Existing

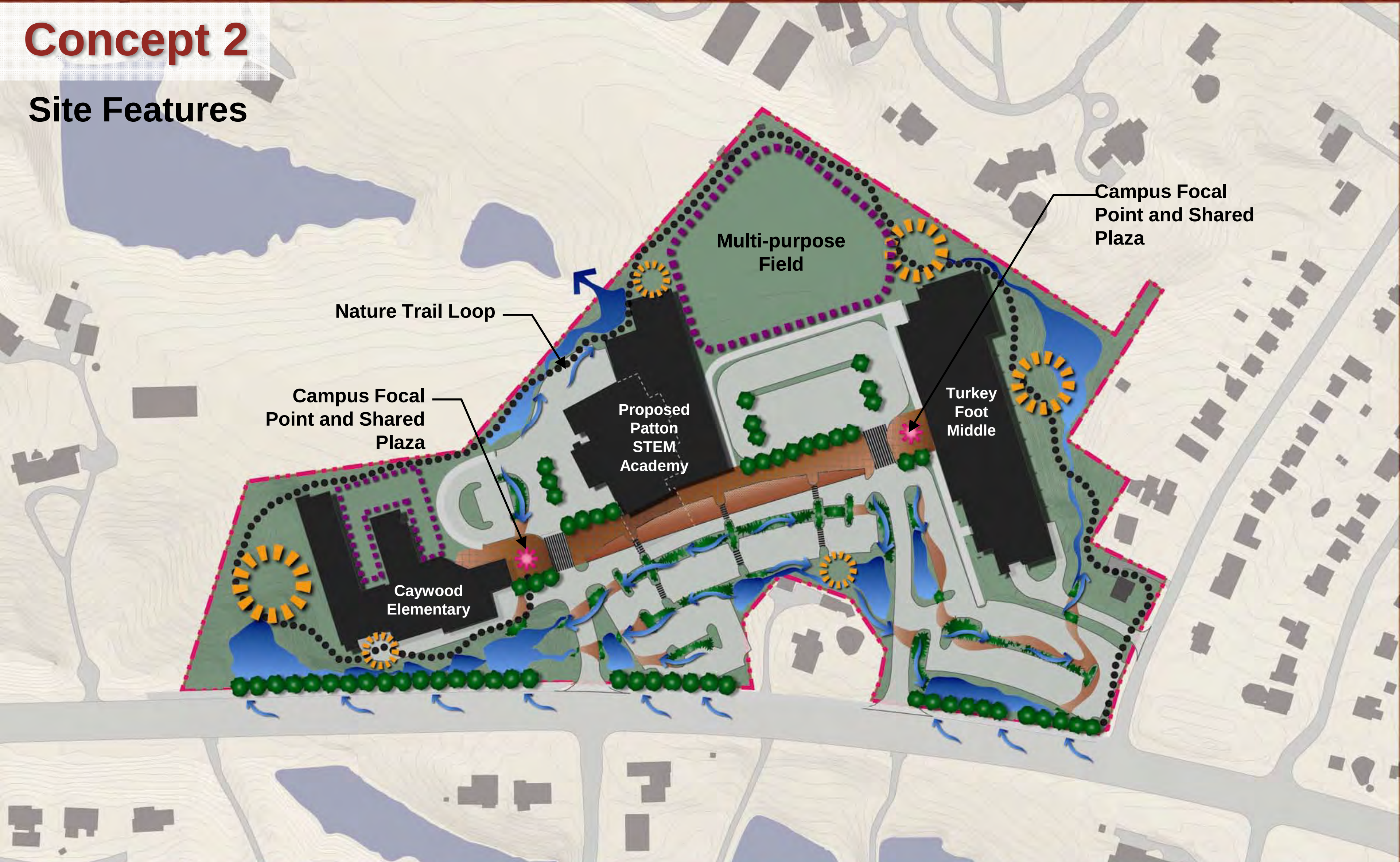
Project Funded by EPA 319 Grant

Concept 1

Site Features

Concept 2

Site Features



Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

THE KENTON COUNTY SCHOOL DISTRICT
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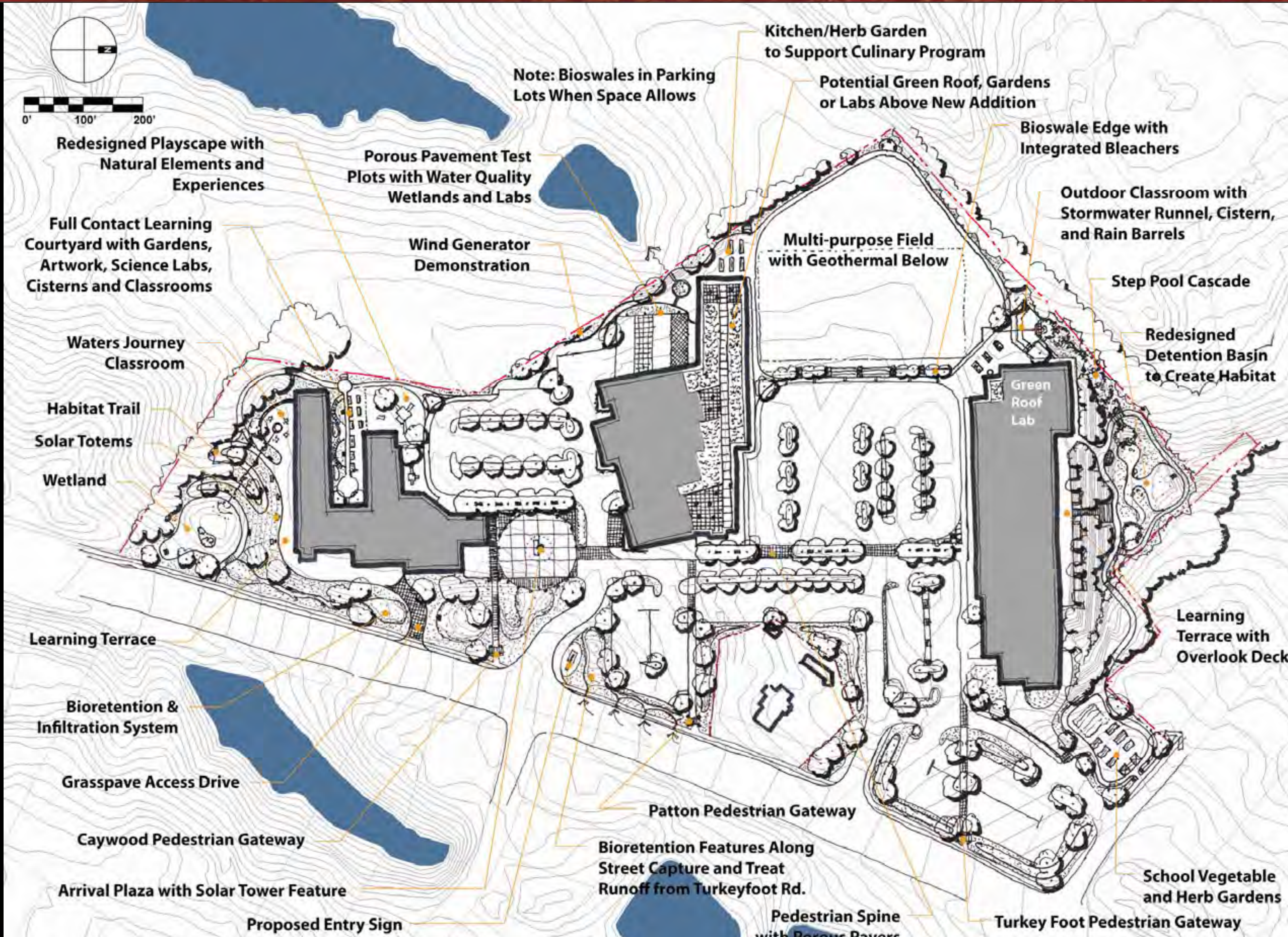


Thank You for Your Interest and Participation!

Student Input Meeting

Growing Leadership from Green Buildings to Green Campus:

Sustainability, Community, and Learning Through Shared Awareness and Visioning

This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act.

Our Master Planning Process

Awareness

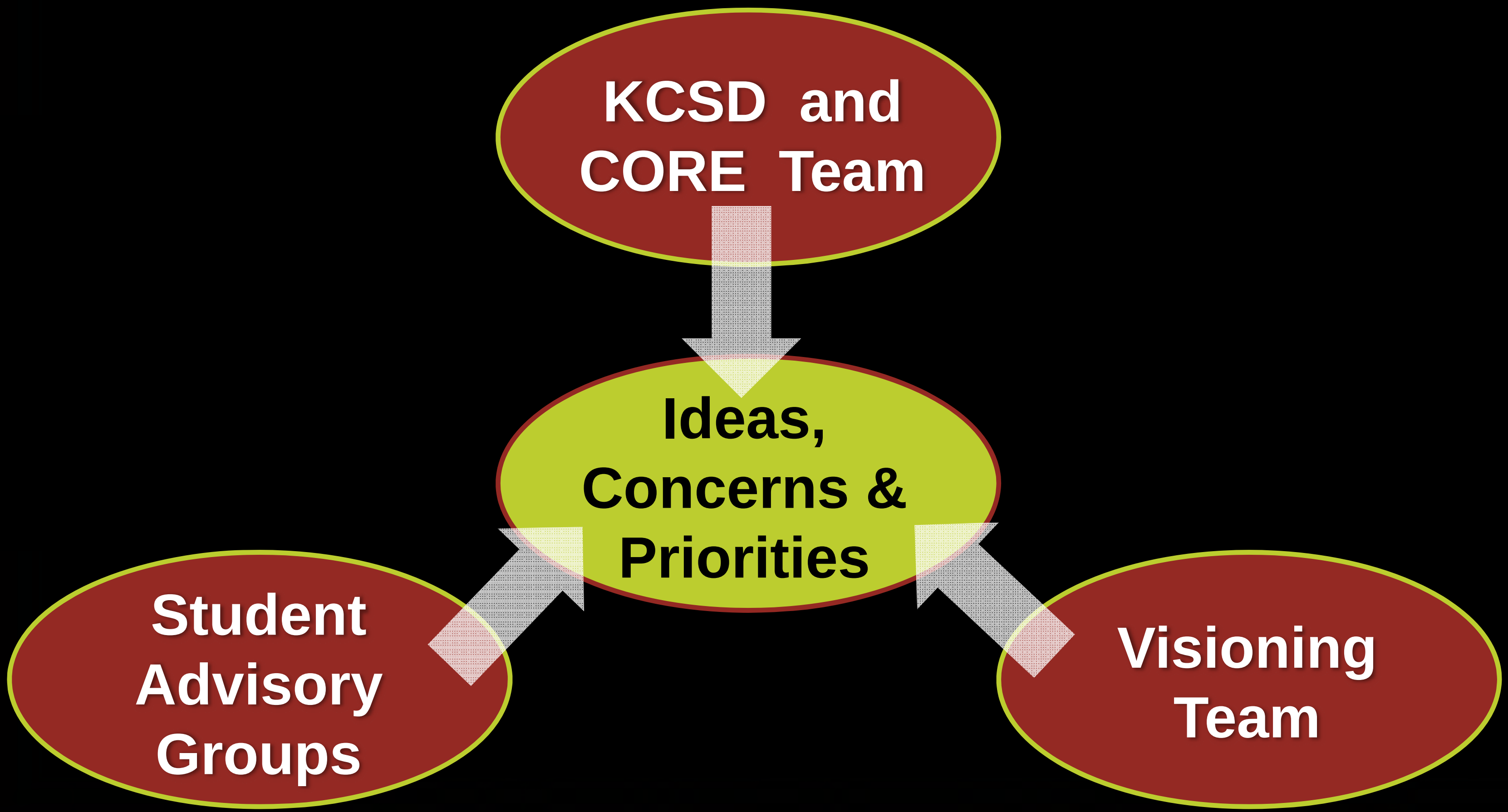
↓

Exploration

↓

Vision

Design Process Input



Today's Topics

- What is a Campus?
- What is a Green Campus?
- What Do We Know About the Site?
- What Should We Keep in Mind When We Begin Design?
- What Green Site Elements Might be Possible Here?
- What Would You Like to See and Do at the School Site?

What Defines a Campus?

- Organization
- Gateways
- Focal point
- Pedestrian system
- Gathering spaces
- Interactive and useable landscape

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What Defines a Campus?

Organized appearance

Stanford University

University of Virginia

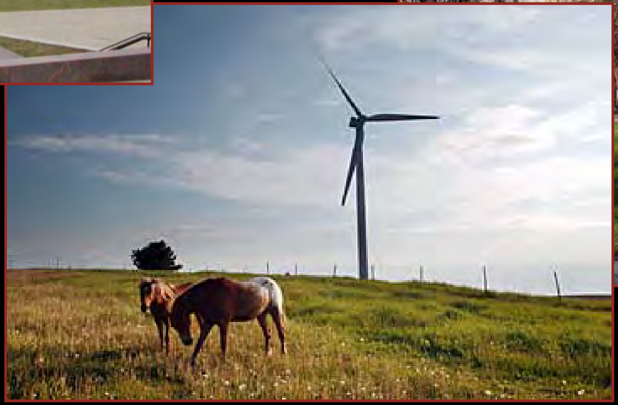
What Defines a Campus?

Gateways welcome students, teachers, and visitors

What Defines a Campus?

Focal point creates a well-defined image for school



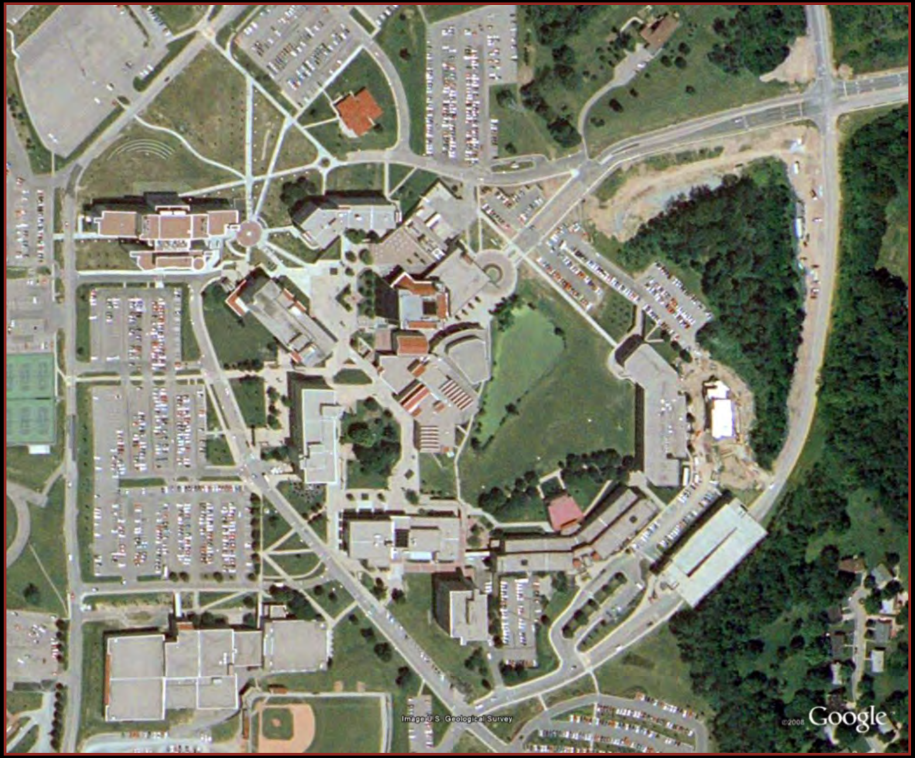
What Defines a Campus?

Strengthened pedestrian sidewalk and path system

What Defines a Campus?

Strengthened pedestrian sidewalk and path system

Foothills College



Northern Kentucky University

What Defines a Campus?

Balance of large and small gathering spaces

What Defines a Campus?

Landscape is a place for learning, recreation, relaxation and contact with nature

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What Defines a Green Campus?

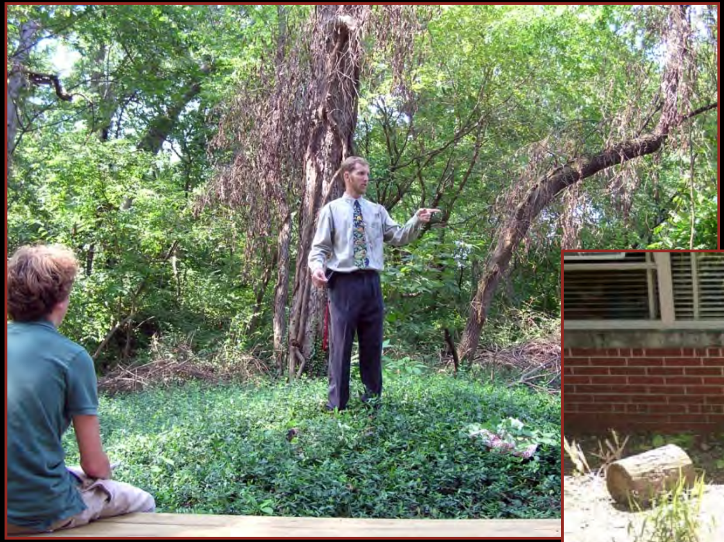
- Natural areas and habitats
- Interaction with nature
- Educational features and activities
- Green technologies
- Stewardship

What Defines a Green Campus?

Protected/restored natural areas and habitats

What Defines a Green Campus?

Lots of chances to interact with and learn about nature and natural systems



What Defines a Green Campus?

Take care of and learn about stormwater runoff




What Defines a Green Campus?

Include green technologies in campus buildings and landscape

What Defines a Green Campus?

Long term care of landscape features and places

What do we Know About the Site?

Aerial Image

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Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

The Kenton County School District
A System of Excellence

Site Plan with New Turkey Foot Middle School

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Strand Associates • Human Nature

0' 100' 200 300

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

Current Green Features & Strategies

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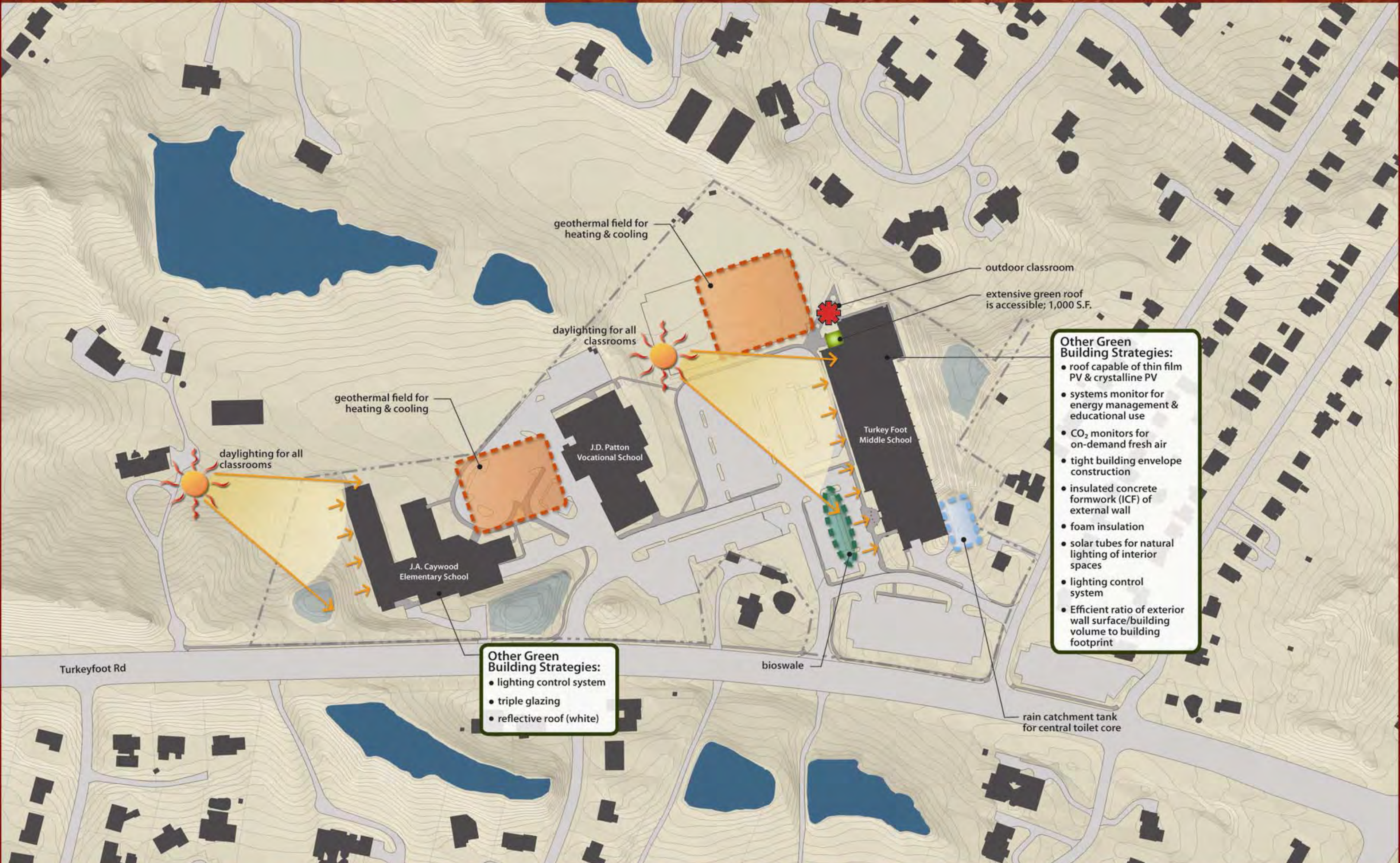

Green Campus & Stormwater Master Plan

Soils

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0' 100' 200 300

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

Site Drainage

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Wind Direction

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Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

Circulation

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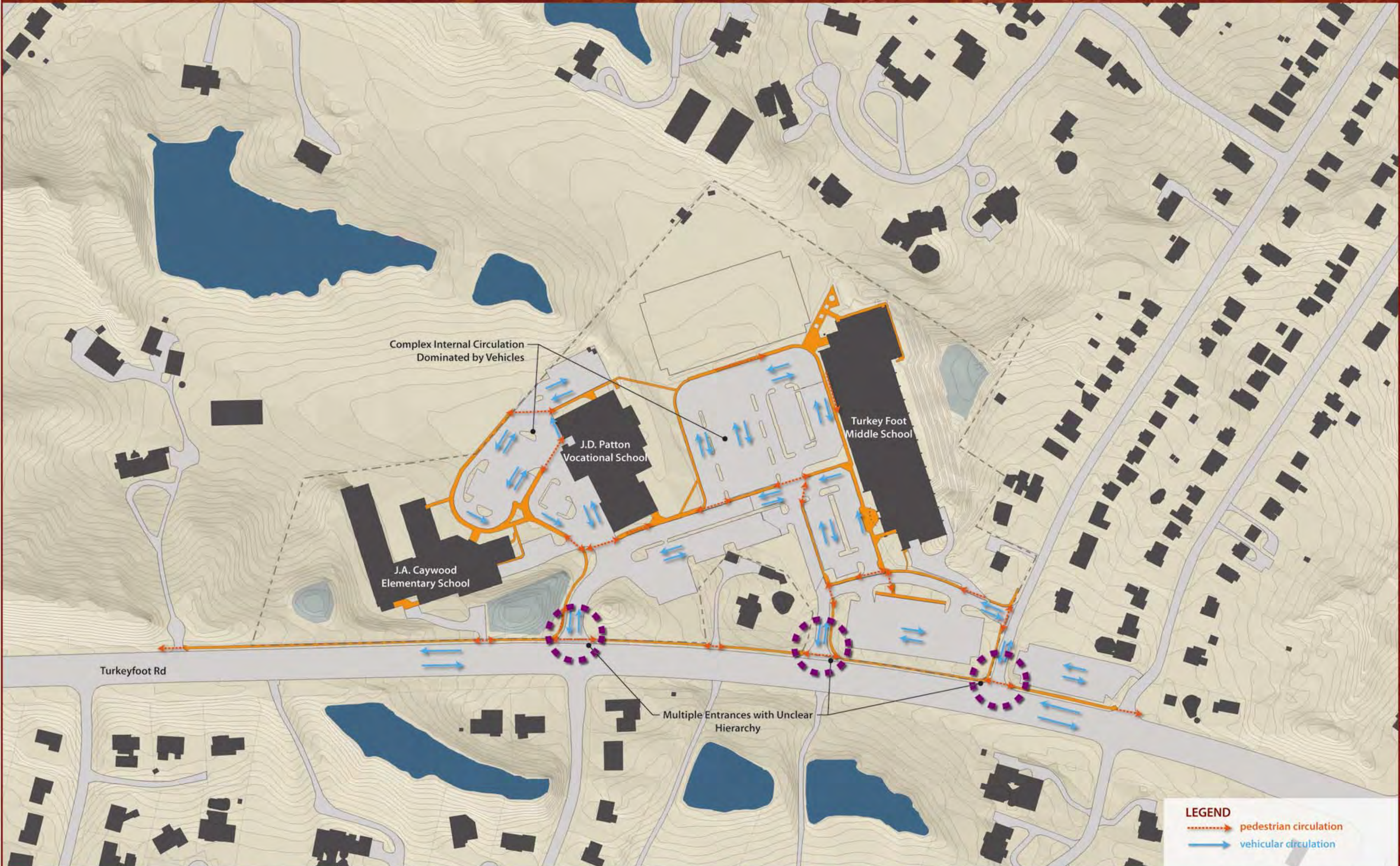


Site Opportunities & Constraints

- Lots of opportunities for green infrastructure elements and outdoor learning and use areas
- Potential for enhanced connections to nearby neighborhoods, schools and parks
- A unified "front yard" and enhanced greenbelt for the campus could tie it together
- A pedestrian spine could connect the campus elements and add clarity to the pedestrian circulation system
- The existing vehicular circulation could benefit from reorganization and integration with pedestrian and green infrastructure systems

Design Exploration Process

- Review and understand survey and meeting feedback as a starting point for conceptual design
- Draw on our professional experience creating functional and beautiful campuses that incorporate stormwater BMPs
- Develop concepts that illustrate a gradient from minimal to extensive changes to the site landscape
- Evaluate the merits of each concept
- Engage the Visioning Team to help the design team determine the essential elements of the campus

What are the Essential Elements of the Campus?

- Outdoor learning venues
- Green infrastructure
- Green space
- Campus identity
- Pedestrian and vehicular systems
- Community interface
- Research

What are the Essential Elements of the Campus?

Outdoor Learning Venues

- **Why?**
  - Nature boosts children's attention, creativity, activity levels, environmental ethics, & self-discipline
  - Nature encourages exploration and discovery
  - Nature promotes full-body learning: mind, body, and spirit
- **What?**
  - Functional and beautiful outdoor classrooms and labs
  - Gardens (demonstration, food, herbs, etc.)
  - Habitats (wetlands, meadows, and forests)
  - Research, monitoring, and site stewardship

Outdoor Learning Venues

What are the Essential Elements of the Campus?

Green Infrastructure

- **Why?**
  - ➢ **Natural stormwater infiltration and evapotranspiration**
  - ➢ **Opportunities for students to learn about hydrologic systems and watersheds**
  - ➢ **Access to cutting-edge green technologies and methods prepares students for future careers**
- **What?**
  - ➢ **Stormwater Best Management Practices (BMPs), such as rain gardens, bioswales, wetlands, and green roofs**
  - ➢ **Sustainable technologies, such as solar, wind, and geothermal**

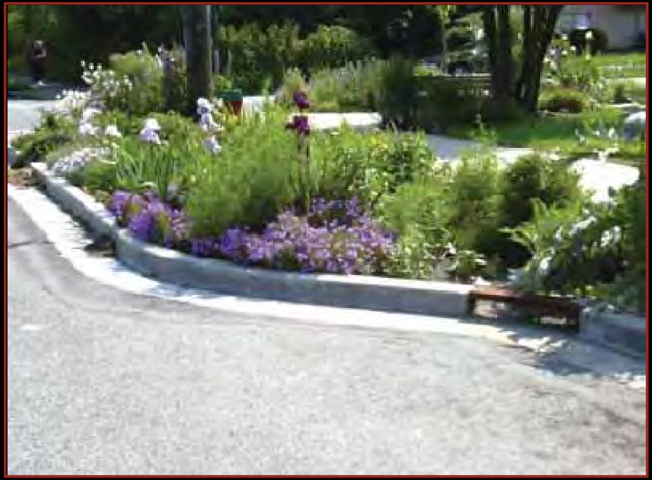
Green Infrastructure

Vegetated Green Roof

Students could compare the water quality and water quantity of runoff from a vegetated roof to a conventional roof.

Green Infrastructure

Green Streets



The right of way along Turkeyfoot could be transformed into a green street for pollutant removal, and pedestrian safety.

Green Infrastructure

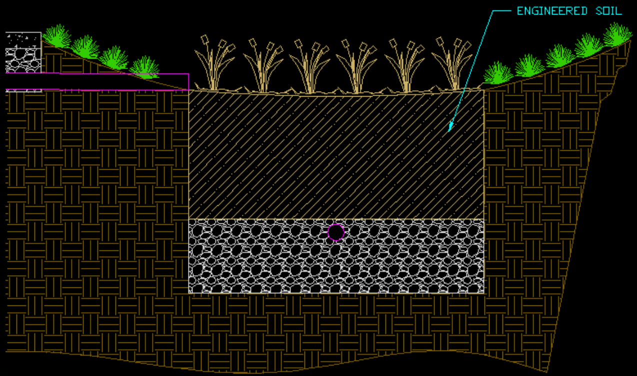
Porous Pavement Demonstrations

Unique pavements display would allow students to view the functions of different paving systems, as well as monitor and test their performance.

Green Infrastructure

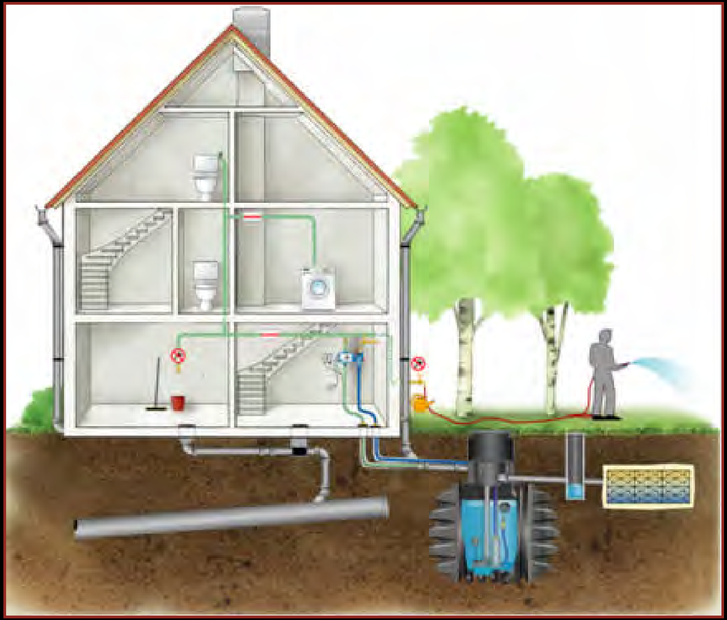
Biofiltration Swales in Parking Lots

Biofiltration swales in the parking lots will allow students to monitor pollutant removal capabilities of plants, and better understand pollution from vehicles.



Green Infrastructure

Cisterns/ Rainwater Reuse



Rainwater harvesting facilities are planned for the campus – students could learn about the importance of conserving water, and the concept of capturing and reusing rainwater. Students would monitor water consumption rates.

Green Infrastructure

Downspout Disconnection and Rain Barrels

Similar to rainwater reuse, students could learn the applications of downspout disconnection and rain barrel installation for small scale applications like their homes.

Green Infrastructure

Wetland Systems

Wetland systems on site would allow students to interact with a unique natural treatment system. This would open up opportunities for advanced research and chemical testing. This would also allow ecology studies.

Green Infrastructure

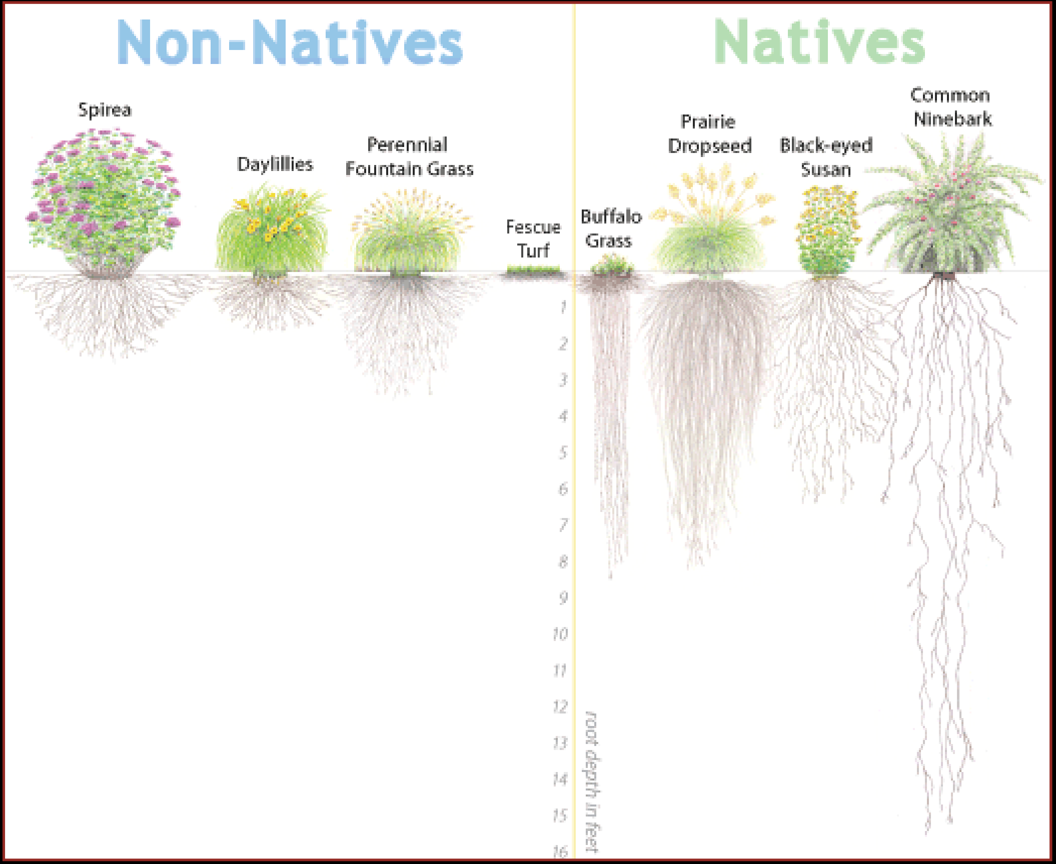
Reforestation and Restoration

Students would learn the concepts and the importance of reforestation and restoration through the examples throughout the site.

Green Infrastructure

"Lyons Chamber" Plantings Display

Students will learn about the importance of plant selection, and various root types. Students will visually assess root displays as well as test plant uptake.



Green Infrastructure

Rain Gardens

Students could learn the importance of rain gardens for water quality, air quality, and infiltration opportunities. Students would test and monitor rain gardens, as well as maintain native plantings.

Green Infrastructure

Step Pools

Students could learn about the power of water, and the importance of energy dissipation for stream protection against scour, etc.

Green Infrastructure

Energy Demonstrations

Tying the energy theme into the site plan, energy demonstrations could allow students to interact, hands on with different alternative energy technologies.

What are the Essential Elements of the Campus?

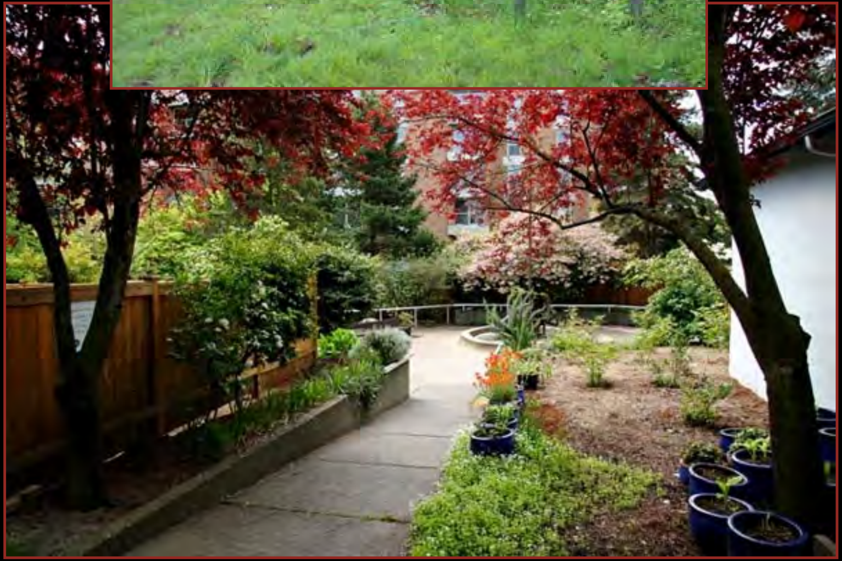
Green Space

- Why?
  - Natural areas have a positive impact on people's intellectual, emotional, social, spiritual, and physical growth and health
  - Green space provides a living, dynamic setting with year round interest and buffers adjacent properties
  - Green space reduces the heat island effect, pollution, and glare
- What?
  - Natural play environments
  - Active recreation facilities
  - Trails
  - Functional landscaping (buffers, street trees, flowers, etc.)

Natural Play Environments

Active Recreation

Trails & Paths



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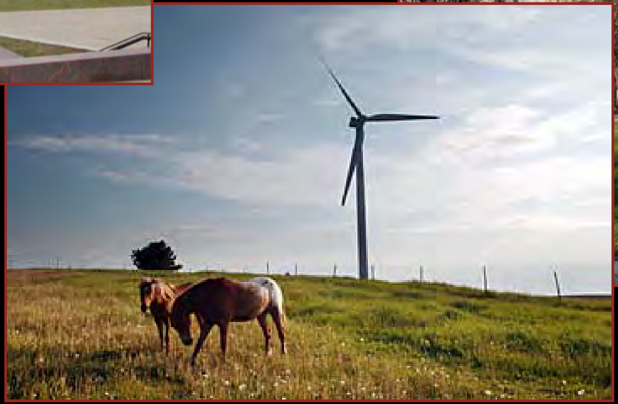
What are the Essential Elements of the Campus?

Campus Identity

- **Why?**
  - **Unified and integrated campus creates a memorable and identifiable image**
  - **Identifying elements and spaces help make the campus more legible for pedestrians and vehicles**
  - **Campus features express mission of innovation and education**
- **What?**
  - **Focal points, such as towers and art**
  - **Shared gathering spaces, such as plazas and courtyards**
  - **Significant architectural features and gateways**

Focal Point(s)



Shared Gathering Spaces



Gateways

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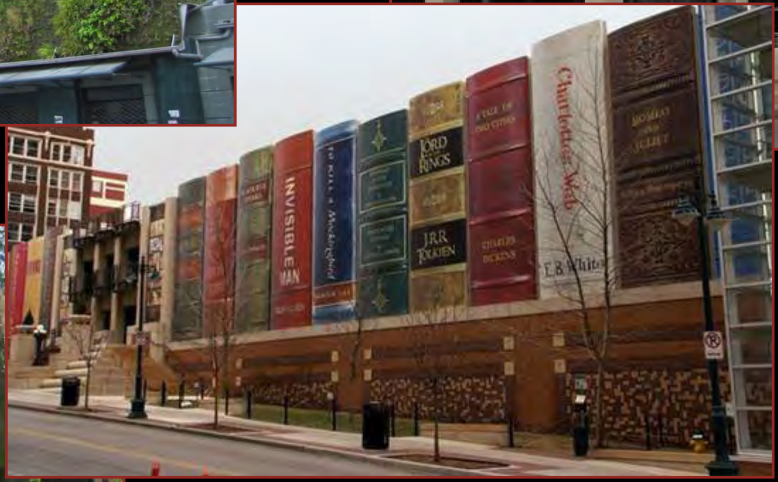
What are the Essential Elements of the Campus?

Pedestrian and Vehicular Systems

- **Why?**
  - Efficient and effective pedestrian and vehicular circulation should be safe, functional, and legible
  - The amount of site dedicated to parking and vehicular circulation directly affects the amount of useable green space
  - Pedestrian movement between buildings and other site elements should minimize vehicular conflicts and be a pleasant experience
- **What?**
  - Parking
  - Vehicular drives, drop-off areas, and bus loading zones
  - Walkways, trails, and gathering areas
  - Neighborhood and regional connections

Surface Parking

Structured Parking



Pedestrian Network

What are the Essential Elements of the Campus?

Community Interface

- Why?
  - Schools are often places for community gatherings and events
  - If the campus becomes a model for green technologies, methods, and ethics, it could be a logical place to host demonstrations and disseminate information on sustainable living to the community
  - This campus is a growing career training facility that could extend its services to the larger community
- What?
  - Shared facilities for sporting events and educational lectures
  - Amenities, such as gardens, demonstration areas, and interpretive elements
  - Meeting and conference facilities

What are the Essential Elements of the Campus?

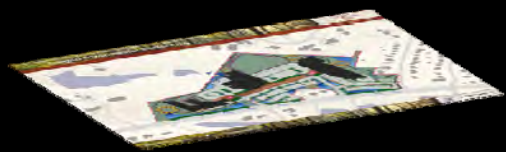
Research

- Why?
  - Study of on-campus technologies, habitats, and amenities promotes understanding of their function, effectiveness, and sustainability over time
  - Encourages multi-disciplinary interaction and collaboration
  - Students are exposed to a range of professions and knowledge
- What?
  - Other Kenton County schools can visit the campus and learn from its elements
  - Universities and colleges can research and monitor the effectiveness of stormwater BMPs
  - Corporations and non-profits can learn about green technologies

Design Exploration Gradient

Concept 1:

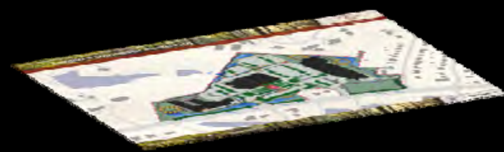
Maximizing Opportunities within the Existing Framework



- Maintain current/proposed locations of buildings
- Consider minor changes to existing paving but improve pedestrian network and integrate small stormwater BMPs
- Maximize and link greenbelt enhancements and gateway arrival experience, including upgrades to existing stormwater detention facilities

Concepts 2:

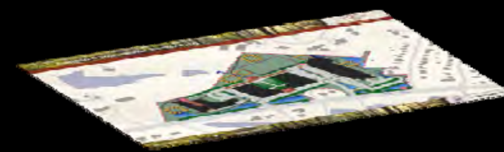
Modifying the Existing Framework



- Recommend minor changes to Patton/STEM building
- Reorganize vehicular & pedestrian networks for improved efficiency, legibility, & connectivity
- Enhance community interface & linkages with site with walkways, shared facilities, and amenities

Concept 3:

Creating a Bold, New Green Campus Vision

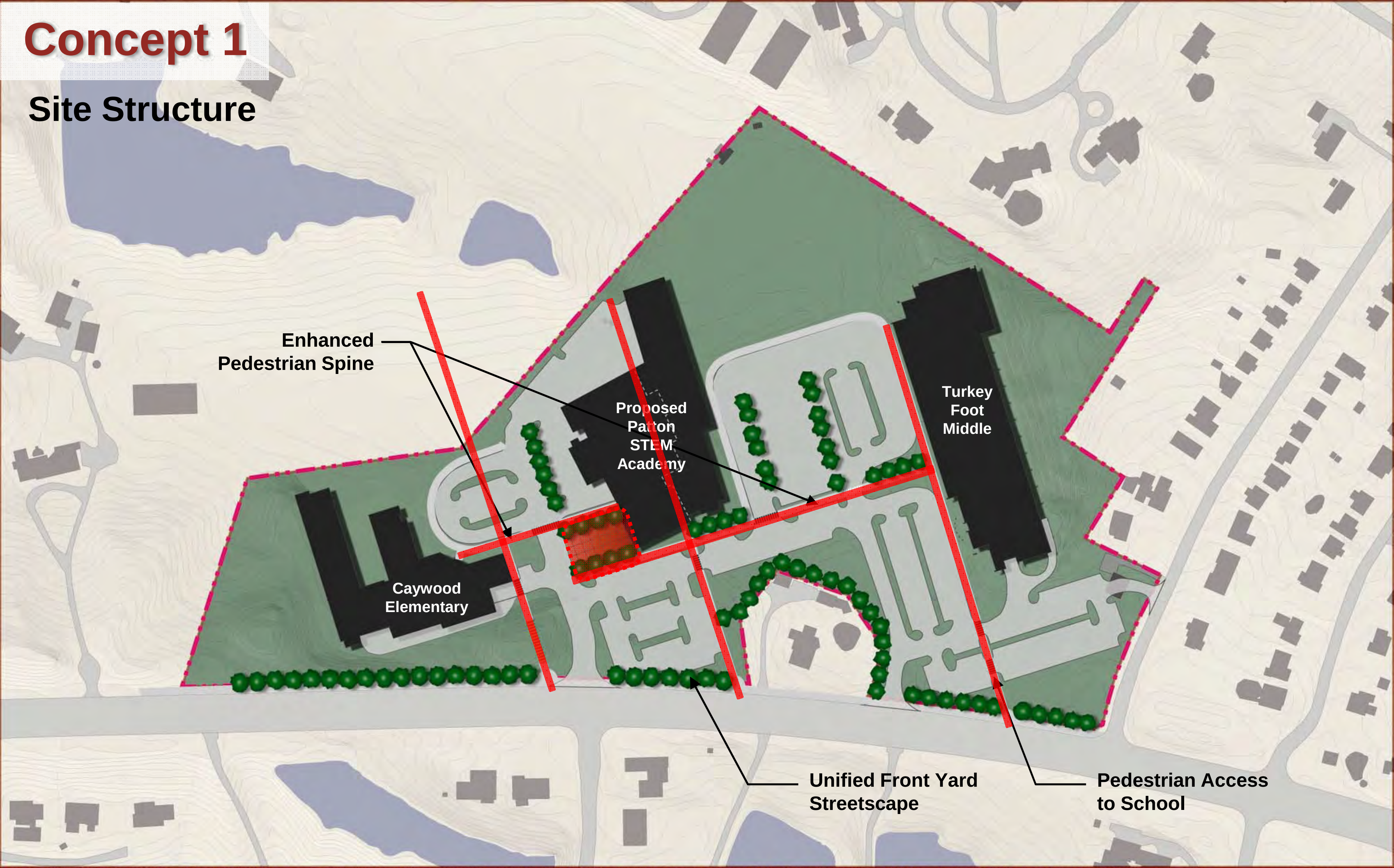


- Celebrate the new STEM Academy building as the central, iconic feature of a bold, new campus organization
- Promote the campus as a visible, regional model of sustainable design, curricula, technologies, & community education
- Establish a new, cohesive campus structure to accommodate the full needs of all of the schools
- Maximize the density & efficiency of parking, including the potential use of structured parking

Existing

Concept 1

Site Structure



Concept 1

Stormwater BMPs

Green Campus & Stormwater Master Plan

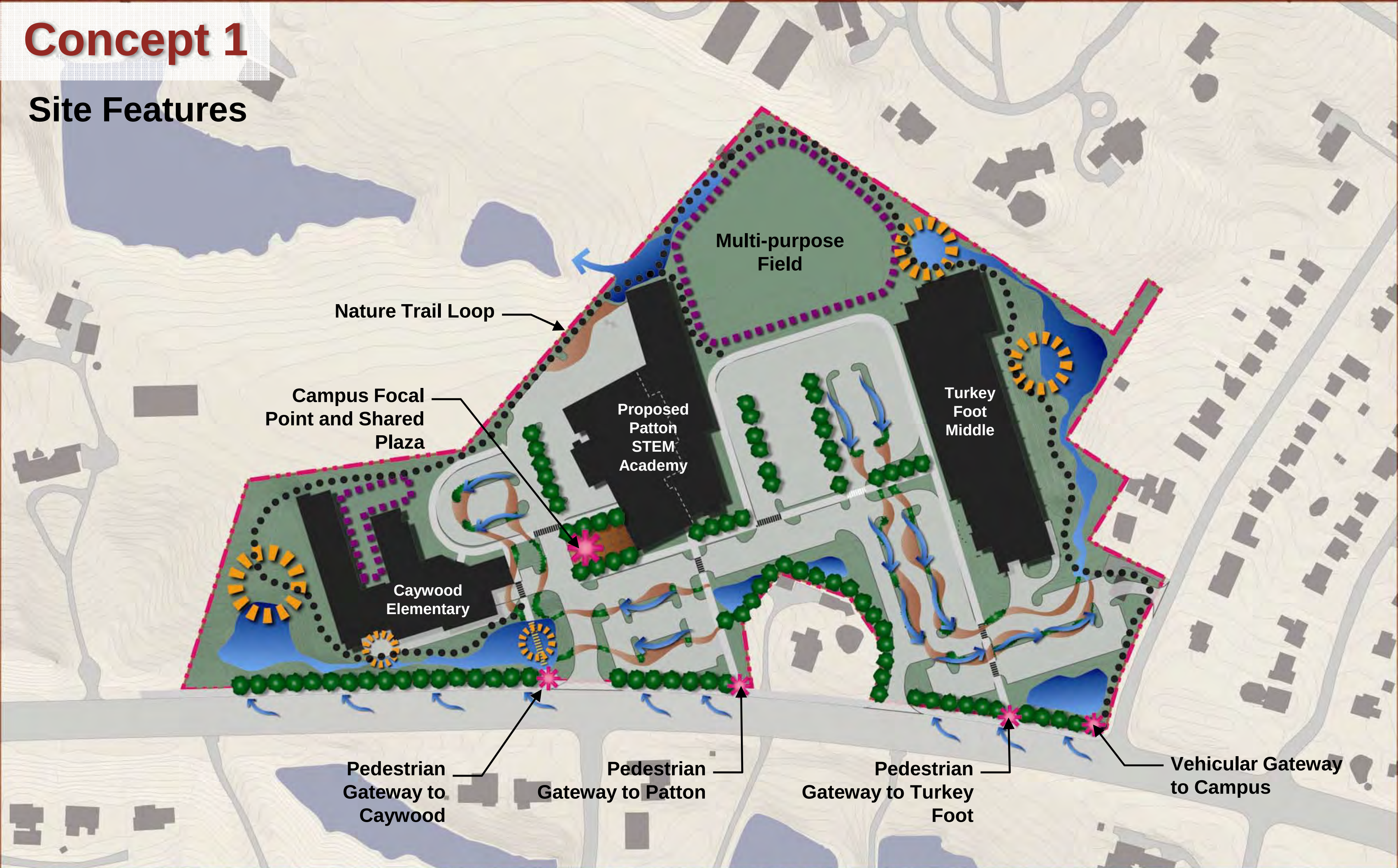
Project Funded by EPA 319 Grant

Concept 1

Outdoor Education

Concept 1

Site Features



Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

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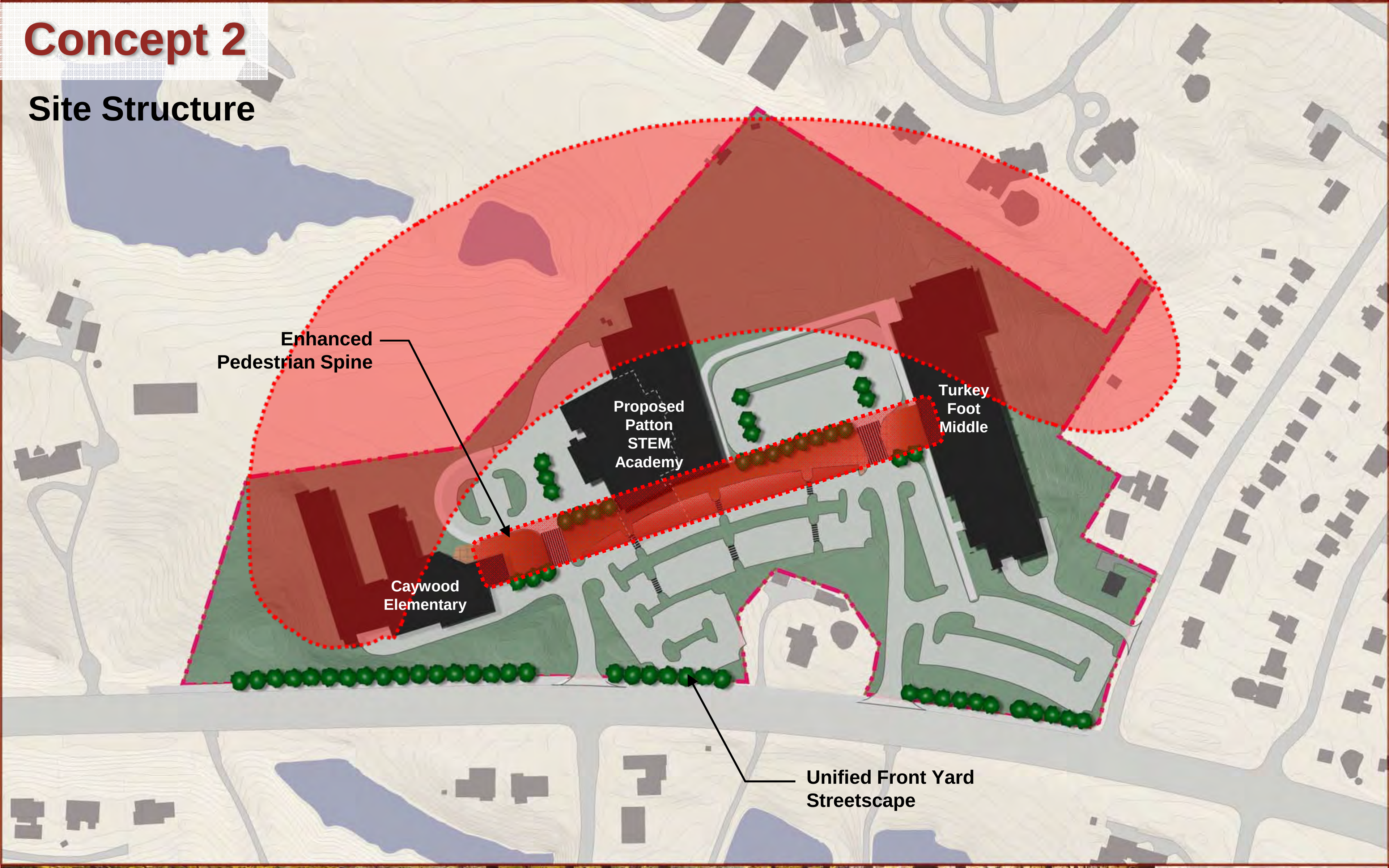
Project Funded by EPA 319 Grant

Existing

0' 80' 160' 240'

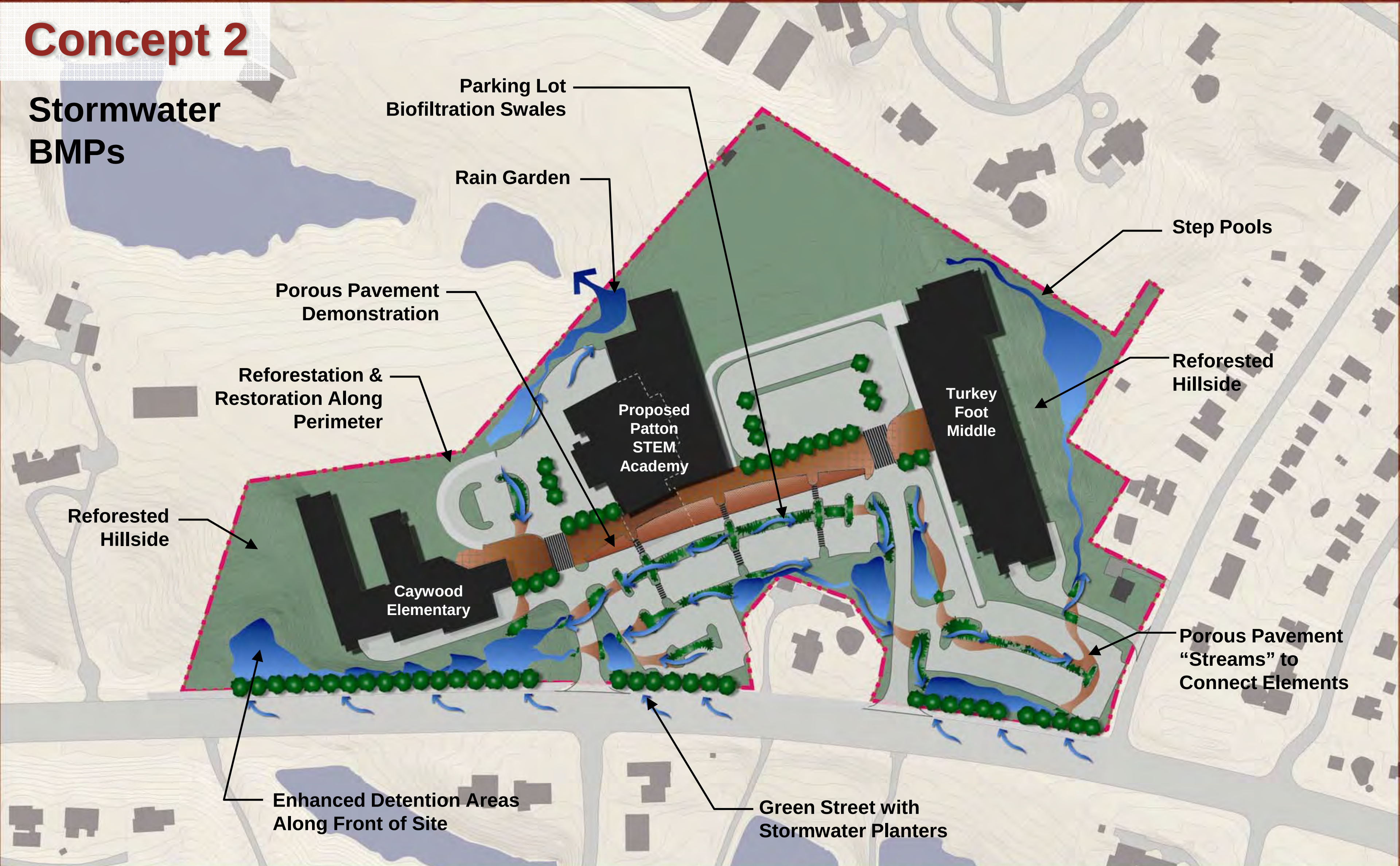
Concept 2

Site Structure



Concept 2

Stormwater BMPs



Green Campus & Stormwater Master Plan

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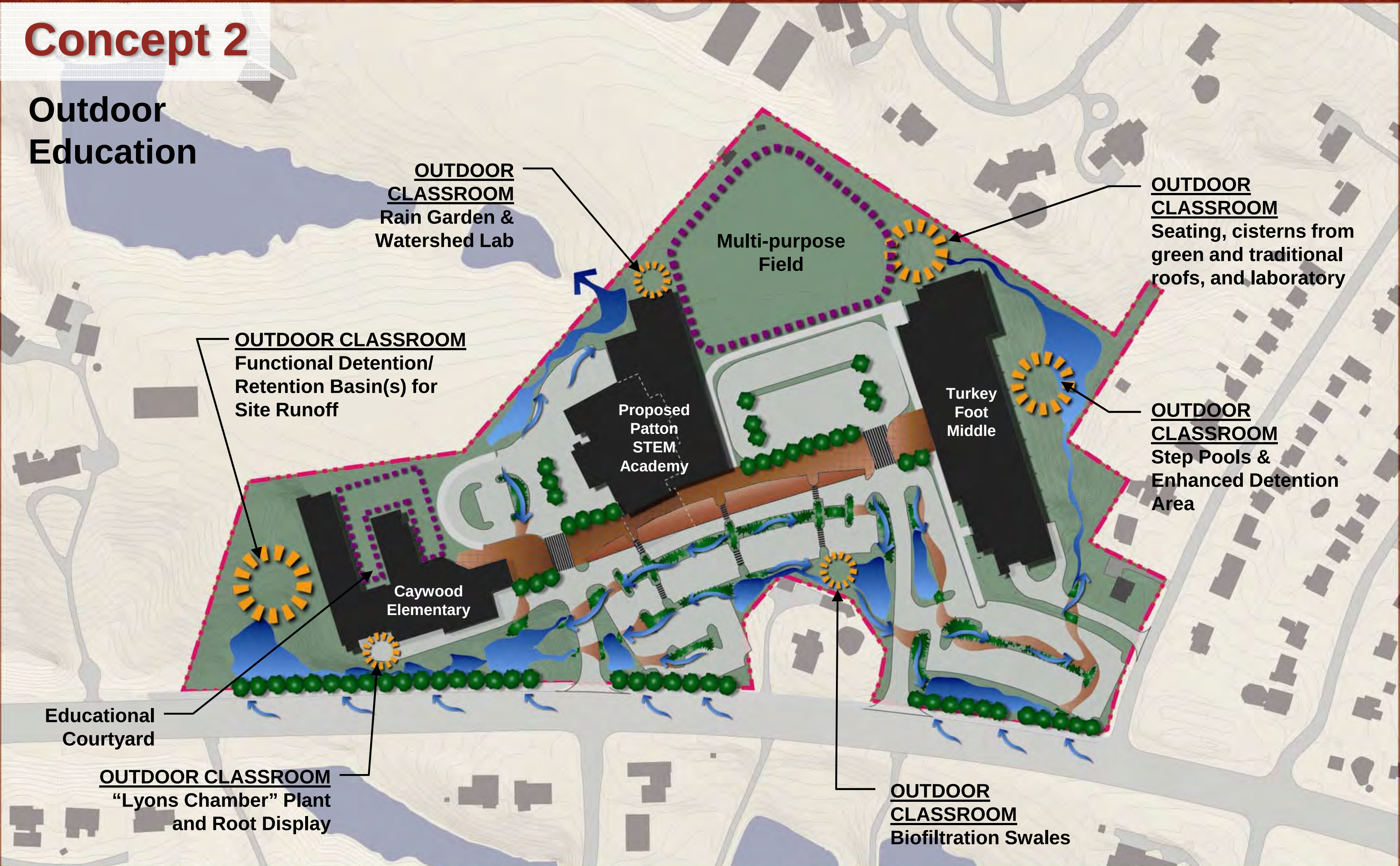
Concept 2

Outdoor Education



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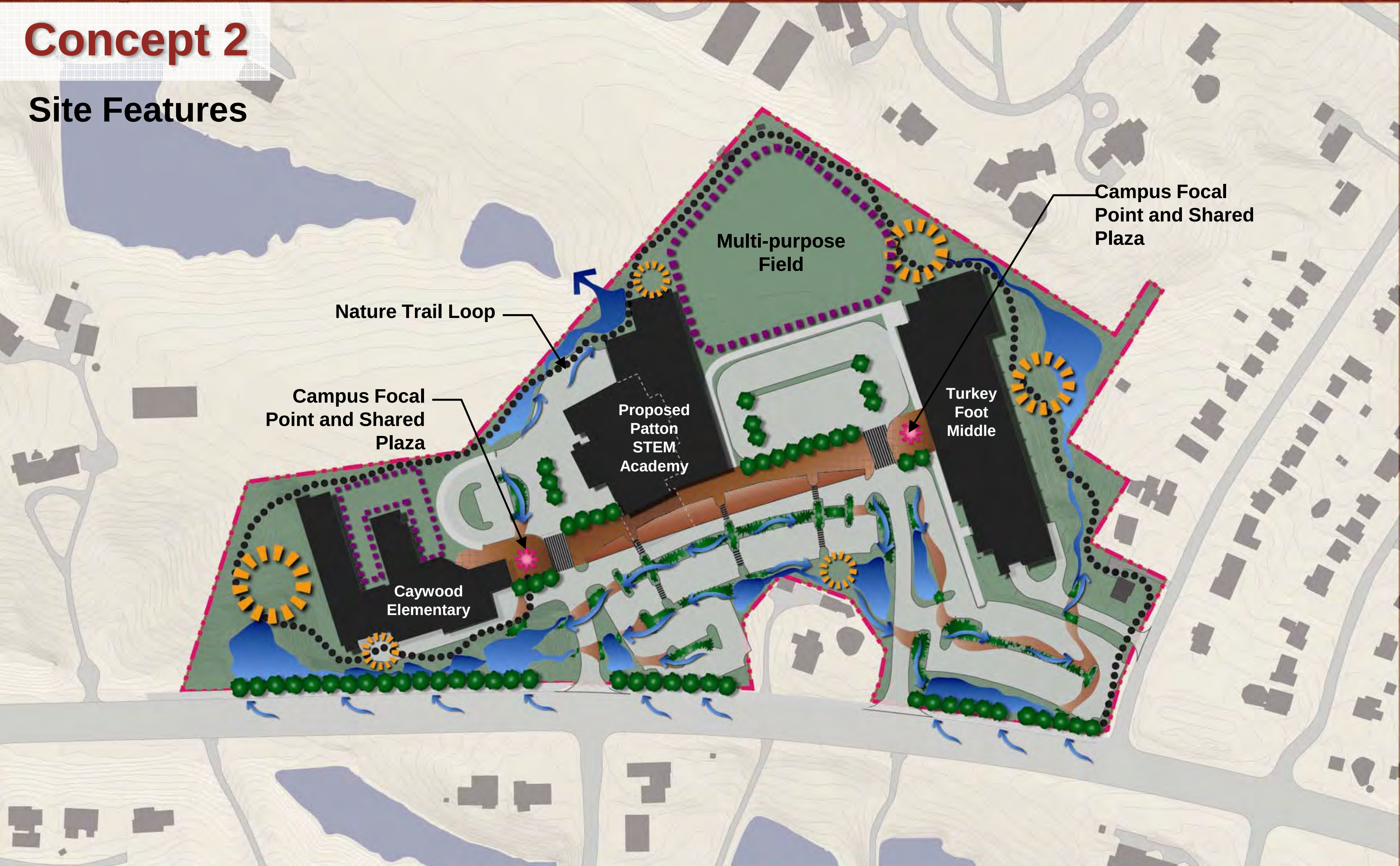
Concept 2

Site Features



Existing

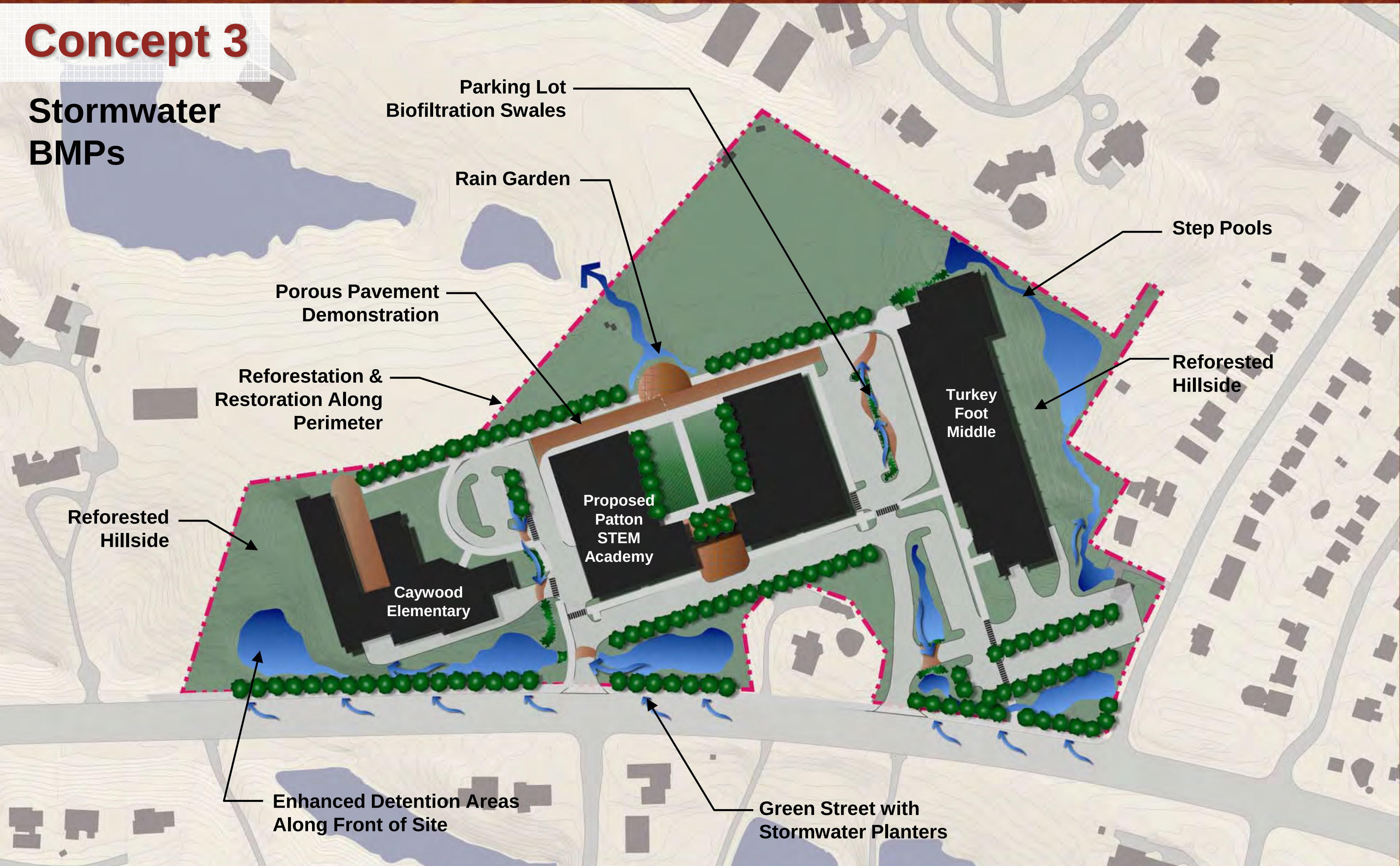
Project Funded by EPA 319 Grant

Concept 3

Site Structure

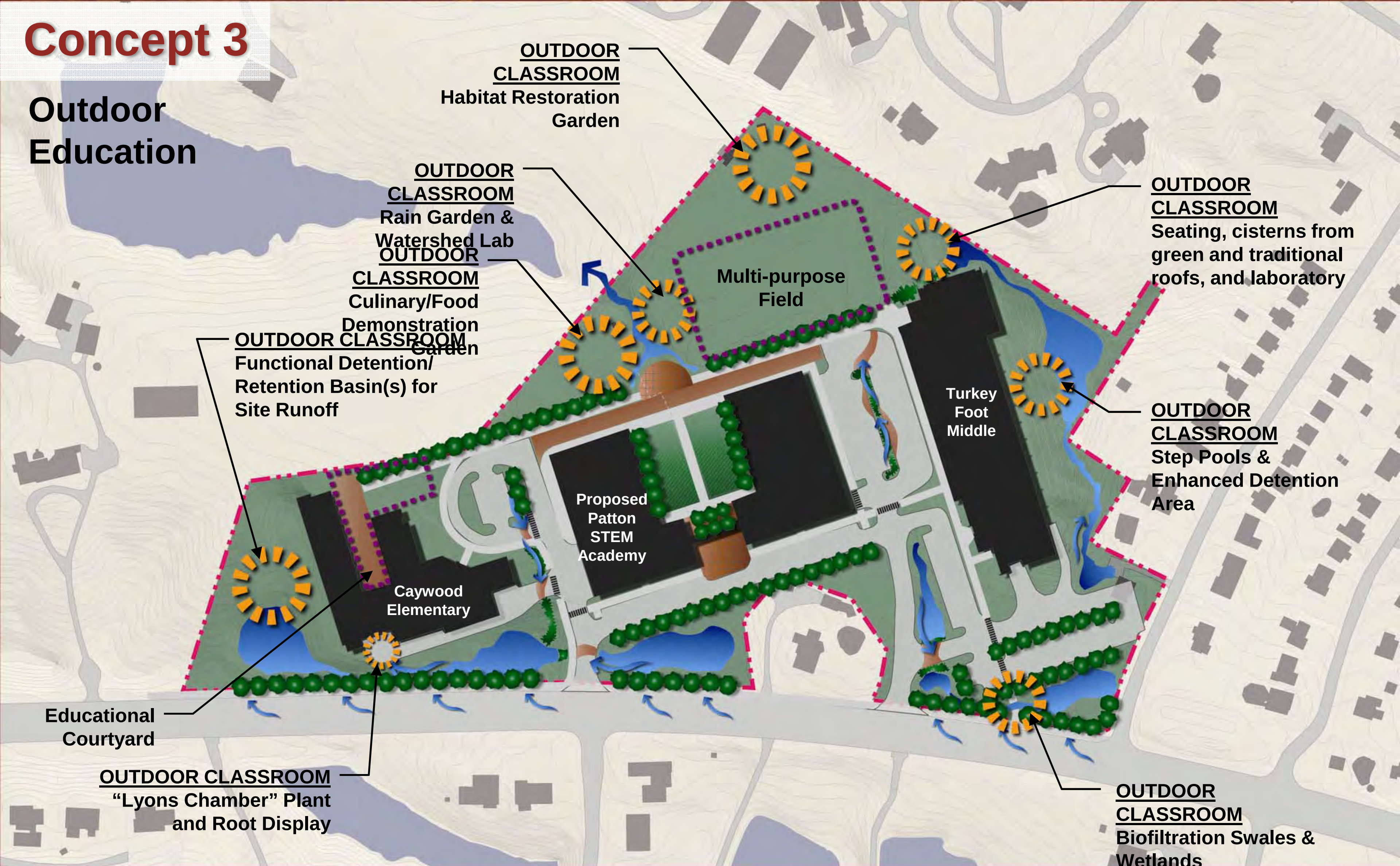
Concept 3

Stormwater BMPs



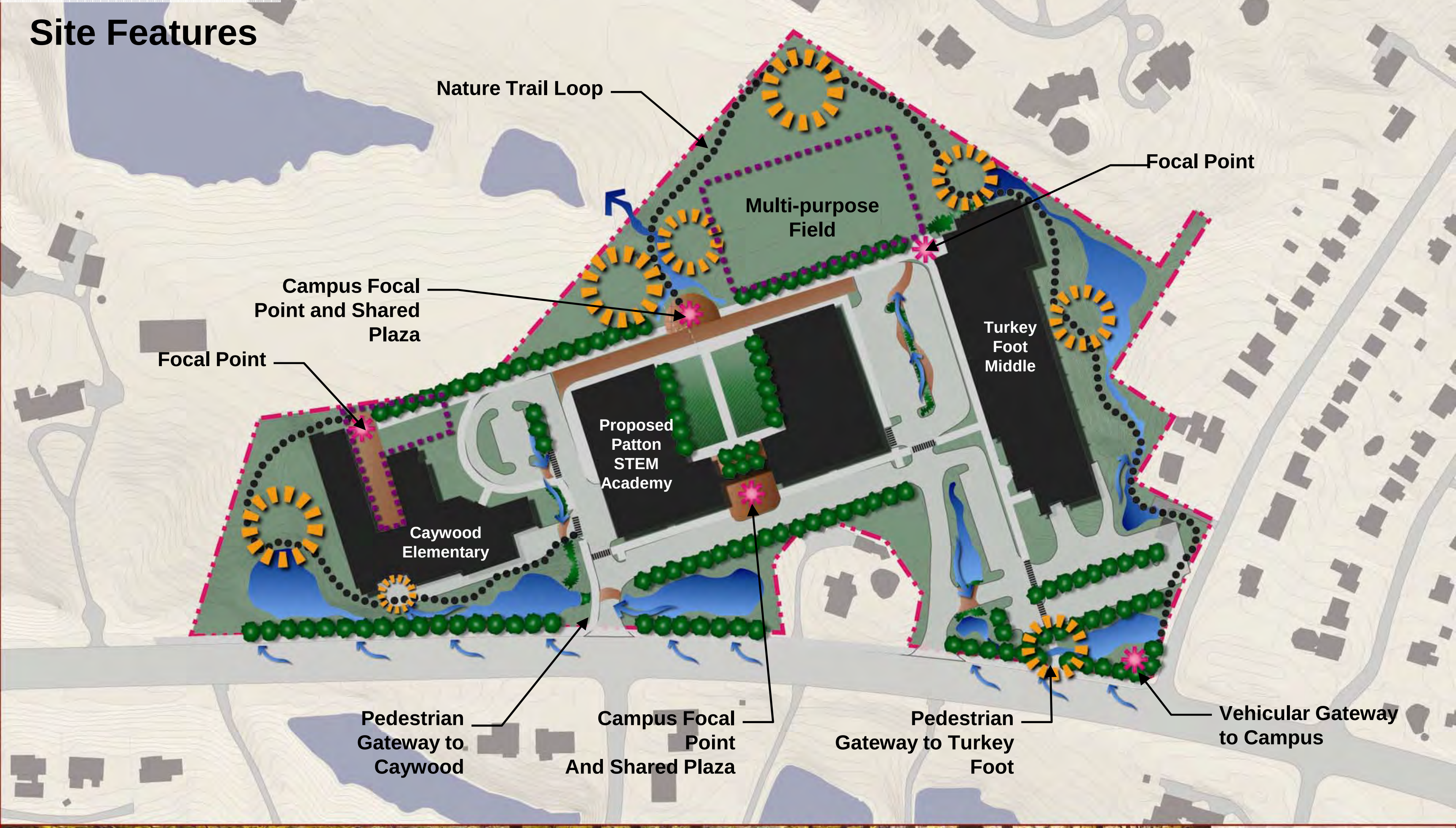
Concept 3

Outdoor Education



Concept 3

Site Features



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What are the Essential Elements of the Campus?

- Outdoor learning venues
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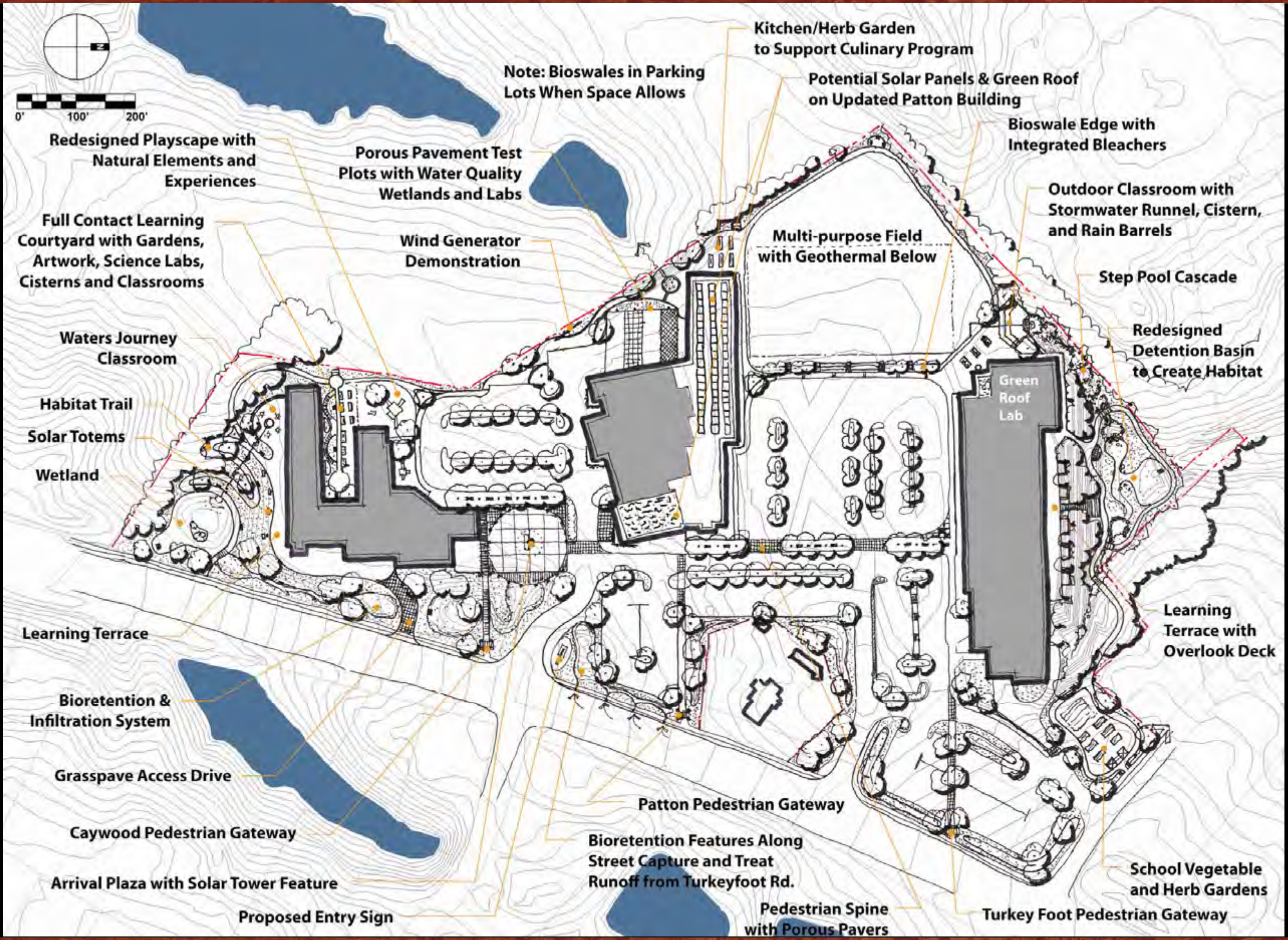
- Community interface
- Research

Green Campus & Stormwater Master Plan

THE KENTON COUNTY SCHOOL DISTRICT A System of Excellence

Project Funded by EPA 319 Grant



What ideas do you have for the campus the would make it a fun, educational, and green place to learn, play and visit?

Wetland Science Lab?

Vegetable/Herb Gardens?

Natural Play Elements?

Plaza?

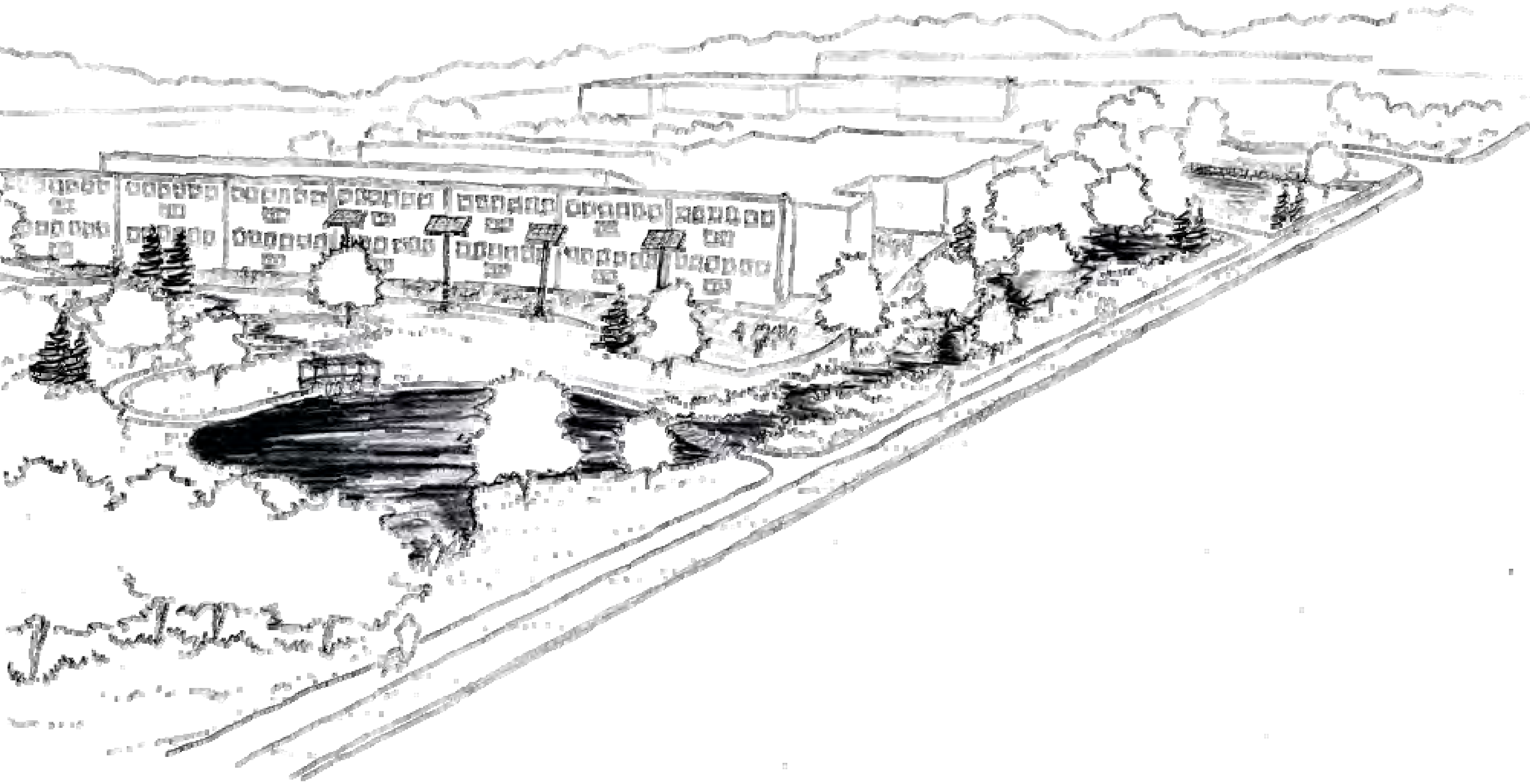
Flower or Butterfly Garden?

Trails?

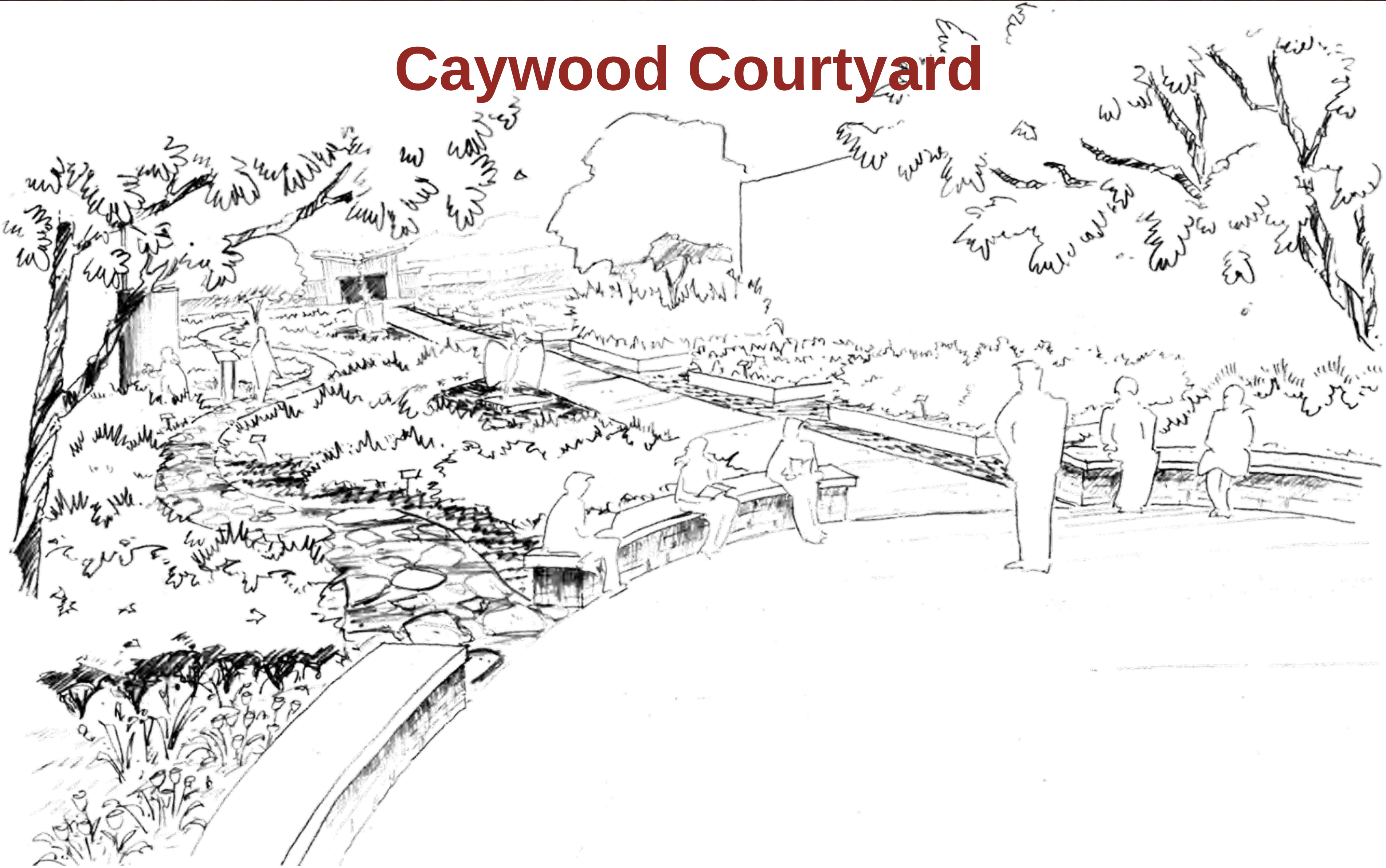
Fountain?

Student-Made Art?

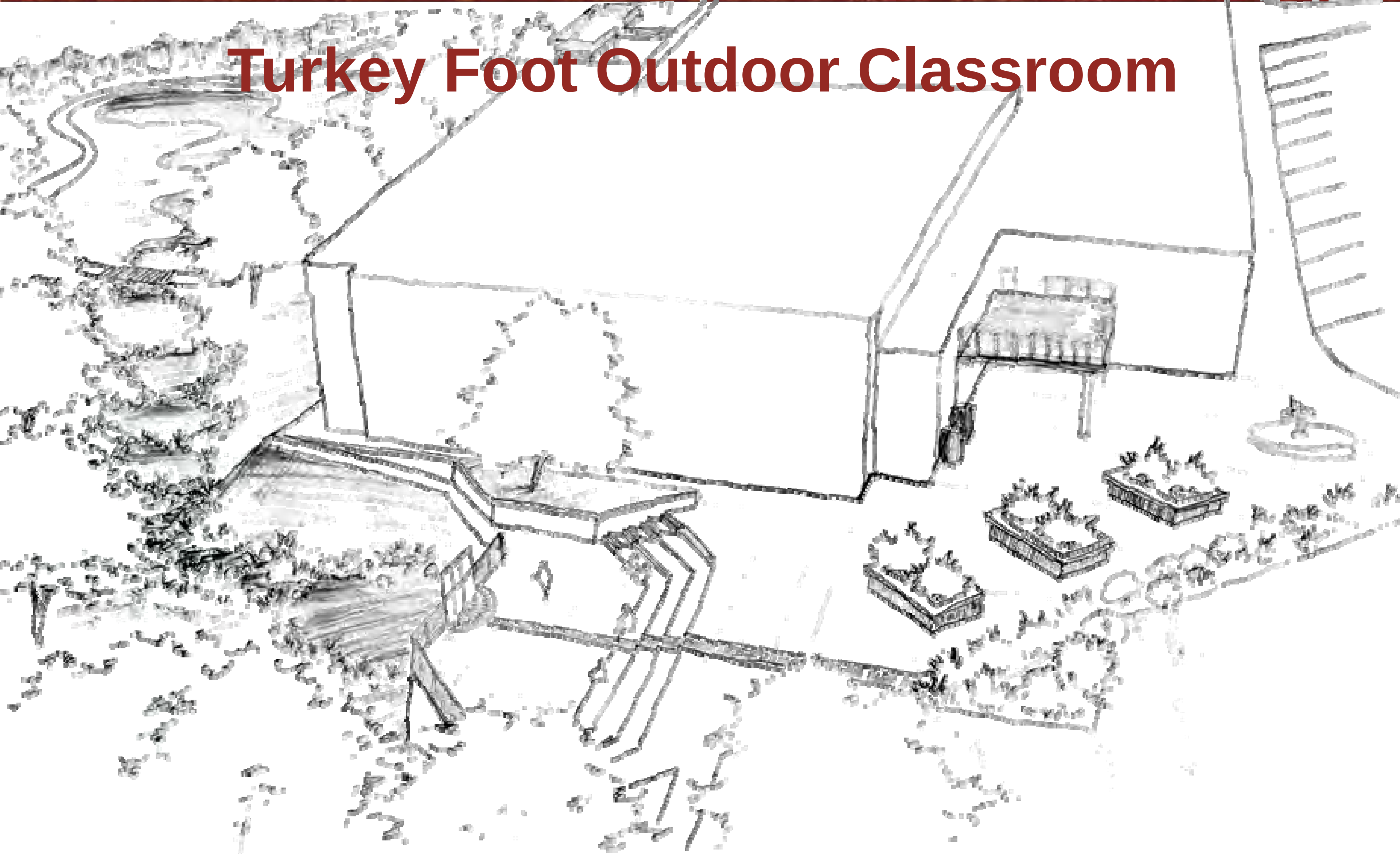
Campus Front Yard



Caywood Courtyard



Turkey Foot Outdoor Classroom



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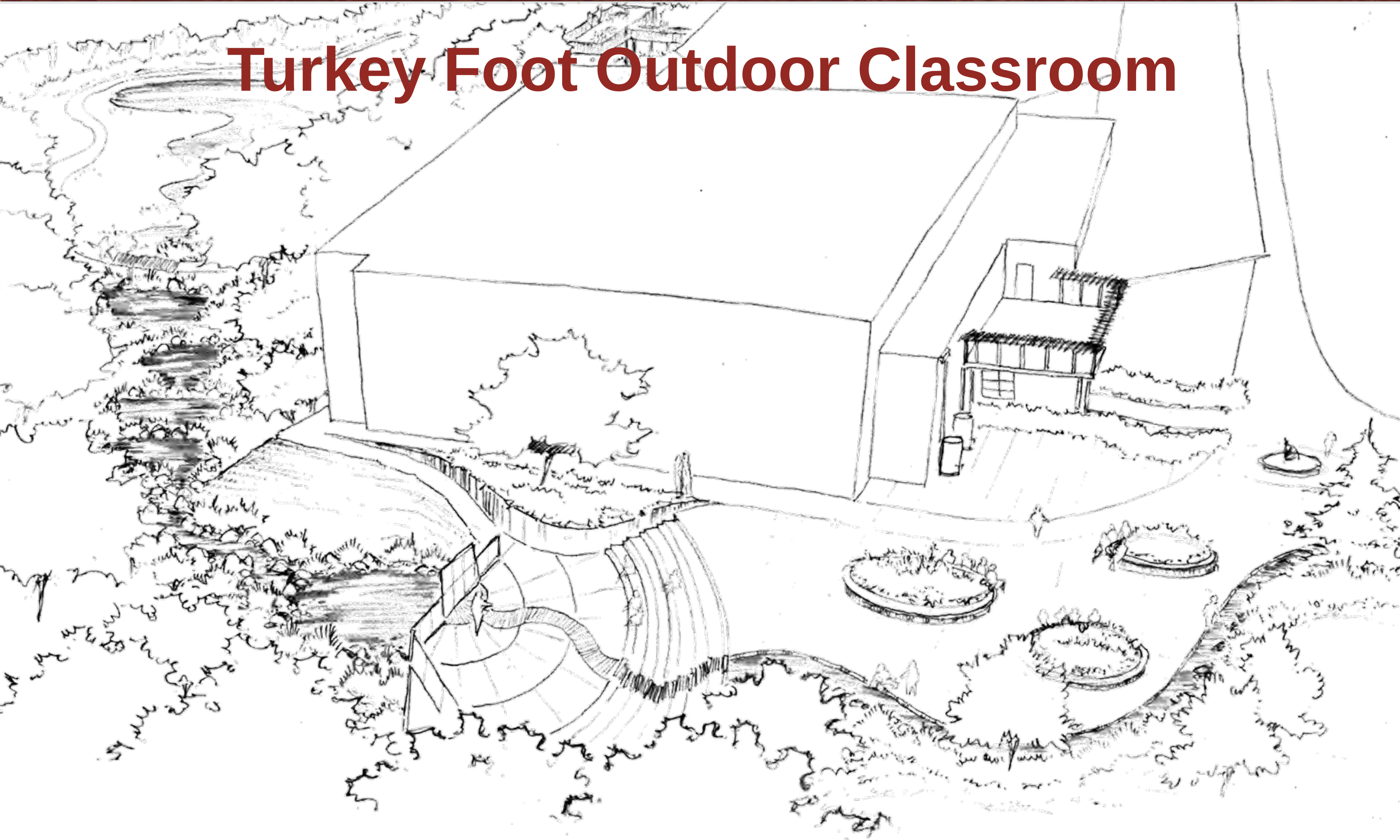


Thank You for Your Interest and Participation!

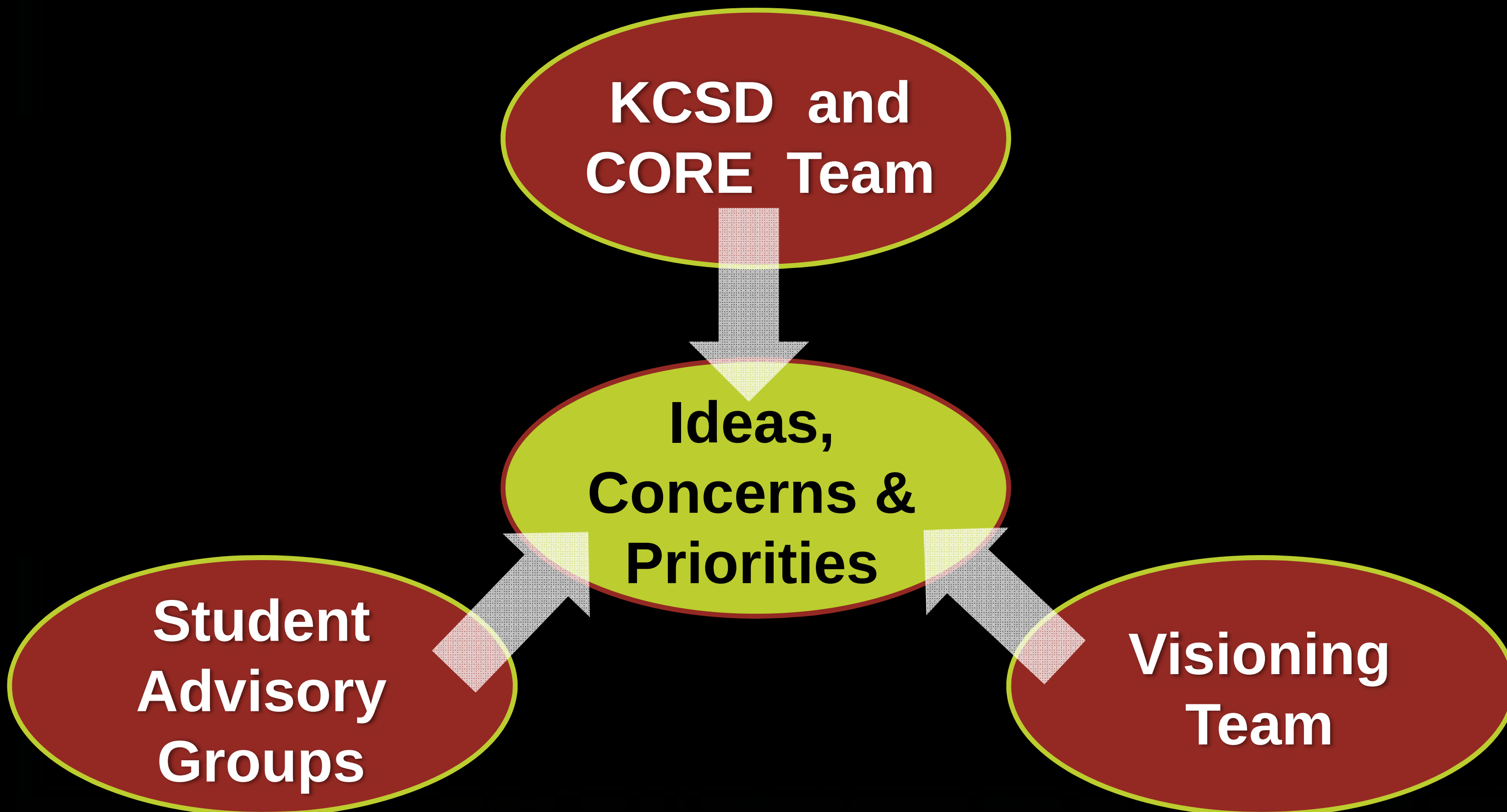
CORE Team Meeting

Growing Leadership from Green Buildings to Green Campus:

Sustainability, Community, and Learning Through Shared Awareness and Visioning

This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act.

Design Process Input



Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

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Campus Front Yard

Key Features:

- Learning Terrace
- Bioretention Labs
- Wetland Lab
- Solar Totems
- Solar Umbrellas with Seating
- Interpretive Signage
- Forest & Meadow Restoration
- Hydropower Demonstration Lab
- Grasspave Fire Lane Access
- Habitat Trail Connection to Rest of Campus
- Community Trail Access

Caywood Courtyard

Key Features:

- Circular Outdoor Classroom/Lab
- Rain Garden Lab
- Student-made Artwork
- Cistern
- Raised Planting Beds
- Interpretive Signage
- Outdoor Tool/Storage Shed with Green Roof
- Enhanced Play Area with Natural Play Elements
- Water Feature/Fountain
- Famous Quotes in Pavers
- Birdhouses and Bat Houses
- Formal and Informal Paths Through Garden
- Connection to Campus-wide Trail System

Turkey Foot Outdoor Classroom

Key Features:

- Outdoor Classroom/Lab
- Rain Barrels
- Green Roof
- Student-made Artwork
- Biofiltration
- Raised Planting Beds
- Step Pools
- Interpretive Signage
- Enhanced Retention Area with Meadow and Wetland Plantings and Trails for Student Access
- Learning Terrace with Tree Canopy Overlook Deck
- Outdoor Storage
- Solar Powered Cellphone/Computer Recharge Station(s)
- Connection to Campus-wide Trail System

APPENDIX F
SURVEY RESPONSES AND PUBLIC INPUT

Green Campus & Stormwater Master Plan – Campus Vision Survey

1. When you think of the qualities that contribute to a great campus, or better yet a great green campus, how would you describe them? Please feel free to provide specific green ideas, if you like.

- Need to consider waste management of the students, how to capture/recycle or eliminate waste; how are you going to measure your progress i.e. energy reduction, water reduction, waste reduction, CO_2 reduction, GHG reduction.
- Outdoor classrooms, wetland classrooms, wind generation, solar, better vehicular patterns, “green” icon.
- I think of grass and trees, gardens, and fountains. Geothermal, solar and solar thermal systems are a must. They should be installed in a way they serve as laboratories for students. Use solar thermal to collect water and heat it for use by campus. Recycling.
- I think of a place which is appealing to eye as well as functional. A place which draws students and teachers outside to learn rather than area to just pass through on the way to class.
- Easy access to all buildings – plenty of opportunities for students to be outside (safely) learning about flora/fauna and the powers of nature – wind/soar.
- Green spaces with pedestrian ways meandering to specific buildings or activities – good social gathering included.
- Landscaping should be incorporated throughout parking lots, walkways, drive, etc.
- Green areas and design of landscaping, waterfalls and plants that grow within the area.
- Use of outdoor space – outdoor classrooms, learning from the environment.
- Live plants, green leaves, trees, flowers, etc.
- Greenspace; features that provide various environmental benefits: air quality, water quality, solid waste management/recycling, energy efficiency.
- Hands on learning for the students/Interaction of the older students teaching the younger students/possible compost for wasted food from breakfast and lunch.
- I would like to make sure that the campus would be beneficial and include opportunities for all students (elementary/middle and high-school). A way to update students using technology (website).
- Use of renewable energy to power the school and save the school money. Green space, walking paths.
- Functional – needs to safely meet needs of all students, faculty and visitors. Forward thinking – should be built to incorporate future technology/ideas. Fun – we are talking about kids, they need to be able to have fun.
- Lots of trees, free of visual clutter, quiet, wind breaks so one can walk across campus in colder weather.
- Cohesive designs and functional green space are both very important elements. Creating useful areas that provide educational and aesthetically pleasing functions.

- Green buildings, wetlands, good campus design to encourage pedestrian movement and discourage vehicular movement, vegetation (native), permeable concrete, good environmental education to better utilize these campus modifications. Energy and water conservation, waste reduction; informed teachers that utilize space; research/data collection; good air quality; energy production; use less paper.
- Sustainability – students should understand where energy, food, and water come from as well as where they go. 100% recycling in cafeterias, maybe even be actively involved in growing the food served at lunch as well as being in charge of cistern maintenance and energy sources upkeep. Every student should have a daily job!
- There are plenty of opportunities for student movement safely and orderly through the campus while utilizing unnecessary space for items that enhance the attraction of the campus.
- Parent and student friendly. Campus maintenance.
- Highly visible signage directing pedestrian/auto flow as well as informing (educating) students/visitors about the campus they are on. Zero landfill.
- A site that provides a learning experience for the students and the surrounding community. This site is at a key location and could be used to educate people beyond the student body.
- Ensuring that students are fully aware and exposed to the unique/innovative learning opportunities available and bringing on board "adjunct-like" faculty/educators into the curriculum.
- Aesthetics, state-of-the art technology, BMPs, local flavor, sense of ownership; hub of activity; overall sense of master plan rather than a piecemeal look.
- Hands-on and traditional learning. Opportunity for students to understand green and their contribution to the environment while also introduction them to careers in green industries. Plus campus is a role model for conservation, efficiencies, etc. A model for other employees, schools, etc. to replicate.
- A campus that can be used by the whole communities. Other schools, colleges, green technology industries.
- A connection, keeping a flow from point A to point B. I would also like to see a courtyard that incorporates a landscape that is useable as an outdoor classroom or meeting area.
- Connectivity to the community, enabling students, teachers, others to access without driving. Use each component (both built and natural) as a learning opportunity. Incorporate maintenance as part of learning strategy, and sustainable practices that can be replicated at homes and businesses in the community.
- A great, green campus helps students holistically understand how human and natural systems interact. Example student should have garden/orchards to grow local food as an energy saving strategy.
- Inviting, easy in-easy out, provides visitors/user reason to linger. Recycling in all aspects.

- Solar, wind, hydro? Green construction – bamboo, water collection and storage – maintenance, recycling capabilities, waste management (grease, etc.).
- Using open, well lighted rooms, solar and geothermal HVAC, wind generated electric. Runoff water for flushing commodes. Plants and grasses, trees for shade and windbreaks
- Visually beautiful.
- Cohesive design; themed campus.
- Accessibility for students to use as natural learning labs. Incorporate as many different aspects as possible even if it is on a small scale. Wind, solar, recycling.

2. When you think of the existing campus for Caywood, Patton, and Turkey Foot, what existing strengths should be accentuated, what existing weaknesses need to be improved, and what potential barriers might arise?

- The greenspace should be accentuated, wetlands, wildflowers, etc. Eliminate mowing.
- Strengths – the buildings (Caywood & Turkeyfoot). High performance features esp. day lighting. Weakness – lace of landscaping, disjointed traffic patterns. Barriers - funding and compact side.
- Accentuate the water body. Strength is quite simply the unique approach you are taking to build this campus. Weakness is lack of existing trees and foliage.
- One weakness is a lack of wildlife habitat. Mainly attractive flowering landscape plants were used but not very wildlife friendly. Even the grass is not the type wildlife would use. A large outdoor activity area out of traffic areas is needed (or with a low wall barrier). Let's use a variety of wildlife attracting trees – not "matching".
- The greenspace in front of campus should be utilized. However, the house in the middle is a barrier. Additionally, it appears from the road as though you only see the back of Caywood. Turkeyfoot's design may pose this same problem. We need a circle drive or something?
- Strong consideration to buffering site along Turkey Foot Rd. and residential area behind. Stormwater management needs to be more than just detention/retention areas. Ball field needs to be given strong consideration/BMPs.
- Buildings are currently very disjointed. Entrances to buildings for public are poor. I do think the buildings want to be clearly defined as separate facilities, but also part of the larger campus.
- Walking paths, curb appeal to improve parking space area. Overall looks.
- Weakness – lack of parking at Caywood – when there are special programs there is not enough parking. Strength - proximity to universities, H.S., park, water. Need – more playground area for Caywood.
- Strength – Access each by walking. Weakness – They sit isolated. Doesn't blend together well.

- Strength – location, great access to regional employers that may have interest in STEM – SD1, NKY Water, SEMC, Fidelity, Toyota, NKY, CVG Airport, Thomas Moore. Weakness – traffic/pedestrian accessibility, reliance on cars
- Weakness at Caywood is the Styrofoam trays used at lunch. If we are going to be a green campus we need to find a solution to this habit harming the environment.
- The shelving that Caywood has and that Turkeyfoot will have is beneficial because it allows the light to be evenly disbursed in the room, but sometimes we receive too much of a glare in the classroom.
- Co-location increases the chances of building a strong STEM interest. Vehicular traffic is throughout the campus.
- Need to build on success – energy efficiency and green infrastructure. Need to change things that are not working – traffic flow/front door appeal.
- Strengths – building occupants (students, teachers, staff) who understand their campus and how to use it. Excellent location in the community, high visibility, easy access for I275.
- The existing body of water on the adjacent property can be used in proper relationships are formed with the property owner that neighboring property has great potential.
- The good central location to neighborhoods and community buildings – makes pedestrian travel/bus transport easier; greenspace surrounding the campus. Weakness is traffic and current lack of greenspace usage. Teachers need to be taught how to use these greenspaces while still teaching current curriculum (environmental education)
- Strengths – areas that retain water should be wetlands, nearby streams should be restored, and reforestation of natural areas. This will provide students with major ecosystems to be studied. Weakness – is the “front yard” area being utilized?
- Strengths would be the wide area of frontage to provide safe vehicle traffic. Weakness would be the building set up as it exists now for creating a green campus which leads to the barrier of creating this campus while at the same time not interrupting the current school day.
- I think the possibilities are unlimited. I do think space will be of issue and the amount of environmentally sound ideas that can be incorporate. Campus maintenance?
- There are some old growth trees on site that if at all possible need to the saved. Personal property sits directly in front of the campus (facing TF Rd.). Possible negotiations with owners to acquire.
- Strengths: location, location, location - use this site’s location as a benefit, convenient to many communities and visible from a main road. Another strength is that learning communities of many backgrounds and areas are all located on this site. This site is also close to other environ. Organizations: SD1, Tank, TMC, etc.
- A lack of “traditional” high school on this campus – although Patton serves this student population, it doesn’t touch all its students.

- Strengths – 2 new buildings, all 3 grade levels, great vision. Accentuations - whole environment as a learning opportunity. Barriers – space considerations, surrounding structures
- Space seems to be obstacle – not much room with housing all around. Model – Caywood is a great start. Funding is barrier – and distance from this site to Dixie with major hwy. Student pedestrian issues if connectivity to high school.
- Drainage – I would like to see storm drainage used to power a small hydro electric plant that would continually circulate the water through the pond systems.
- The land around the area should be highlighted and sued as education area. Trees that have names on/around them so they can be easily identified.
- Strengths – natural features, esp. woodlot (about 15-18 yrs. ago this area was being developed as an outdoor learning area, as were courtyards, etc at the school. The effort enjoyed litter support from administration). Weakness – traffic flow, both pedestrian and automotive. Involve the immediate community in decision on redirecting access.
- The major strength is the commitment you have to a green campus. Also, existing land and water feature are a plus. The amount of impervious surface is a major issue.
- Its visibility, enhance the image, provide easy access from/to high school, redesign of TD Patton building to be more inviting.
- Are athletic fields going to limit what you can do? How can they be made green?
- Not familiar enough with campus.
- Strengths are the students. Weakness, I'm not sure. Barriers, I'm not sure.
- Potential barrier – setting up a cohesive structure so everyone utilizes the campus. Designing everyday instruction around campus.
- Strengths – New buildings containing green technology. Different levels of students nearby (elementary, middle, high school nearby). Blank canvas allows us to create. Weakness – great deal of vehicular traffic with 3 buildings (parking needs, etc.). Potential barriers – financing to do it the right way in a timely manner.

3. As you imagine the campus taking on some bold green dimensions, as the new high performance buildings have, what role(s) do you think the automobile (cars and buses) should play in the new campus organization? What ideas do you have to minimize the impacts of the automobile?

- Limit the idle time, good flows, provide prime parking for carpools and hybrids.
- In many ways the automobile should not be minimized, but used as a teaching tool. The society is currently automobile driven, but needs education. The automobile is and will evolve. Encourage car pooling, have bike trails, and shuttles from around the community.
- A no idle zone would help clear our air. Bus and parent pickup could turn off the vehicles. The parking lot swales would be terrific. I'd like to see a staff car (bus?) powered by and plugged in to a solar panel or wind generators on site: community

recycling dumpster in parent pickup zones. Students could take recyclable from car on Fridays to encourage drop off – glass, plastic, cans.

- Currently at TF parent parking is a distance from the campus and parents park and walk to pickup or students are dropped off in walk. However, students do cross what could be a busy driveway. I'd love to see parking at a distance but in a safer way.
- Vehicular traffic should be limited to certain areas – have drop off areas that add interest to site design – paths from parking areas should also be interesting.
- I like the ideas of some sort of pedestrian connection to the Dixie campus, but don't know how that could work.
- Reduce automobile movement on campus and use screening materials to reduce sight of bus and cars.
- Automobiles should be minimal. Aside from staff and student drives at Patton, there is not a lot of traffic (once parked, cars usually aren't accessed for hours at a time).
- Carefully analyze need for parking, provide incentive to teachers for carpooling and students for busing, think about options for overflow event parking, alternative paving and grass pavers materials.
- Parking is already an issue at Caywood. I am not sure how it would be fixed unless more land was purchased.
- Parking is already "tight" at Caywood, so I would just want to make sure there would be spaces available for teachers, parents, visitors, etc.
- Should be minimized – can't say how.
- Vehicle traffic should play a minimal role – trying to route traffic away from the "front door" and "hide" parking as practical. Still needs to be functional – maybe consider parking garage to limit footprint on parking lot.
- Have grass-covered parking lots using pavers or other new technology. Promote carpooling – reward it. Promote walking – "walking school bus" office in Frankfort, provides safe way for students to walk to school.
- The roles of auto need to be virtually eliminated, creating an NKU-esque design that would allow a free pedestrian space encircled by auto traffic/parking.
- You need to reinforce and possibly give incentives to cut back on individuals driving separately. Parking should be decentralized and give more area and improvements to pedestrian walkways.
- I think vehicle entrance into campus should be as minimal as possible, even kept on the exterior of the campus.
- Parking could be concentrated in specific areas. The less traffic the better the campus.
- With 3 schools on this site automobile traffic will be an issue. Try and keep automobile traffic isolated to one or two areas on this site could help with air quality.
- Incorporate a parking garage to serve all the three buildings, this would have possibility to double greenspace. Roof of parking garage could double as outdoor science lab area with demonstrations of solar/wind, etc.

- Carpool, green vehicles, partnerships with transit system use this as an opportunity to educate future drivers about air pollution.
- Buses should be green. Cars should be parked on the outside. Programs such as carpooling, bike riding, walking, and public transportation could be encouraged.
- Offer bicycle racks, encourage carpooling, etc. Put lots behind and a nice distance from buildings to further encourage walking. Have easy drop off/pickup system.
- Limit cars on campus and encourage mass/pedestrian transportation.
- Parking that is not attached to the main building. Have the amount of automobile on Turkeyfoot and on the campus measurable and usable for student data collection. Measuring carbon footprint of cars.
- Minimize the role of automobile. Schedule school evens so students can ride provided mass transportation. Consult community (parents, students, teachers) about the school schedule.
- I would ban automobiles from the campus, constructing some sort of rail-line or other mass transit to more people from parking areas to campus. Also, organize walking school bus, etc. so kids get exercise walking to school.
- Parking designs that incorporate landscaping, walkways that provide easy access to buildings but protection from the weather.
- Hook-ups for electric cars? Buses more environmentally friendly. Producing biofuels for buses. Using used oil for heating. Biking trails.
- Invest in modern clean fuel buses. Encourage carpooling and incentives to use them.
- Not sure.
- Vertical parking garage structure.
- There is a need for parking for employees of all 3 buildings. Bus loop for student drop off.

4. What skills and information need to be taught on this new green campus of the future to create a valuable future workforce?

- How to make/measure the impact of the school, the consequences of the greenspace; how can you be zero carbon? What is sustainability?
- Solar and wind generation, geothermal technology, wetlands, new technologies for cars. Energy efficiency, diversion from landfills, recycling.
- Energy efficiency should be taught to everyone. Students interested in these areas should get exposure, but don’t underestimate the basics of reading, writing, and lots of math.
- How is what we have in the new site different from old (gather before and after data), why is it better?
- Not only do study, need to understand about renewable energy, they need to learn to design greenspace – how to maintain greenspace – how to appreciate greenspace.
- Green site design is as important as green building design.

- Could it be planned so that annually the one area of the campus was “re-envisioned” or maybe every other year so students planned the area and then “built” it? Definitely, the green roofs will require annual work that the students should work on.
- To show benefits of what green campus can offer in savings from the different areas.
- Use of solar panels, geothermal – get H.S. students involved in the new technology.
- Conservation. Energy wise.
- Too many to list: energy conservation, alternative energy sources, role of planning in developing sustainable development, smart growth, read Tom Friedman’s latest book “Hot, Flat, Crowded”.
- The skills of being green. These skills will allow the students to bring this to their family which have an impact on the community. Workforce. Solar, geothermal, greenhouse effect. Environmental science.
- Having the students actually complete hands on activities and be a part of the production process so that they understand what is really going on and why it’s important.
- The foundational skills for advanced manufacturing – electrical technology, hydraulics/pneumatics, mechanics.
- Need to ensure education is “science” based and practical. Needs to encompass broad spectrum of STEM, kids need to understand that there is not a solution to every problem and encourage them to think and solve problems.
- The building blocks for future workforce require training the teachers, special PD to address this. How core content connects to various new technologies.
- Continuing to instill values of preservation and conservation in younger generations is extremely important. Just providing the opportunities for students to learn about green initiatives will promote increased interest.
- Environmental education should be taught to all teachers and implemented across the curriculum. Teaches, admin., and students first need to discover the value of greenspace. Adding green infrastructure will lead to a better informed student body.
- Current environmental jobs such as environmental engineering, habitat restoration, wetland delineation, data analysis, etc.
- Inform students why this is important and how the process is designed.
- Soil and water conservation. Wildlife management. Alternative power. Landscape Architecture.
- Students will need to learn how to use information about the campus/how it was designed/why it was designed in this manner to apply principles to/future employers. Being a good steward of resources/always looking how to improve.
- How to design green – this is a career that will grow as NKY becomes more on board with green initiatives. What can be done at home, school, work to go green every day. Students need to learn how to go green in their everyday lives in order to go after or be interested in green careers.

- A hands on learning environment tailored to growing industries. Creation of programs and “real world” job shadows or internships that meet the students interest areas. Engaging female students in this learning.
- Life cycle analysis. Energy production / use stormwater management. Ecological impacts.
- Relativity – how green saves environment, stats on cost savings, jobs in green fields, how knowledge is transferred to all phases of life, home, work, etc.
- Solar, wind, geothermal, hydro electric, green area maintenance.
- GIS and remote sensing.
- Data collection. Observable workable labs and outdoor classrooms. Conservation, land management as well as real-world examples of how they impact the environment and other environments around.
- Science and technology behind the innovations at the site. Don’t forget education of teachers, too.
- The district needs to ensure that all students have a strong base of environmental literacy that goes beyond just studying the green features of the campus.
- Design, maintenance of infrastructure, projects designed to teach, making more with less.
- Welding, chemical engineering, industrial maintenance, automotive robotics, construction, mechanical engineering, CAD, civil engineering.
- Need environmental courses for students to complete a career pathway to postsecondary programs. Math and science courses should integrate environmental activities. Look for dual credit courses.
- Math and science skills for those who live within walking distance of the campus.
- STEM related jobs. Green technologies.
- All aspects of problem solving (using practical/real world situations). Data collection, engineering, robotics, true culinary program, interactive technology (web based).

5. What potential partnership between the campus and your organization might be created for mutual benefit ?

- Dixie Heights would utilize campus as a support for STEM programs as well as extension of our programs. Mini fieldtrips.
- Learn from your initiative to share with other schools in the state and nation.
- We can help with programs and curriculum.
- Interdisciplinary curriculum, project based learning activities.
- Our organization is the state agency that oversees EE for the state. We can help with curriculum, green schools inventories, outdoor classroom idea/feature, teacher training, etc.
- Partnership on land management, and any conservation elements, (conservation district) many of the schools in the district could benefit from better land management.

- Dixie Heights would use the facility regularly as an education lab area. A hands on approach to education. This facility would benefit may students.
- The KY Girls STEM Collaborative can work with Kenton County to improve STEM opportunities for girls. chanley@uky.edu.
- UK could help professional development training for Kenton County teachers. UK students and graduate students could interact with campus & students (engineering, landscape architecture, architecture, etc.). Create a culture of STEM initiatives and learning to produce students interested in STEM disciplines at the college/university level. UK has many programs including healthcare that would benefit from well educated K-12 students.
- Would like Kenton Co. to speak to business community on the going green concept and how it has impacted, how to track savings, etc.
- Summer STEM camps for high school students. Dual credit programs, research collaborations with high school students and college mentors.
- We would be interested and could offer assistance in the area of connecting the learning to current or future employers, ensuring students off-campus experiences are met.
- Stormwater credits, job shares/shadows, partner to fulfill community projects.
- Not sure – make sure Kenton Co. Soil & Water Conservation is involved as well as local EPA along with college and university personnel. Look for the real-world connection.
- Greater learning experiences for students.
- Being a high school teacher – students should run this campus. Every student should have a job to complete everyday to help with the upkeep and sustainability of this campus.
- More teachers need to take advantage of the graduate level environmental education endorsement offered at NKU. This might be encouraged by the district. Teacher education is key to truly utilize green infrastructure around a campus.
- Please feel free to call Congressman Geoff Davis' office for any assistance we may be able to provide. 859-426-0080.
- I envision strands of signage/curriculum for each category science, tech, eng., math/
- The NEED Project can assist in this curriculum and in teacher training. Jus at we trained Energy Wise teachers, we can train on solar and wind energy w/kits.
- Energy efficiency and green infrastructure focus.
- Bring JD Patton seniors to Gateway's campus to complete college courses as Gateway students. Coursework in advanced manufacturing, mechatronics, CAD, machine tool, welding, industrial maintenance, electrical technology, HVAC are possibilities.
- I would just like to have opportunities for our students to interact / use the campus as much as possible.
- As a teacher it will give my students the opportunity to learn hands on. Instead of just reading the students can see it!
- Internships / work-study options may be possible with SD1.

- Community coming together and working together now and in the future.
- Not sure, but we are open to ideas.
- Plenty of opportunities for learning about watersheds – also urban forestry / forestry.
- Rumpke / can we get free recycling service if we become part of an ad campaign for them?
- Establish pathways for a student to pursue degrees in these areas. A well established (published) and affordable path for K-16.
- As energy systems coordinator for the district, I would like to see the partnership of energy and the environment.
- Technical information, lectures and real life experiences.

6. Other questions and/or comments?
   - Why would a green school continue to use Styrofoam trays and plastic silverware on a daily basis? The kitchen staff would support use of a dishwasher and convenient glass/plastic recycling.
   - This is a fabulous opportunity to prepare students for the workforce of the future. Favorite quote (not sure of source) "The future is not what it used to be". We have to make sure they (students) are ready!
   - Very exciting potential/project.
   - Consider uses of facilities after hours/weekends to maximize use of campus; encourage STEM study of campus by nearby colleges/universities. Make sure you get input from a younger crowd – this meeting today (Lexis Rm, 2112) skews older.
   - I am happy to be a part of this and can't wait to see the outcomes. The students are our FIRST Priority!
   - I think it would be neat to have some sort of website or web-cam that could be focused on the progress of the construction site or maybe even focused on a specific aspect of the site to where teachers and students who may not be able to show up on campus will still be able to log on to a site and see what's going on.
   - Would like to be involved/informed of green curriculum/careers that JD Patton is considering.
   - Checkout www.vitalcommunities.org/valleyquest/valleyquest.htm. Create self-guided tour using maps and clues. Students and/or teachers could create multiple quests for the campus e.g. water quest, energy quest, stormwater, etc. You might consider making one of the elective classes at Turkeyfoot a course on the campus itself-a STEM class that integrates curriculum with the measures in place outside. Be sure to include Cooperative Extension Agencies, too.
   - Seek outside suggestions from the community at large. The NKY community may be of considerable benefit to design and development teams. Perhaps a hotline or community email address.

- I'm more than happy to help in the education of educators regarding environmental education and how to incorporate green spaces into the curriculum.
- How will students from other Kenton County schools benefit and be transported to these areas?
- This is such a great concept and I am happy to be a part of a community where schools are taking the lead in green efforts. Education is key to change.
- Some of the language can be changed e.g. Landscape Zones to ecotypes, e.g. environmental to ecological. What is the student population like at Patton? Great Plans! Thanks for the opportunity to get involved.
- Applaud the innovation!
- What about radon as an environmental issue? Will buildings be built to be radon-free? Students need to know the dangers of radon – 3rd leading cause of lung cancer, high rate of radon in KY.
- Look at all systems; food, trash, books and materials, sports events. Work toward making all these sustainable. Health Dept. would be helpful for ideas on incorporating healthy lifestyle alternatives. Many ideas can be implemented at other schools (and maybe they are) without building new buildings or revamping at campus.
- There is new and growing body of research that shows children are both physically and mentally healthier when allowed to spend time in green spaces. ADHD, depression, obesity could all be addressed with more time outdoors.
- Good start! Program and courses should be defined to support green school.
- As we continue to work together, what type of communication do we need to keep everyone informed?
- At some point need student input and ideas. Ultimately, it will be their campus so they must have a great deal of input at all phases of the project.
- Would it be possible to utilize any of the facilities at night for astronomy or other type classes, or have areas to accommodate such activities?

Other Comments/Suggestions (Post-it Notes During Q&A Segment)

- Reduce the amount of cars; make the campus walkable
- Incorporate biking trails
- Make the site a tree campus USA candidate
- Current traffic patterns difficult; make system coherent but with separate zones for each school
- Meet with the students who were involved in the design of Turkey Foot Middle School
- Consider connection to Thomas More College
- Consider the soils at the ballfields
- Make GIS part of curriculum
- Provide 3D models of site/environment for the students to use

- Monitor metrics to show benefits and impact of green site improvements (like what is being done with the buildings)
- Gather “before” data for the site and compare it to the “after” data
- Make the campus a zero waste facility
- Show the connection between greening the campus and effects on energy consumption and air quality
- Consider Radon testing on site; Radon is a contributing factor for cancer
- Policy changes are required for car pooling and other ways to minimize vehicular impact on the campus
- Look into carbon footprint data for cars
- Teach land/environmental ethics at school; not just technologies
- Provide a visible electric car demonstration area
- Connect green curriculum to the kid’s home and family lifestyles
- Campus is a community outreach opportunity
- Educate the educators about green thinking, technology, and techniques

Student Suggestions

Butterfly Garden (shared)

Wind / Solar Energy in Courtyard

Lake / Stream with Waterfall and Trees

Outdoor Labs for Science

Water Plans with Built-in Holes

Outreach and Opportunity for Students to Give Back

Eco Events / Fair

Morning Announcement Tells What is Going On at Other Schools

Wind Power at Elementary School

More Job Awareness at Schools

Students Participate in Building and Designing Campus

Keep Students Involved / Meetings

Sensors in Classrooms for Light Control

Earlier Job Awareness

Student Art as a Focal Point and Panels / Themed Garden

Disconnect with Grade Levels, Too Long, Sustainable Research Campus

Students Take Ownership of Landscape / Trees

Central Activity Area that all 3 Campuses Could Use

The Green Ground

Articles and Campus Newsletter / Eco-Events, Students Participate

Presentations to Community

Trail Lined with Flowers Connecting all 3 Schools

Bring in Eco-Jobs Career Counselors – Make Students Aware

Not in Stem Campus – Close it Off

Webcams / Outdoor Marquee Green Letters

Monthly Principal’s Meeting, Share What They are Doing

Eco-Vision, Eco-Campus (home)

Students Involvement with Building, Regular Activities

Recycled Water for Fountain

Each Class Plant a Tree. Students Take Ownership of Plantings / Landscape

Symbol with Flowers Combining All Three Schools

Please Don’t Say “Going Green”

Keep Students Involved thru Meetings

Windmills near Playground

Vision, Green Campus Technology, Energy-Efficient

Provide Updates via Broadcasting and Technology

Natural Play Area

One Central Entrance with Archway

Art by Students

Courtyard Learning Area

Plant Vegetation on the Roof

Go to Businesses and Educate Community on Campus Features

Students be Involved in the Choices

Large Trees, Welcoming Space, Incorporation of Plants and Colors

SOS Projects and They Can Talk About what’s Going On

Wind Generation Project

Water Re-use

Patton Feels Like a SEP Entity. Incorporate Students into Patton

Patton Feels Like a SP. Program

Residential and Community Member Education

Butterfly Garden – Focal Point – Everyone Contributes

Road Noise Buffers, Turkeyfoot Rd. Busy

Incorporate in Morning Announcements

Awareness Campaign on Features

Highlight Opportunities

3 Eco Campuses

Wetland(s)

Electro Class Connection other Schools, Other Schools Visiting Other Schools, Schools Working Together

Students Give Back. Flower Delivery at Nursing Homes. Give Back what is Grown. Make Community Green and Aware

Incorporate Campus into Stem SOS

Patton Doesn't Blend In

Room Displaying Wind Energy and Other Items in Action to Experience It

Biology Students Could Do Experiments at Patton

1 Day per Week 1 Big Morning Announcement for All Schools

Make Technology Visible and Accessible

Educational Display Room to Highlight Campus Features

Patton is Dull Right Now. This Process Could Provide Nice Areas for Breaks

Viewable Solar Areas

Trail with Trees and Flowers

Central Rain System. Filter the Water for Projects. Pond Use

Trail with Trees with Flowers

Demonstrate Progress After School Programs and Affairs

SK/Scott. Plant Trees near Walkways. SK=Pavement Everywhere

Solar Panel Grants

"The Way of the Future"

Internet Presence

Student Led Tours

Hands-on Interaction and Maintenance

Parent Nights

Welcoming Center

Rainwater Fountain and Focal Point for Irrigation

Windmills near Playground

Trees to Separate Sidewalk from Cars

ESSENTIAL ISSUES AND COMPONENTS	PRIORITY RATING						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Outdoor Learning Venues	20	7	7				
Green Infrastructure	9	9	8	4	3	1	
Green Space	1	5	8	7	7	5	1
Campus Identity		2	2	3	9	6	12
Pedestrian & Vehicular Systems	4	8	1	5	8	4	4
Community Interface		1	2	8	5	8	10
Research		5	7	6	3	8	5

Essential Issues & Components

Outdoor Learning Values: Functional and beautiful outdoor classrooms; Gardens (demonstration, food, herbs, etc.); Habitats (wetlands, meadows, and forests); Researching, monitoring, and maintaining site elements

- Redesign – Consider the view TF students will have as they look out – the more green the better.
- Can trees be planted next to bldg or window boxes?
- Consider teacher accessability to outdoor from their classroom.
- Obviously a key feature across all alts.
- The young students that will be attending these schools will be the future of our community. By having outdoor classrooms & by allowing them to learn the benefits of this site first hand, they are more likely to retain the info & be better stewards of our environment in the future.
- I like having the concept of more outdoor facilities to teach, a larger variety would be nice so we may have more areas to cover more material.
- As many as possible.
- Students can learn by being outside. Being in/around a beautiful environment can determine one's mood and learning.
- More outdoor classrooms for hands on learning and conserve energy and space inside because some classes won't be used.
- By going outside, kids who team differently can benefit. There will be more hands on activities with outdoor classrooms.
- You will realize some stormwater treatment with these features.
- Students need to be outside. Incorporate as much as possible. Learning is the activity!
- Having the learning venues structured to teach both the student and the adults (local leaders, business, community members) would provide a well rounded learning center.
- Learning is <u>most</u> important goal.
- Having a ton of green space is nice, but outdoor learning areas can be anywhere if good planning is implemented. Outdoor learning venues need to be present. Sometimes over planning these areas can make the area stagnant educationally.
- Provide opportunities for all 3 schools to benefit from the outdoor classrooms.
- Tie schools together.

- The more educational opportunities available to not only students on the campus but for other district schools to visit and experience, the better.
- If most of the classrooms and opportunities are in the back of the campus, I believe it will be utilized more.
- Sustainability: Technology that produced sustained savings and green benefits. If you build it right that will happen.
- Sustained Learning Benefit: May require more nurturing.
- Can’t be teacher depended.
- Greenhouse effect mentioned by SSLC.
- Must be program dependent. Feature is identified as part of the course program (eg vegetated roof is in biology I course map at the school with the vegetated roof) as a vehicle for instruction (lab) for core standards of the bio I course.
- We’ll have (biofilration swales, rain garden, 3 outdoor classrooms). How can these features be incorporated in your classes to enhance learning. Identify how and when you’ll use them. Resourced by tech. partners.
- Primarily math/science classroom applications. What about humanities (Eng., SS., Arts)?
- Hands on learning a must.
- So important to use the campus itself as a learning tool.
- The outdoor classrooms seem very impt. to me for a variety of reasons.
- Involving the student in the maintenance of gardens, etc., should be a priority.
- Obviously important green we are all about instruction.
- Concept 2 offered more opportunities for outdoor learning.
- Essential tools for the learning process to occur.
- The outdoor classrooms are critical to provide areas to research and collect data.
- Nature path connection. Security?

Green Infrastructure: Stormwater BMPs (rain gardens, bioswales, etc); Sustainable technologies (solar, wind and geothermal)

- NEED provides K-12 curriculum and kits on renewable energy (wind, solar, hydropower) – connect to features on STEM site.
- NEED provides teacher training to help teachers connect curriculum to STEM site.
- NEED provides youth awards to help students create projects related to STEM site.
- The opportunity for green infrastructure will present itself across any alternate. It is just a matter of retrofitting or building it into plans.
- The more places that install GI, the more this will become well known and common practice. The more examples we have in the community the better.
- Make the infrastructure visible, a teaching connection would be ideal.
- I like the step pools and rain gardens. Rain gardens could include vegetables, solar fountains and wind generation, concept 1 porous pavement paths.
- Have to have this in order to have the others – credibility and relevance.
- Important.
- Good idea because it is saving energy and money so it’s very efficient.

- This easy, why not?
- Green infrastructure is essential to improving water quality. The finished design should incorporate both green space and green infrastructure.
- Having the multiple BMPs used (rain gardens, bioswales, porous pavements, etc.) would provide a great demonstration and research opportunity.
- Building plans are already in place, yet I do believe Patton could use a facelift. I do believe showing an older building can be used and updated and brought up to “green” standards (concept 2). I like concept 3 best, however.
- My organization would benefit if the campus had stormwater BMPs on site because we could use it to promote and demonstrate how schools can implement and teach from green infrastructure.
- I like the thought of some sort of windmill or solar tower to create energy and ways to monitor the energy provided.
- Extremely important but from educator’s view not our priority.
- As I see the actual green infrastructure as the most important aspect, I believe that whichever plan can be incorporated the most benefits would be the most viable.
- Now is the time to incorporate these features as you are building.
- This is an area that also provides some teachable moments. Our firm (engineers) creates BMPs. I can see how involving students/community members in this may help to direct the students toward career paths. Plus, this way of design can’t be underestimated.
- Infrastructure will do more to enhance learning than anything I can think of.
- I feel that the concept of receiving rain water runoff of Turkeyfoot Rd. is something that could be viewed by others as the next generation thinking and benefit KCSD.
- The primary opportunity on the campus is the development of the outdoor green infrastructure to compliment the outdoor, existing green buildings to create a green campus.
- Connect to outdoor classrooms.

Greenspace: Natural play environments; Active recreation facilities; Trails; Landscaping (buffers, trees, flowers, etc.)

- Trails a viable component across all alts.
- Nice to have if there is a connection to the outdoor classrooms, keep it educational.
- Trees lining the road and pedestrian entrances, colorful flowers along a nature trail.
- Great idea because kids need more hands on learning outside with the environment and they can enjoy themselves.
- The greener the better and prettier. Plus, kids can enjoy this.
- Demonstrating how green space can be an effective stormwater management tool would be beneficial.
- These things are extremely nice, but not necessary. If overdone they can be one dimensional. Natural areas are very important, but can be used through community parks, etc.
- Natural play areas would definitely benefit elementary school.
- Important for the outdoor campus to be used every day.
- Even though I marked it a 4 it is essential to the nature of the project. This is interactive and will engage.

- My overall thought is something touched on. This can be a community gathering space if done right. I liked the idea of having quite a few outdoor learning/gathering spaces. I am imagining outdoor theater opportunities, lecturing, etc.
- Green space is becoming less and less. Students need green space to increase their awareness of its value.
- Good for the community.
- Secondary essential tools for learning.
- Critical to maintain an area for football practice/soccer and baseball diamond for active physical activities.
- Fitness stations?

Campus Identity: Focal point(s) (towers, art, etc.); Shared gathering spaces; Significant architectural features(s).

- Signage very important for educating public about STEM feature.
- If the campus has a specific identity, it will attract more attention from the general public, hopefully attracting more visitors which ultimately spreads environmental education.
- Share space outside Patton as shown on concept 1 with a focal point structure built by students.
- Saves space which can help to conserve the environment. Good!
- The campus identity is nice and should be there, but it's not one of the main priorities.
- I don't see this as essential to either the vision of the project or enhanced learning for the students.
- The fancy stuff is not necessary, but rather just for show. Keeping the campus natural provides beauty, while keeping the overall theme and ideas.
- This is a good idea. Why not build campus identity through green techniques and installations? This way you meet two goals in one effort. Make landscaping and BMPs decorative. (i.e. entry ways out of plants).
- It is so important for the campus to "fit" together and for all buildings to make use of natural light (I'm thinking of Patton's present design which doesn't do this.)
- Significant campus identity for me personally is only impt. in its functionality.
- Important, but can be a work in progress. Too much emphasis can look wasteful to taxpayers.
- There currently is a lack of campus identity at this campus and I think a strong focus needs to be directed to resolving this issue.
- Not a requirement.
- Organic, not formal informational signage.area (outside) for orientation.

Pedestrian & Vehicular Systems: Parking (quantity, character, etc.); Drives, drop-off areas, and bus loading zones; Walkways and trails; Neighborhood and regional connections.

- Common opportunities on all projects.
- I am in favor of parking in the rear of the campus.
- Safety is upper most in minds of school personnel. Looking at concept 1, I do have questions about evacuation paths in case of emergencies. Where would students go for fire drills?

- Parking underground seems expensive and perhaps over kill. Walking trails would be beneficial but I wonder how much they would be used. This is a destination place. PPL are coming to it for a purpose, not necessarily to walk trails.
- It seems that construction is the time to take care of these issues.
- Concept 2 or 3. 3 is top choice.
- Concept 3 would work best I think with the already existing parking issues on the campus.
- Safety issues are priority.
- Very important for safety of students as well as ability to host events and allow other schools and students access to the campus.
- Walking and trails are a must to include in community involvement. Do have concerns about security of campus when school is not in session.
- Whether used by employees and students, the community or both, the site will need sufficient parking and safe walking/gathering areas. You won't attract the community without an accessible site.
- Vehicles play a big role in development, but I definitely think we should encourage design to encourage green, health living/transportation. Good, clear walking paths (2&3) are important. Keeping parking to a minimum could be encouraging and safe.
- Abundant green infrastructure will mitigate a little of the issues associated with cars, pavement and stormwater runoff.
- With the backup time and traffic in the mornings at schools, this is very necessary and important.
- Good idea. Could help save traffic time and reduce the amount of fuel used.
- The vehicular and pedestrian systems are very important for everyone. The way things are built with the parking lots and such determines how smoothly everything will run. Very important. Safety.
- Pedestrian entrances. Grass pavement systems.
- Allowing students to have easy access to greenspace and outdoor classrooms is essential to their learning, but more importantly for the retention of their learning.
- Strong need to separate pedestrian/vehicular traffic. Need to consider parking issues. What about a lot that is for overflow parking only. Would not be used on a daily basis, but on during events.
- Consider grass porous pavers

Community Interface: Shared facilities (sports, events, etc.); Amenities (gardens, demonstrations, etc.); Meeting spaces.

- Community use restrooms – very important. Mark a park type setting.
- Saves spaces and conserves energy and shared facilities can save money.
- Sharing facilities for sports may save space, etc., but it's too much hassle and causes too much stress if teams must share facilities for everyone involved.
- Bringing the community onto the campus is very important for the learning opportunities if provides and for community involvement in the learning that takes place in the classroom.
- I like concept 3 because of the overall feel and connectedness feel.
- If there were meeting areas and amenities, my company may be able to use the school as an educational tool for community organizations and businesses.

- Necessary for positive community buy-in.
- Concept 3 would be great for this component with the meeting space in the back of the campus.
- Nice, but not required.
- Security & maintenance?

Research: Other Kenton County Schools; University and colleges; Corporations and non-profit organizations.

- The success of the STEM campus as a learning/research tool hinges on community, University and corporate research connections prior to design.
- Provide the necessary system and signage for use by schools to perform data collection and analysis.
- My company would benefit from research opportunities with stormwater BMPs.
- Using the campus as the central research location is key, but drawing on community resources/experts is a fabulous learning tool. Keeping up to date is key. Children using campus to collect meaningful data is very important and relevant.
- Making these results available to decision makers (local/state/federal) and tying these results to upfront installation costs could help our leaders make more informed decisions and may help overcome some barriers to using these technologies.
- This was an awesome experience as an outsider. Other schools would enjoy this and could benefit from these programs.
- Research is important to develop ideas for “go green” conserving, this way conservation is made a priority.
- US Dept. of Energy’s energy efficiency and conservation block grant awarding Kenton Co. $450,000+ can be used for installing renewable energy technology. Grant info. at www.energy.ky.gov. Contact Wayne Spiegel, Kenton Co. Fiscal Court.

Other Comments:

- Funding: Ways to make money for the campus from the campus e.g., crops, tours, zoological items, animal habitats, etc.
- Many of these overlap. If you have some it may incorporate others i.e., if you have BMPs, other organizations could do research. Also, green infrastructure can be learning venues.
- NKU Center for Env. Education can be utilized to train and educate teachers, and promoting environ. Literacy amount the students, staff and community. The graduate endorsement in EE should be utilized to train teachers to discourage “greenhouse effect.” The more school districts that “go green” will put more pressure on colleges/universities to offer more env. Edu. As part of the undergrad program.
- Curricula is critical, we need to have the tools and curriculum in place so that the educational value of these green site elements is sustained and integrated into the coursework, you cannot depend only on the teachers to lead this.
- Traffic flow and pedestrian networks are so important from a safety standpoint, you have to consider the keeping the heavy traffic flows away from highly trafficked pedestrian areas for safety of the children.

- In terms of the focal points, they should incorporate green elements and green infrastructure, it is important to showcase energy and green, as the campus identity.
- The focal points should also be student made – whether it be art, or welding classes, or something else, the students should be engaged, and should help make these focal points.
- The traffic patterns provide an opportunity to educate and intrigue the parents and community members who are driving through the site in addition to the students who are on the site daily.
- Open this site up into a real community benefit so that the general public feels welcome to learn and enjoy the site – make it friendly for people of all ages, and make it accessible (restrooms?)
- A company in NY has completed projects that incorporate accommodations for all disadvantaged individuals – blind, disabled, etc should be able to enjoy the site as well as all other people.

Caywood Courtyard

Bird bath (overflows) or fountain in middle of learning area

Shade trees near benches

Mosaic opportunities in paving

Sculptures out of bottles or cans to promote recycling

Bird feeders

Inscribed pavers in patio – sponsorship opportunities

Different sections/ rows for different grades/ ages

Sundial

Make letters on signs big and colorful

Bat houses

Plenty of color use gray on walk

Color hand prints of children on walls

Butterfly garden

Fruit trees (snacks)

Pictures adjacent to writing for non-readers

Small stream with bridges

Use rain water from roof and water garden

Could sculptures bear weight of children for school pictures?

Inscriptions in stones and teachers can stop there – other curriculum

Alphabet along wall cap

Caywood Front Yard

Peninsula on pond

Step pools

Green Roof(s) on Caywood in future?

Solar panels send a message along Turkey Foot

Hydropower mill or water course – waterfall

Rest areas around trail loop – benches and small structures

Educational signage throughout for students and/or public

Technology

Outdoor Classroom Option 1

Sundial

Make it feel more in the woods, more natural

Speakers outside for announcements

Green retaining wall

Green house for plants in the winter

Outdoor presentations and related infrastructure

Geese and duck control?

More benches and seating nearby

Bug trap

Bridge(s) over water course

Path(s) through the step pools?

Logs and stones for seating

Removable grates? Controlled access to water

Pergola or troths with overhead plants

Signage about animals and games about how to find them

Capacity questions about number of outdoor classrooms and scheduling management

Signs with plants, sign idea, and info about it

Handprints and painted flow patterns

Outdoor Classroom Option 2

Combo of two studios

Evolving forms

Feels more roomy and looks better

Angled study is better – has more room

More abstract and unique shapes for raised planters

Could you mix amphitheater with flow lines and patterns?

Preliminary Master Plan Concept

Green house

Walk around loop trail at end of gym class

Fish and aquatic life? Feed fish

Marked distances on loop trail

Fitness stations

Different trees labeled on loop walk

Groupings of benches

Student feedback from April 16. Superintendent Advisory Group

What about vans for small groups? Using a big bus for 5 kids doesn't seem "green"

Capitalize on the fact of the three schools being on the same campus.

Sports areas: athletic turf that is environmentally friendly

Showcase green techniques in athletic complexes since that is where most people gather

Make outdoor classrooms more interesting

Make outdoor classrooms feel more closed in and feel like a classroom instead of just an open space

Make the teachers use the outdoor classrooms on a consistent basis

Have student maintain site by picking up trash

Have a courtyard or gathering area

Use shrubs to enclose outdoor classroom

Show teachers how to use the outdoor classroom for each type of class, not just elective courses

Have smaller modules for large green infrastructure so kids can interact with it and show it to community

Focus on small things that can make a big difference

Have a good balance of traditional trades and green trades at Patton, don't make it all green

Make outdoor classrooms accessible

Right now, outdoor classrooms are hard to get to, muddy, over grown, etc.

Make outdoor classroom multi-purpose. Make them inviting to go to. Give people a motivation to use them. Have families and community groups use them.

Open windows near walkways and hall ways

Use student art, make it colorful

Make a gateway to the campus, with signage that sets the tone of the campus

Put greenhouses on all campuses

Have clubs meet in outdoor classrooms

Give students exposure to many programs, and pathways to green careers.

Don’t like the name STEM Campus or Sustainable Research Campus.

THE KENTON COUNTY SCHOOL DISTRICT

A System of Excellence

1055 EATON DRIVE / FORT WRIGHT, KENTUCKY 41017

TELEPHONE: (859) 344-8888 / FAX (859) 344-1531 / WEBSITE: WWW.KENTON.KYSCHOOLS.US

Tim Hanner, Superintendent of Schools

The Kenton County School District
STEM Campus
Student Involvement Day

Tuesday, July 21, 2009

Sample Questions

1) Tell us about your background. Where did you go to school? How did you achieve your position?
2) Tell us about your position. Describe a typical day.
3) Why did you pursue this career track?
4) Our campus and our school will be a leader in education and protecting our environment. What should we know about Kentucky's leadership in these areas?
5) As middle school students seeking support for our campus and outdoor classroom, what specific advice would you give regarding solicitation of potential supporters?
6) Who are some partners we should share our campus vision with?
7) How do we go about soliciting support from government leaders such as yourself?
8) What would you like to see happen on our campus?
9) How can we help you achieve Kentucky's goals regarding education and sustainability?
10) How do we, as students, stay connected and current on Kentucky's efforts?

APPENDIX G
FINAL CONCEPT PLANS

Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Green Campus & Stormwater Master Plan

Site Master Plan

Project Funded by EPA 319 Grant

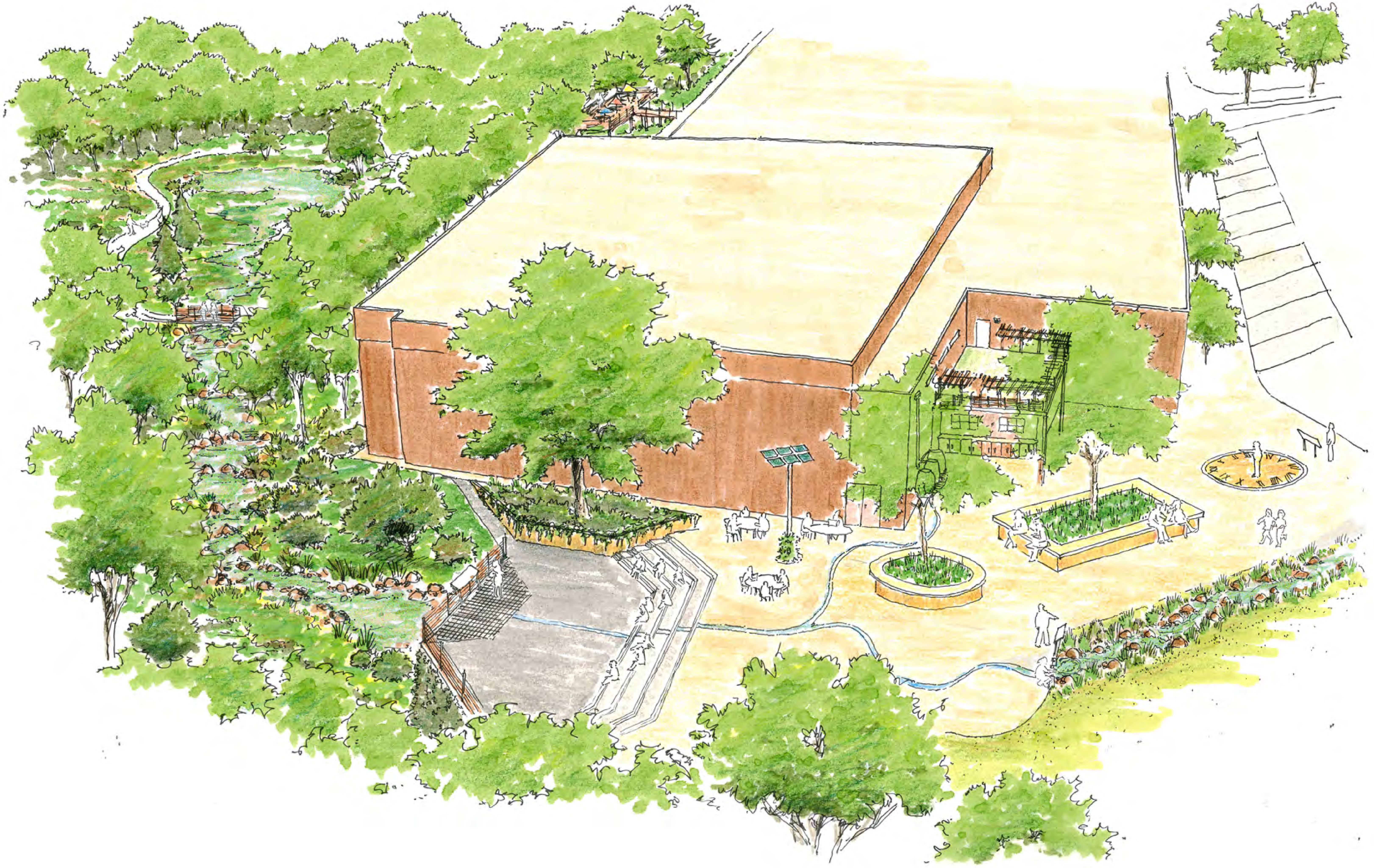
Strand Associates • Human Nature

September 2009

0' 100' 200 300


the only
thing
JM '09


JM '09



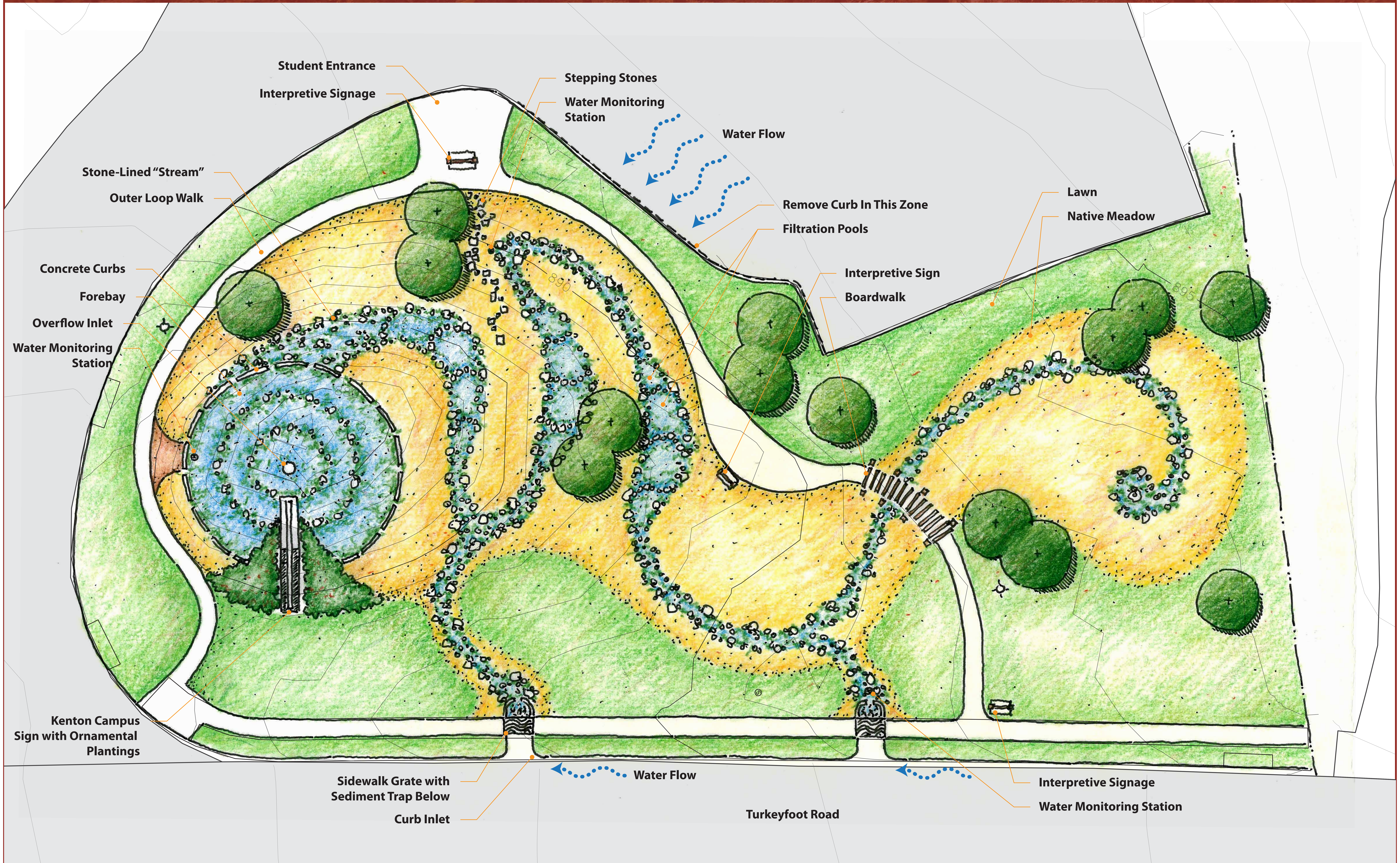
Caywood Elementary School, Patton STEM Academy, & Turkey Foot Middle School:

Educational Rain Garden

THE KENTON COUNTY SCHOOL DISTRICT
A System of Excellence

Concept Plan

Project Funded by EPA 319 Grant



Strand Associates • Human Nature

December 2009

0' 10' 20' 30'

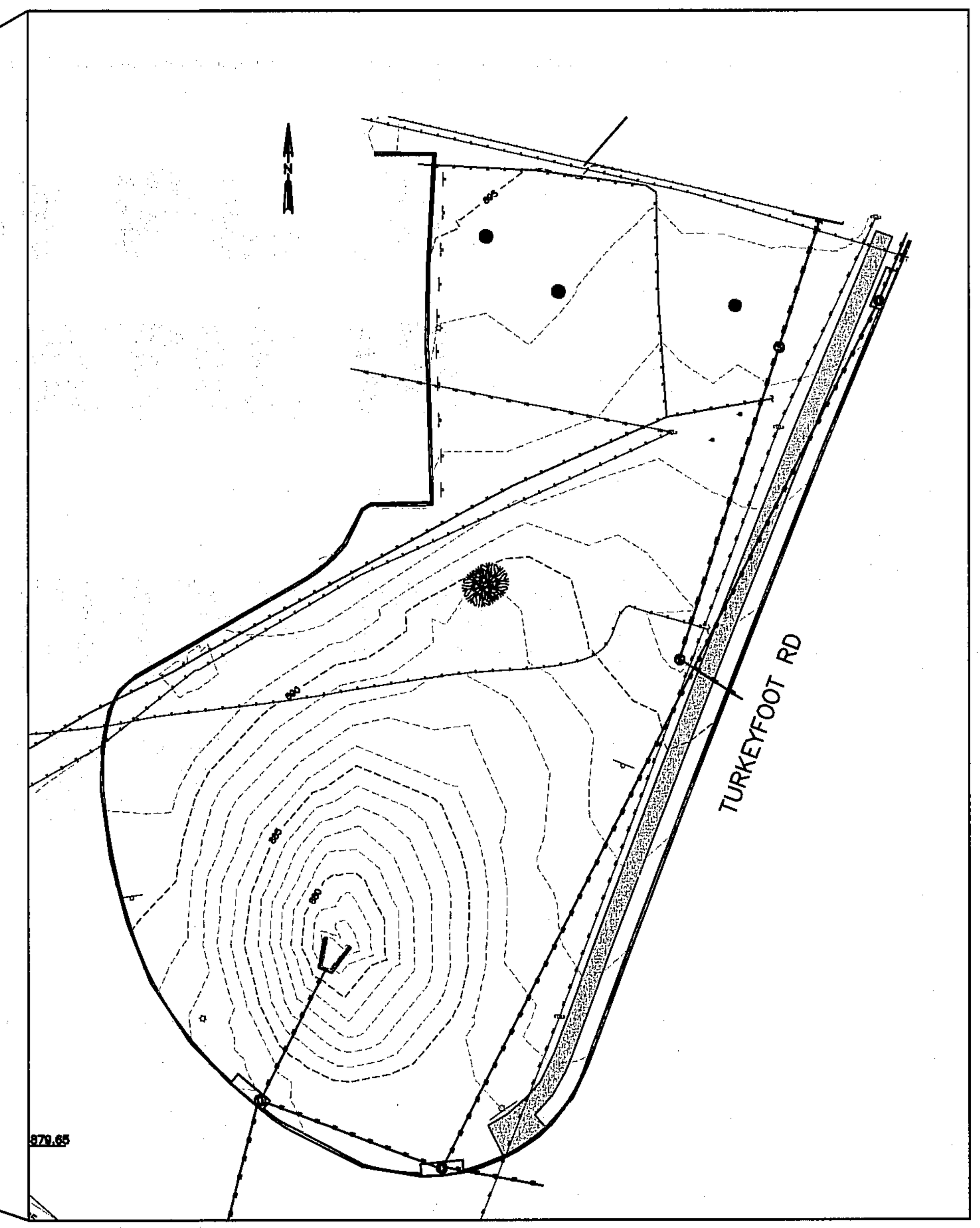
APPENDIX H
DESIGN DRAWINGS

GREEN CAMPUS MASTER PLAN
RAIN GARDEN ENTRY FEATURE

FOR

KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

FEBRUARY 2010



615 Elsinore Place, Suite 320
Cincinnati, OH 45202
513 861-5600 PHONE
513 861-5601 FAX

STATE OF KENTUCKY
MICHAEL A. WOOLUM
15347
LICENSED
PROFESSIONAL ENGINEER
2/05/10

STRAND ASSOCIATES, INC.®
ENGINEERS

SHEET
1

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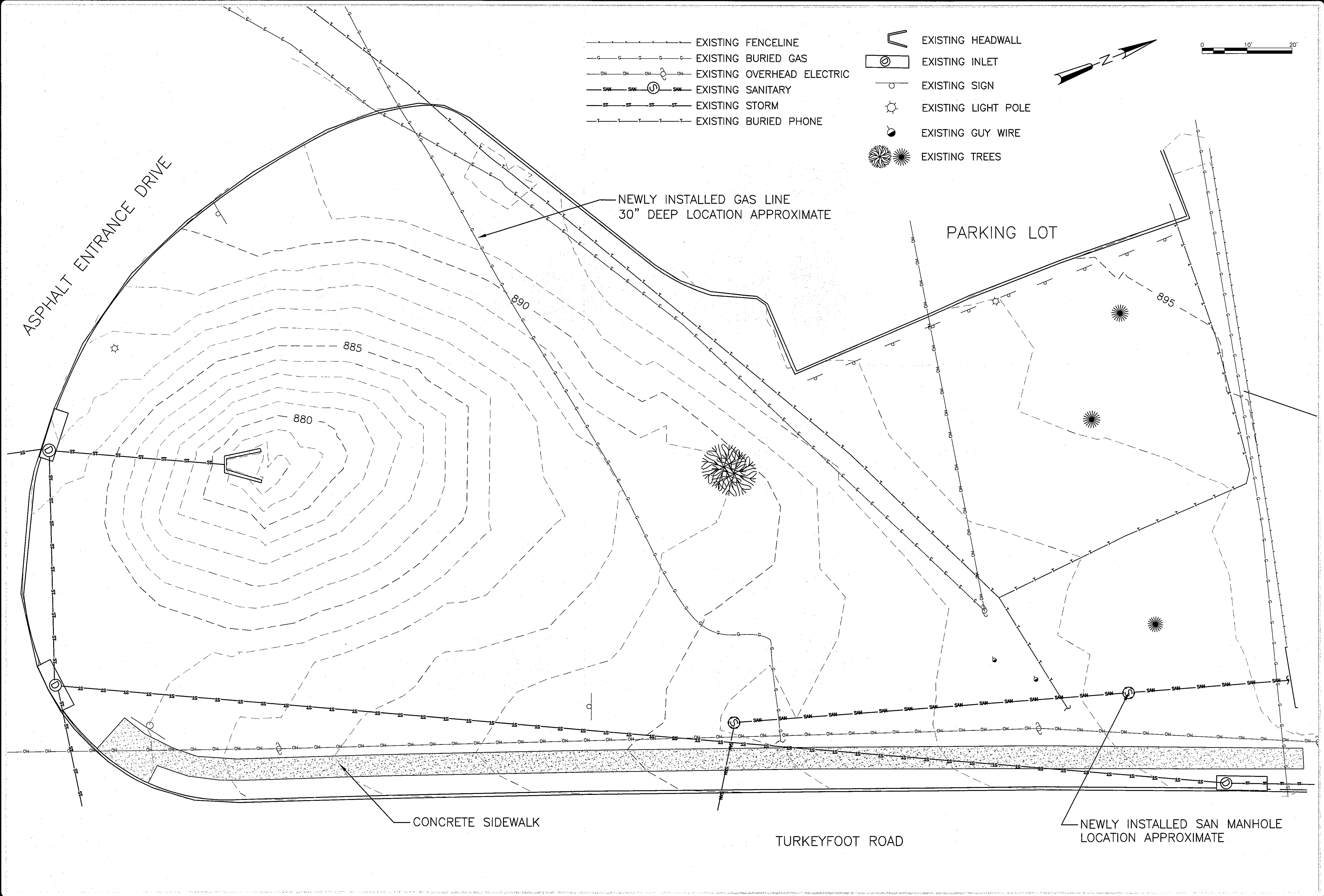

STATE OF KENTUCKY
MICHAELA WOOLUM
15347
LICENSED PROFESSIONAL ENGINEER

NO.	REVISIONS	DATE:

DATE: JANUARY 2010
DES BY: KMK CHK BY: MAW

RECORD DRAWING
BY:
DATE:
CONTRACTOR:

EXISTING CONDITIONS MAP

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

HUMAN NATURE

STRAND ASSOCIATES, INC.®
ENGINEERS

2

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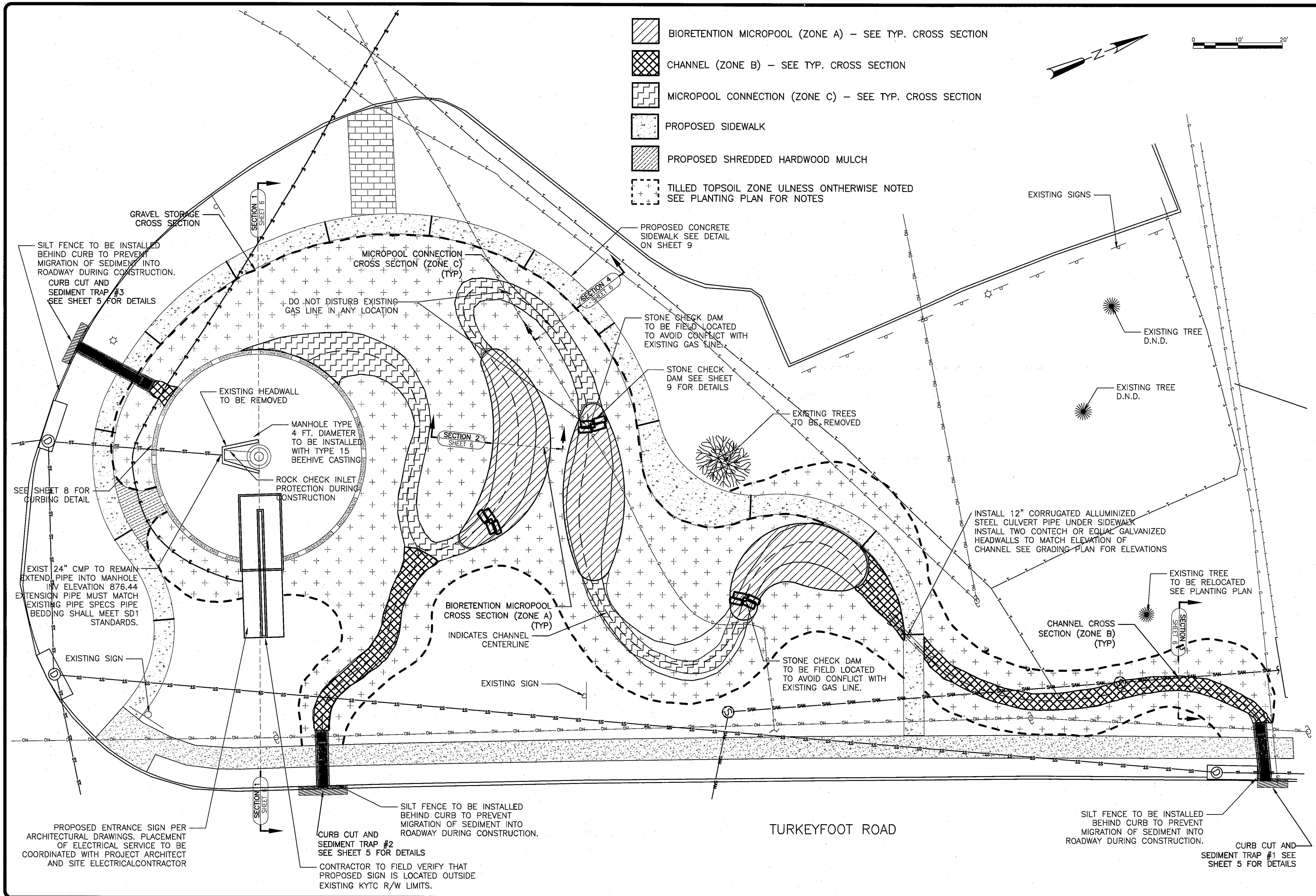

STATE OF KENTUCKY MICHAEL A. WOOLUM 15347 LICENSED PROFESSIONAL ENGINEER 2/03/10

NO.	REVISIONS	DATE:

DATE: JANUARY 2010
DES BY: KMK CHK BY: MAW

RECORD DRAWING
BY:
DATE:
CONTRACTOR:

RAIN GARDEN LAYOUT AND EROSION CONTROL PLAN

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

HUMAN NATURE

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3

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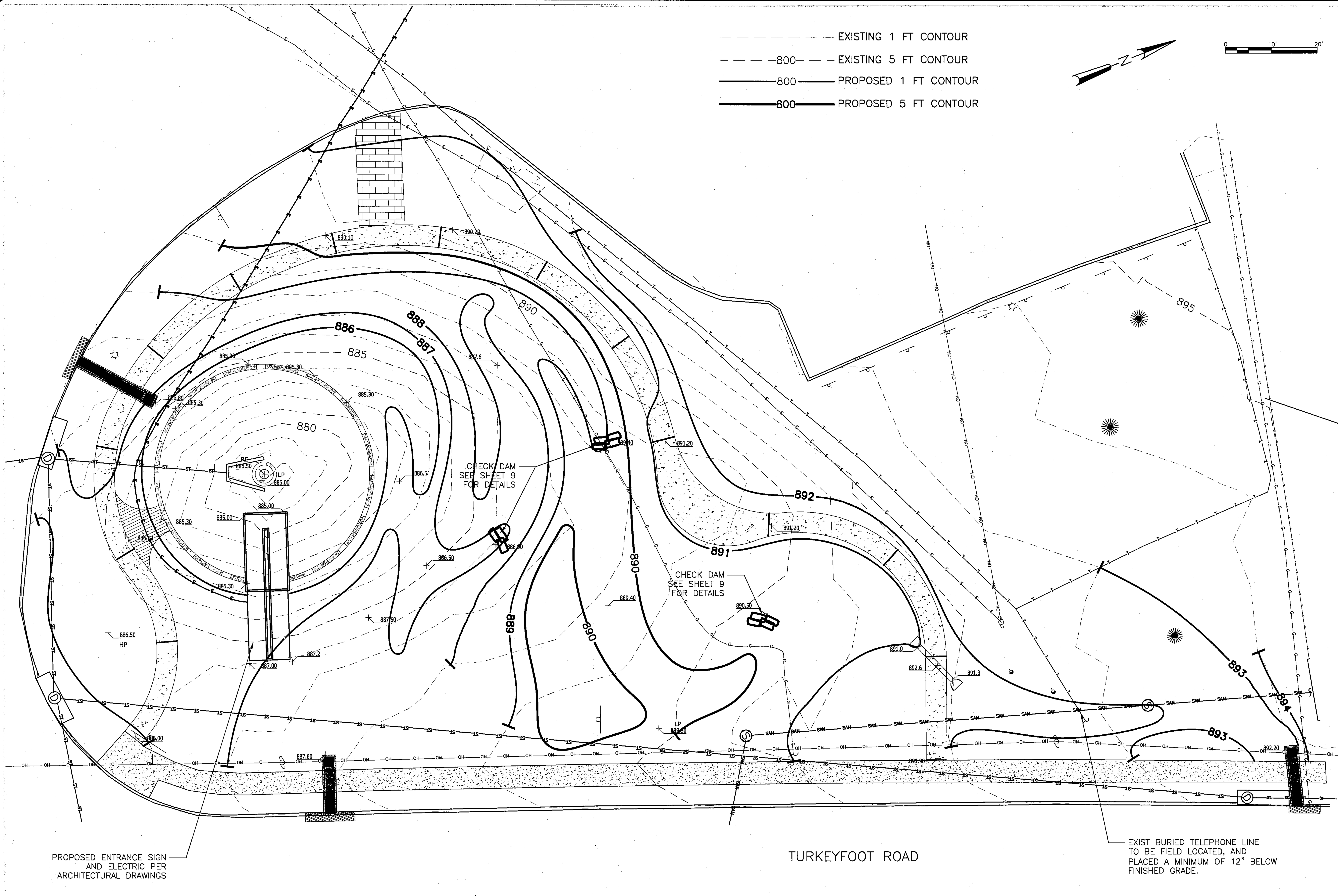

STATE OF KENTUCKY ★ MICHAEL A. WOOLUM 15347 LICENSED PROFESSIONAL ENGINEER 2/05/10

NO.	REVISIONS	DATE:

DATE: JANUARY 2010
DES BY: KMK CHK BY: MAW

RECORD DRAWING
BY:
DATE:
CONTRACTOR:

PROPOSED GRADING PLAN

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

4

JOB NO. 3522.001

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UTILITY NOTES:

EXISTING UNDERGROUND UTILITIES AND SERVICES, IF ANY, ARE SHOWN IN THEIR APPROXIMATE LOCATIONS ACCORDING TO THE INFORMATION MADE AVAILABLE TO THE ENGINEER. THE LOCATIONS SHOWN ARE INTENDED ONLY AS A GUIDE AND CANNOT BE GUARANTEED ACCURATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR:

1) CONTACTING THE INDIVIDUAL UTILITY OWNERS TEN DAYS PRIOR TO CONSTRUCTION, ADVISING THEM OF THE WORK TO TAKE PLACE.

2) SOLICITING THEIR AID IN LOCATING AND PROTECTING ANY UTILITY WHICH MAY INTERFERE WITH CONSTRUCTION.

3) EXCAVATING AND VERIFYING THE HORIZONTAL AND VERTICAL LOCATION OF EACH UTILITY.

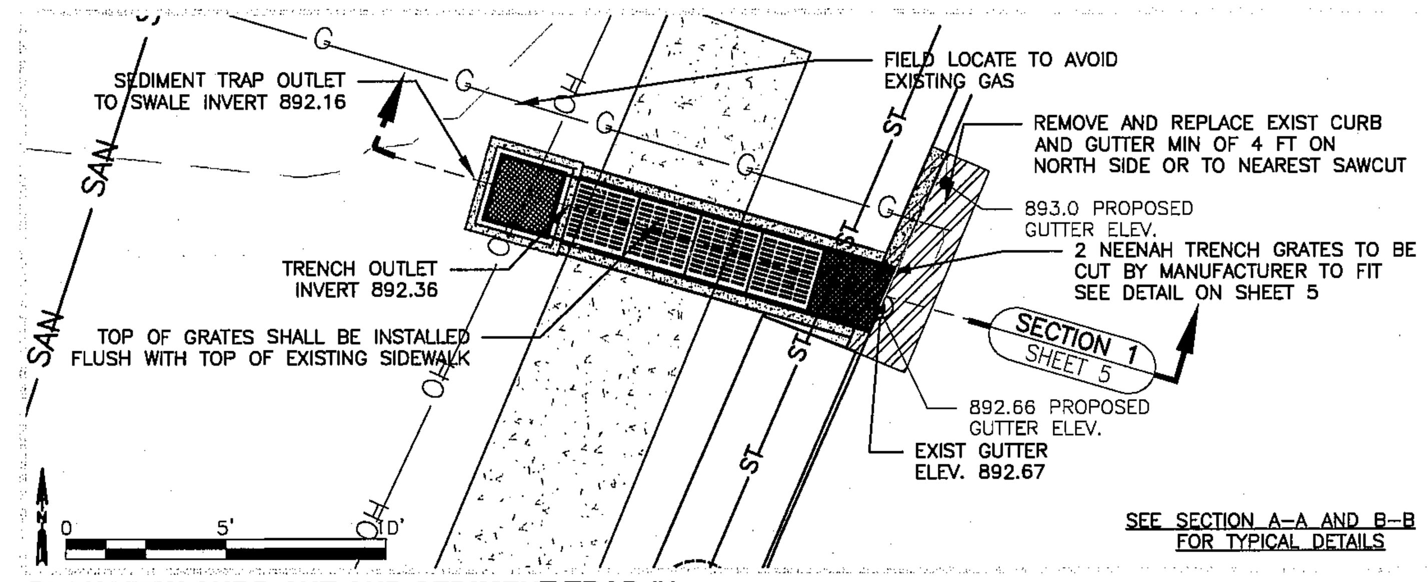
4) ANY DAMAGE TO ANY EXISTING UTILITY.

CURB CUTS SHALL MEET THE FOLLOWING:

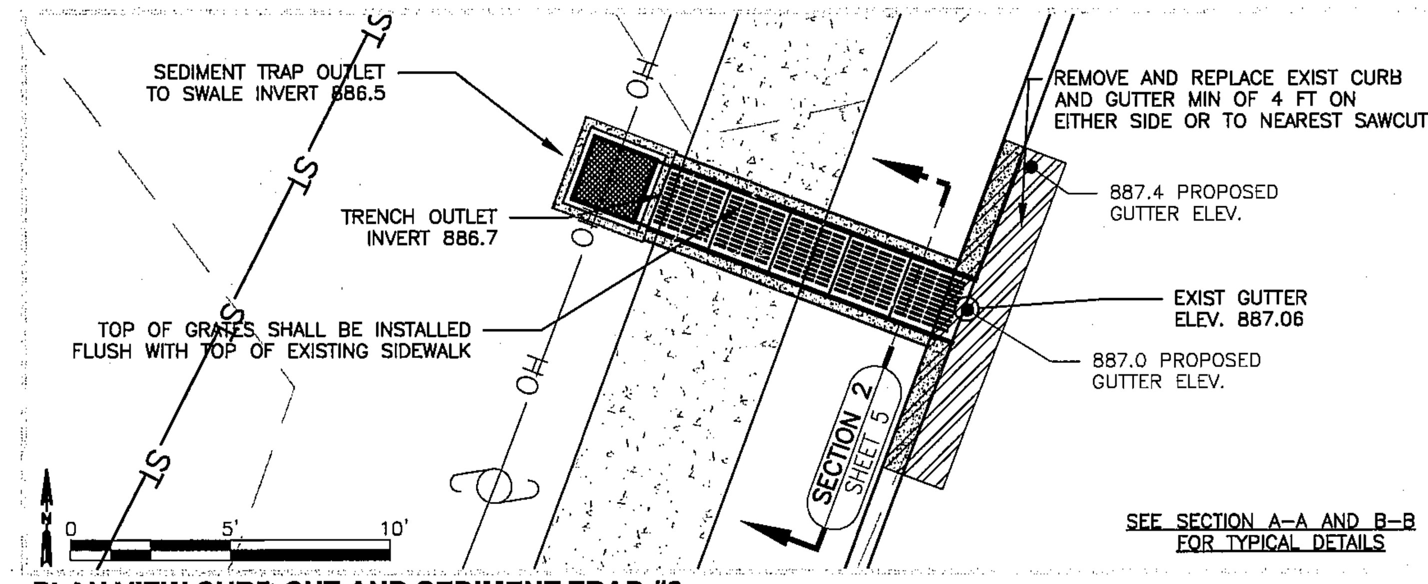
1) BOTTOM OF CURB TRENCH SHALL BE 0.1' LOWER THAN GUTTER.
2) EXISTING CURB AND GUTTER SHALL BE REMOVED AND REPLACED TO NEAREST SAWCUTS.
3) TRENCH SHALL HAVE A 1% SLOPE TOWARDS SEDIMENT TRAP. GRATE SHALL MATCH EXISTING CROSS SLOPE OF SIDEWALK.
4) SAW CUT AND REMOVE EXISTING SIDEWALK FOR TRENCH INSTALLATION.

NEW CURB AND GUTTER SHALL MEET THE FOLLOWING:

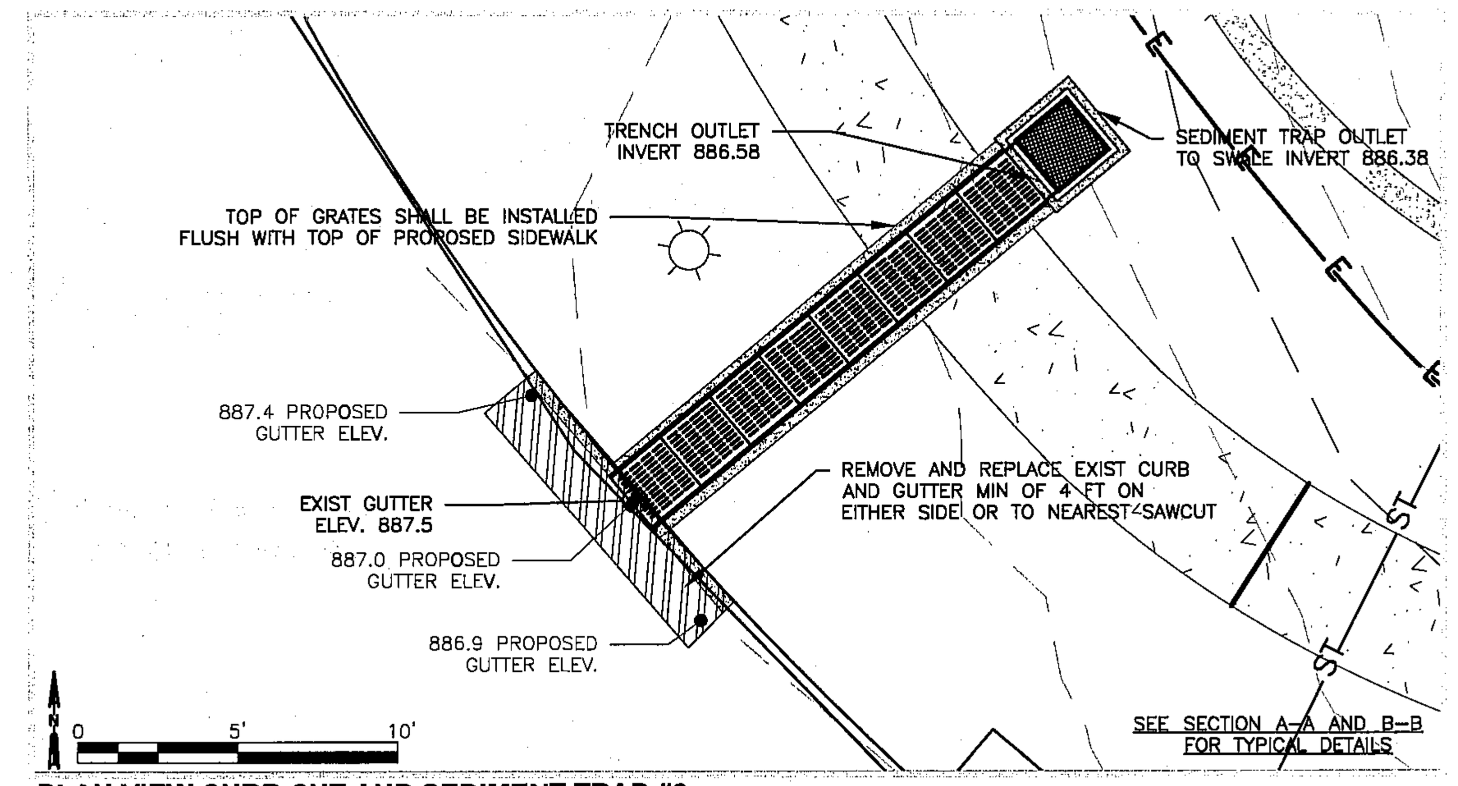
1) CURB AND GUTTER SHALL BE KENTUCKY DEPARTMENT OF HIGHWAYS STANDARD CURB AND GUTTER SEE STANDARD DRAWING NO. RPM-100-09.
2) NEW CURB AND GUTTER SHALL MATCH EXIST. CURB AND GUTTER AT ALL JOINTS.



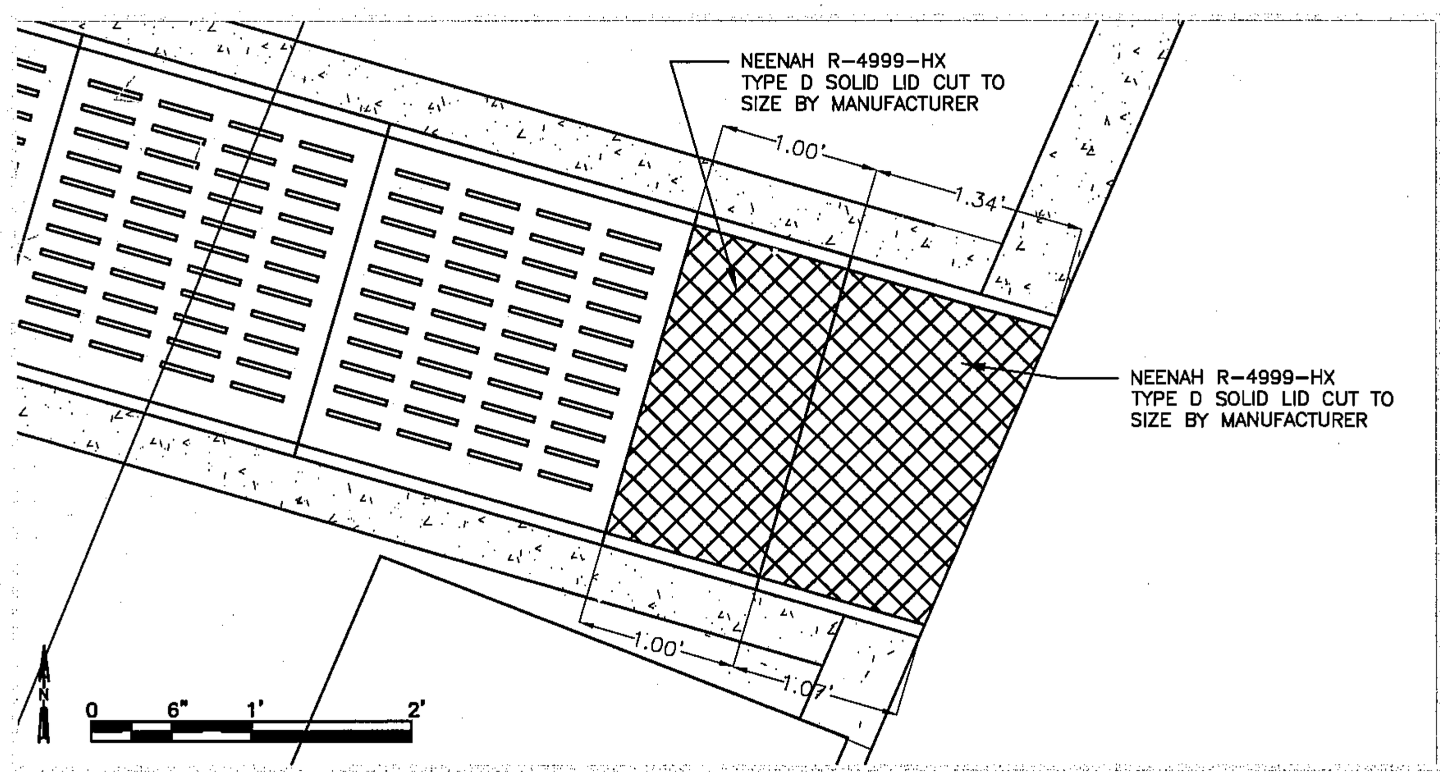
PLAN VIEW CURB CUT AND SEDIMENT TRAP #1



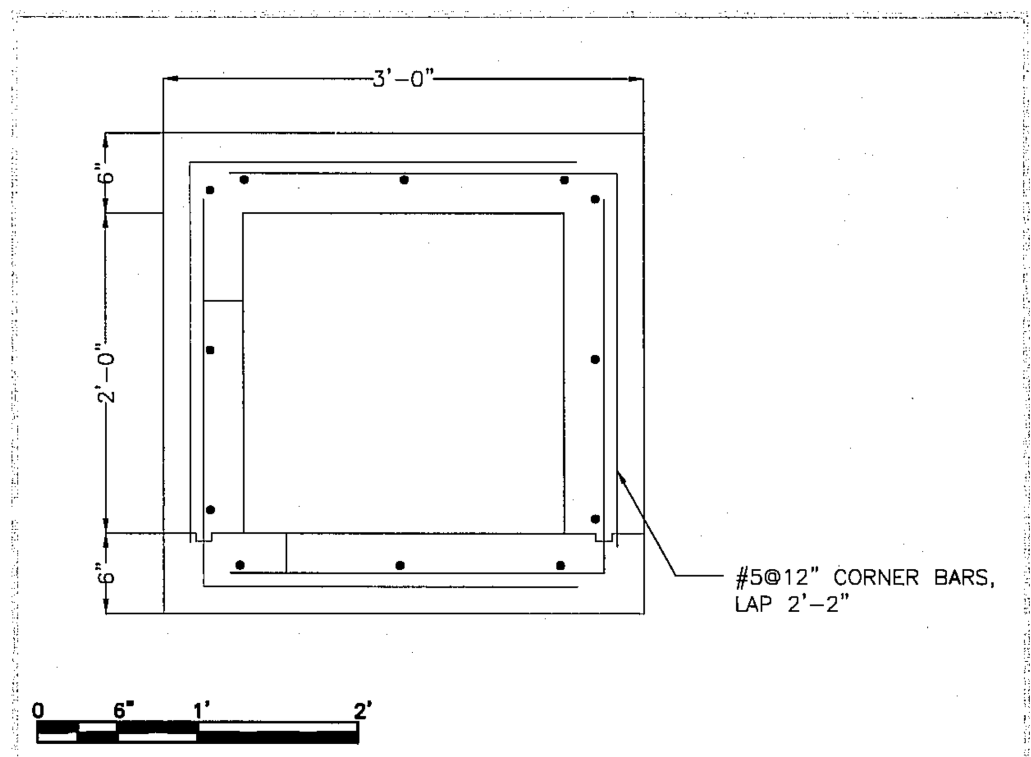
PLAN VIEW CURB CUT AND SEDIMENT TRAP #2



PLAN VIEW CURB CUT AND SEDIMENT TRAP #3



CUSTOM CUT NEENAH TRENCH GRATE DETAIL - FOR CURB CUT #1 ONLY



SECTION 3 SHEET 5 PLAN VIEW OF SEDIMENT TRAP

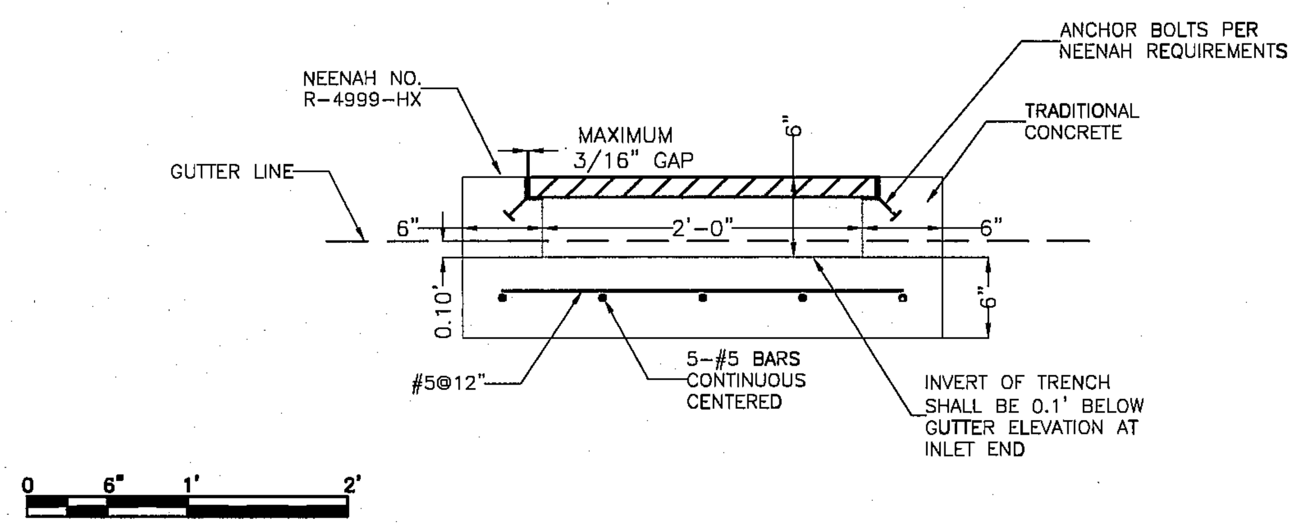
NEENAH TRENCH FRAME AND GRATE SHALL MEET THE FOLLOWING:

1) THE TRENCH FRAME AND GRATE SHALL BE NO. R-4999-HX WITH LID TYPE Q.

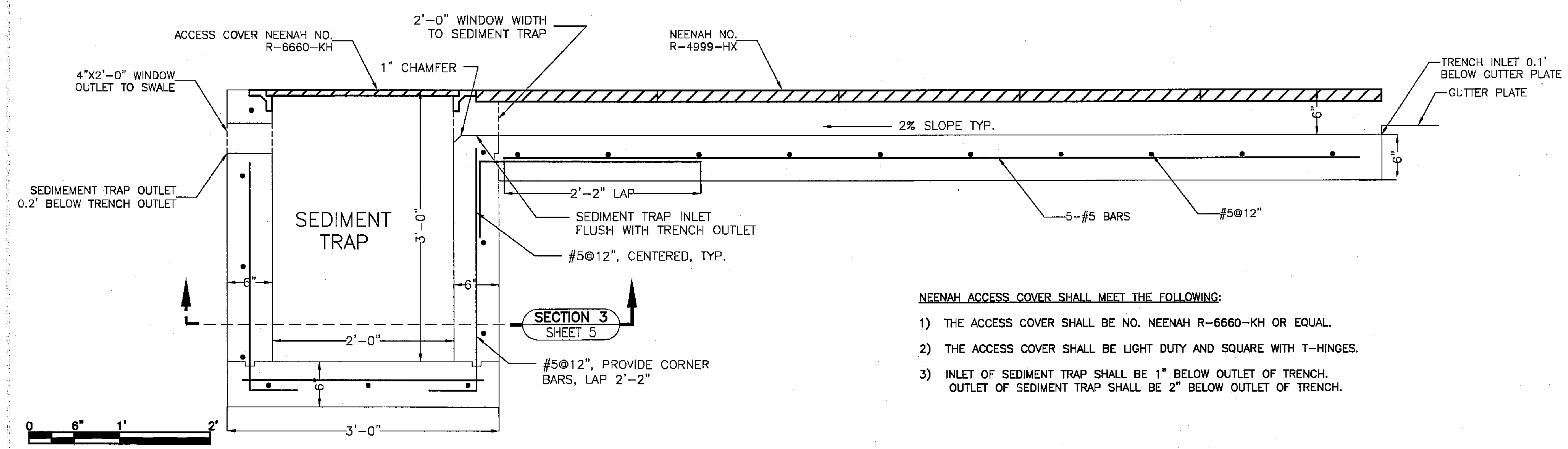
2) THE GRATE SHALL BE HEAVY DUTY AND BOLTED.

3) INVERT OF TRENCH INLET SHALL BE 0.1' BELOW GUTTER ELEVATION

4) GRATE MUST BE ADA COMPLIANT.



SECTION 2 SHEET 5 TYPICAL CURB CUT TRENCH SECTION



NEENAH ACCESS COVER SHALL MEET THE FOLLOWING:

1) THE ACCESS COVER SHALL BE NO. NEENAH R-6660-KH OR EQUAL.

2) THE ACCESS COVER SHALL BE LIGHT DUTY AND SQUARE WITH T-HINGES.

3) INLET OF SEDIMENT TRAP SHALL BE 1" BELOW OUTLET OF TRENCH. OUTLET OF SEDIMENT TRAP SHALL BE 2" BELOW OUTLET OF TRENCH.

SECTION 1 SHEET 5 TYPICAL CURB CUT TRENCH AND SEDIMENT TRAP SECTION

STATE OF KENTUCKY MICHAEL A. WOOLUM 15347 LICENSED PROFESSIONAL ENGINEER 2/05/10

NO.	REVISIONS	DATE:

DATE: JANUARY 2010
DES BY: KMK CHK BY: MAW
RECORD DRAWING
BY:
DATE:
CONTRACTOR:

NOTES AND DETAILS

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

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JOB NO. 3522.001

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ENGINEERED SOIL SHALL MEET THE FOLLOWING:

1) THE PLANTING MIXTURE SHALL CONSIST OF A MIXTURE OF SAND, COMPOST AND TOPSOIL. THE MIX SHALL BE DESIGNED TO APPROXIMATE THE FOLLOWING PERCENTAGES, BY VOLUME.

ENGINEERED SOIL COMPONENT	PERCENTAGE COMPOSITION (BY VOLUME)
SAND	50%
TOPSOIL	20% IF LOAM TEXTURE 30% IF SANDY LOAM OR LOAMY SAND TEXTURE
COMPOST	20% – 30%

2) THE SAND COMPONENT SHALL BE USDA COARSE SAND (0.02 TO 0.04 INCH DIAMETER). THE SAND COMPONENT SHALL CONSIST OF MINERAL SAND THAT IS AT LEAST 97% SIO2. SUBSTITUTIONS, SUCH AS CALCIUM CARBONATED SAND, DOLOMITIC SAND, MANUFACTURED SAND OR STONE DUST ARE NOT ALLOWED. THE SAND SHALL BE WASHED TO REMOVE CLAY AND SILT PARTICLES, AND WELL-DRAINED PRIOR TO MIXING.

3) THE TOPSOIL COMPONENT SHALL BE A USDA CLASSIFIED SANDY LOAM, LOAMY SAND OR LOAM TEXTURE. THE TOPSOIL COMPONENT TEXTURAL CLASS SHALL BE VERIFIED BY A LABORATORY ANALYSIS OR A PROFESSIONAL ACCEPTABLE TO THE JURISDICTION HAVING AUTHORITY.

4) THE COMPOST COMPONENT SHALL MEET THE FOLLOWING SPECIFICATIONS:

(A) PARTICLE SIZE – 98% OF THE COMPOST SHALL PASS THROUGH A 0.75 INCH SCREEN.
(B) PHYSICAL CONTAMINANTS – LESS THAN 1% COMBINED GLASS, METAL AND PLASTIC.
(C) ORGANIC MATTER/ASH CONTENT – AT LEAST 40% ORGANIC MATTER; LESS THAN 60% ASH CONTENT.
(D) CARBON TO NITROGEN RATIO – THE RATIO SHALL BE 10–20:1 C:N RATIO.
(E) PH – THE PH OF THE COMPOST SHALL BE BETWEEN 6 AND 8.
(F) SOLUBLE SALTS – ELECTRICAL CONDUCTIVITY SHALL BE BELOW 10 DS M–1 (MMHOS CM–1)
(G) MOISTURE CONTENT – BETWEEN 35% AND 50% BY WEIGHT.
(H) MATURITY – THE COMPOST SHALL BE RESISTANT TO FURTHER DECOMPOSITION AND FREE OF COMPOUNDS, SUCH AS AMMONIA AND ORGANIC ACIDS, IN CONCENTRATIONS TOXIC TO PLANT GROWTH.
(I) RESIDUAL SEEDS & PATHOGENS – PATHOGENS AND NOXIOUS SEEDS SHALL BE MINIMIZED. PATHOGENIC CONTAMINATION SHALL BE IN COMPLIANCE WITH US EPA 503 REGULATIONS FOR CLASS A BIOSOLIDS.
(J) OTHER CHEMICAL CONTAMINANTS – CONCENTRATIONS OF HEAVY METALS SUCH AS ARSENIC, CADMIUM, COPPER, LEAD, MERCURY, MOLYBDENUM, NICKEL, SELENIUM AND ZINC SHOULD BE NEGLIGIBLE AND SHALL BE IN COMPLIANCE WITH US EPA 503 REGULATIONS FOR CLASS A BIOSOLIDS.

5) THE ENGINEERED SOIL MIX SHALL BE FREE OF ROCKS, STUMPS, ROOTS, BRUSH OR OTHER MATERIAL OVER 1 INCH IN DIAMETER. NO OTHER MATERIALS SHALL BE MIXED WITH THE PLANTING SOIL THAT MAY BE HARMFUL TO PLANT GROWTH OR PROVE A HINDRANCE TO PLANTING OR MAINTENANCE. THE MIX SHALL HAVE AN INFILTRATION RATE IN THE RANGE 0.5–1.5 INCHES PER HOUR.

SURFACE MULCH LAYER SHALL MEET THE FOLLOWING:

1) SHREDDED HARDWOOD MULCH OR CHIPS, AGED A MINIMUM OF 12 MONTHS, SHALL BE PLACED ON PLANTED SURFACES.

2) THE MULCH SHALL BE 3 INCHES IN DEPTH.

3) THE MULCH SHALL BE FREE OF FOREIGN MATERIAL, INCLUDING OTHER PLANT MATERIAL.

TOPSOIL AND SUBSOIL FILL AS NEEDED SHALL MEET THE FOLLOWING:

1) ALL SOIL BROUGHT FROM OFF-SITE MUST COME FROM AN UNCONTAMINATED SOURCE LOCATION.

2) TOPSOIL SHALL MEET THE FOLLOWING CHARACTERISTICS; GENERAL REQUIREMENTS TO MEET ASTM D 5268; USDA SOIL TEXTURE ANALYSIS SHALL RANGE FROM A CLAY LOAM TO A SILT LOAM. PH RANGE OF 6.5–7. ORGANIC MATTER FROM 5–10%.

3) SOIL SHOULD BE FREE OF STONES 2 INCHES OR LARGER IN ANY DIMENSION AND OTHER EXTRANEOUS MATERIALS HARMFUL TO PLANT GROWTH.

4) TESTING FOR TOPSOIL SUITABILITY TO MEET THESE SPECIFICATIONS IS THE RESPONSIBILITY OF THE CONTRACTOR.

5) TOPSOIL MUST EXHIBIT MODERATE INFILTRATION QUALITIES, AND BE LOOSE AND FRIABLE, BOTH AT ITS SOURCE AND IN PLACE AT PROJECT SITE. ONLY HANDLE TOPSOIL WHEN DRY.

6) SOIL PERCOLATION TEST MUST BE CONDUCTED ON TOPSOIL BEFORE PLACEMENT AND GRADING ON SITE. RESULTS OF PERCOLATION TESTS MUST YIELD A MODERATE RATE OF PERCOLATION BEFORE ACCEPTANCE OF THE MATERIAL AND BEFORE PLANTING CAN PROCEED.

7) DO NOT OVERLY COMPACT THE TOPSOIL FILL.

8) TOPSOIL TO BE PLACED AT DEPTH OF 6 INCHES AT LOCATIONS AS SHOWN ON PLANS. FINISH GRADES REPRESENTED ON THIS PLAN INCLUDE THE FINISH GRADE OF TOPSOIL. BLEND TOPSOIL LAYER WITH SUBSOIL WITH A DISC HARROW OR ROTO-TILLER.

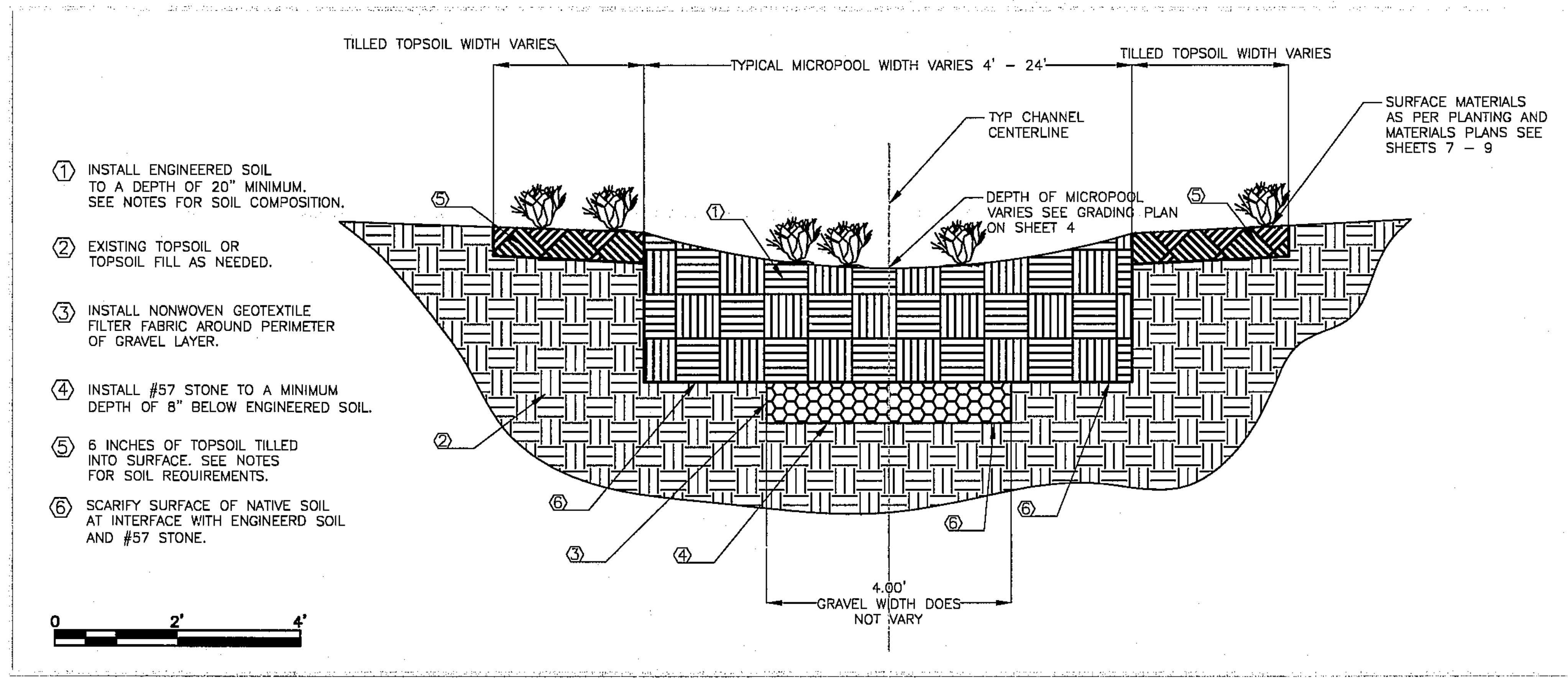
FILTER FABRIC SHALL MEET THE FOLLOWING:

1) THE FILTER FABRIC SHALL BE A NONWOVEN GEOTEXTILE FILTER FABRIC.

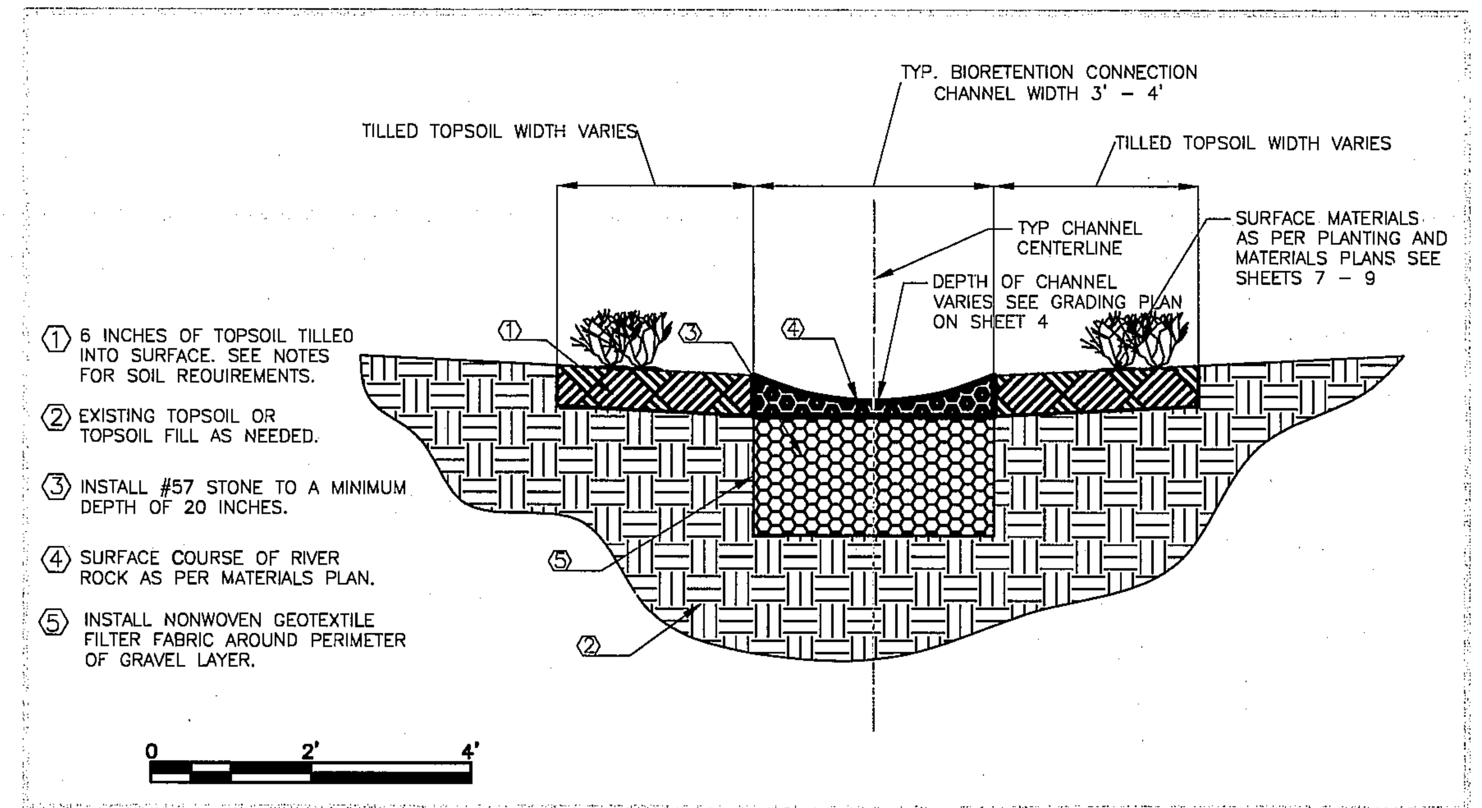
2) THE FILTER FABRIC SHALL BE A MIRAFI 140N SERIES FABRIC, A TYPAR STYLE 3341 FABRIC, OR APPROVED EQUAL.

GRAVEL AGGREGATE SHALL MEET THE FOLLOWING:

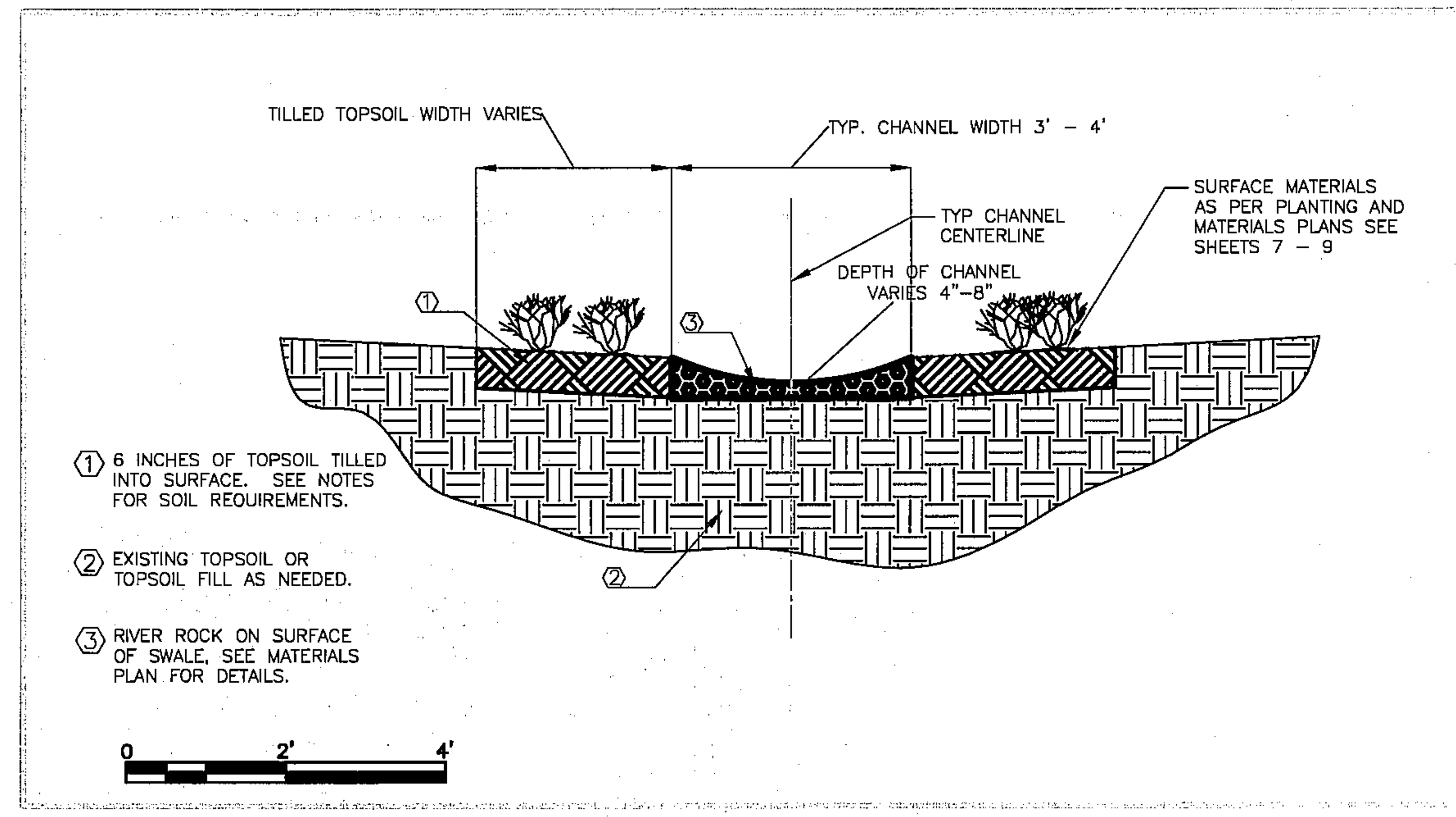
1) AGGREGATE SHALL BE CLEAN DOUBLE WASHED #57 AGGREGATE.



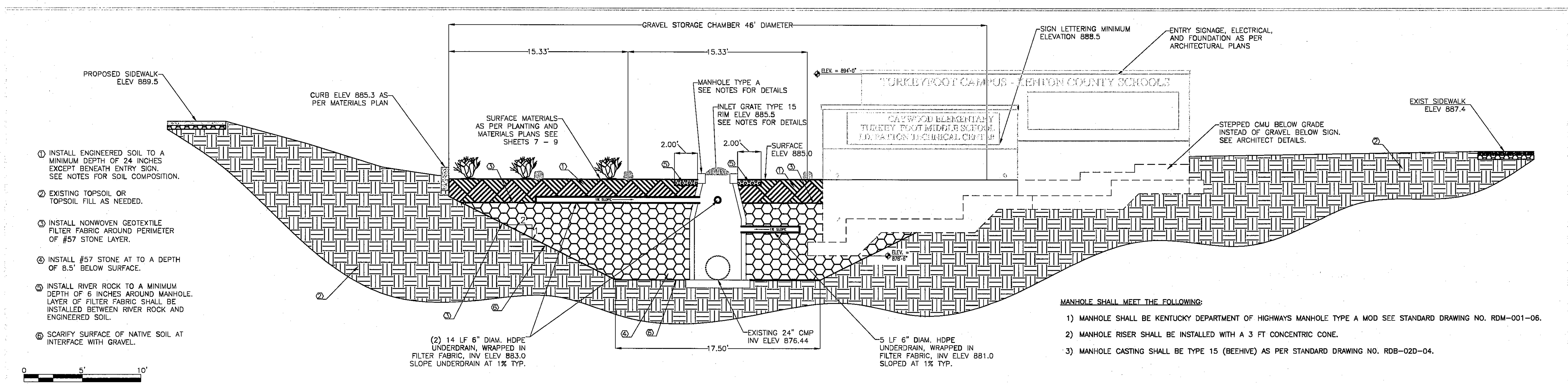
SECTION 2 / SHEET 3 TYP. BIORETENTION MICROPOOL (ZONE A)



SECTION 4 / SHEET 3 TYP. MICROPOOL CONNECTIONS (ZONE C)



SECTION 3 / SHEET 3 TYP. CHANNEL (ZONE B)



MANHOLE SHALL MEET THE FOLLOWING:

1) MANHOLE SHALL BE KENTUCKY DEPARTMENT OF HIGHWAYS MANHOLE TYPE A MOD SEE STANDARD DRAWING NO. RDM-001-06.

2) MANHOLE RISER SHALL BE INSTALLED WITH A 3 FT CONCENTRIC CONE.

3) MANHOLE CASTING SHALL BE TYPE 15 (BEEHIVE) AS PER STANDARD DRAWING NO. RDB-020-04.

SECTION 1 / SHEET 3 GRAVEL STORAGE AND OUTLET CONTROL

STATE OF KENTUCKY ★ MICHAEL A. WOOLUM 15347 LICENSED PROFESSIONAL ENGINEER ★ 1/25/10

NO.	REVISIONS	DATE:

DATE: JANUARY 2010
DES BY: KMK CHK BY: MAW
RECORD DRAWING
BY:
DATE:
CONTRACTOR:

NOTES AND CROSS SECTIONS

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

STRAND ASSOCIATES, INC.®
ENGINEERS

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JOB NO. 3522.001

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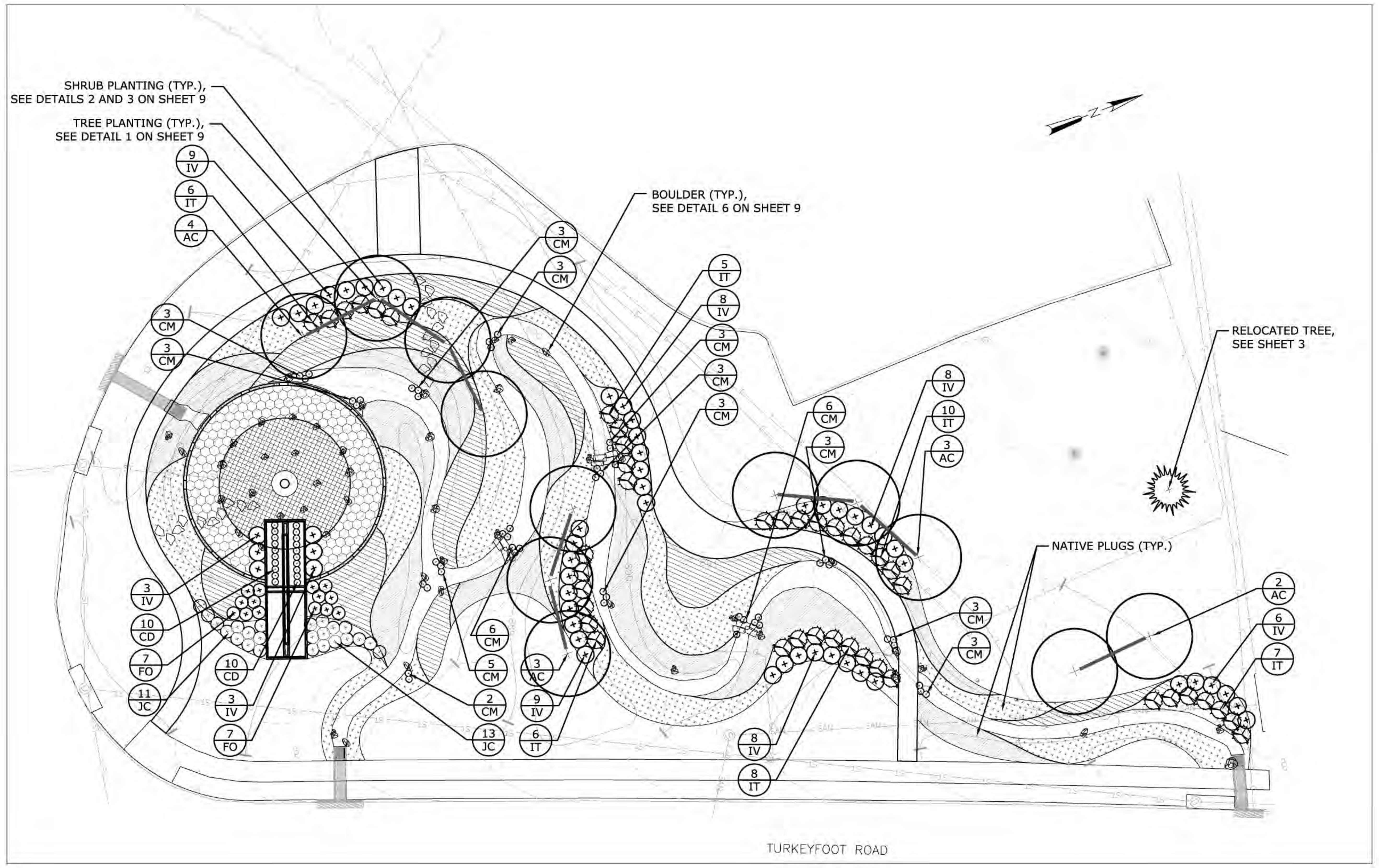
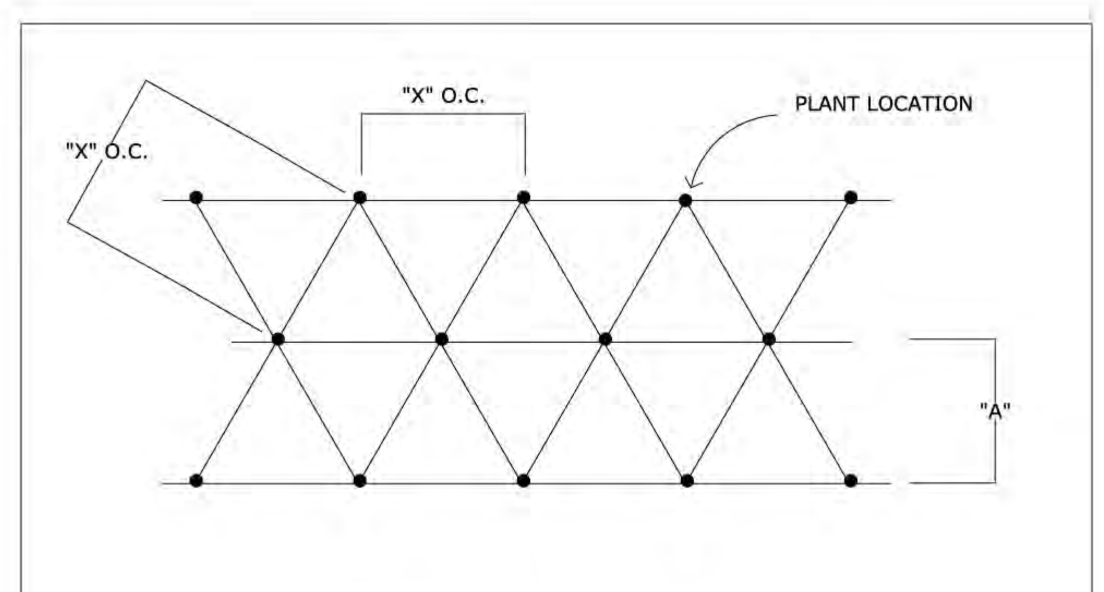


1 SITE PLANTING PLAN
SCALE: 1"=20'

PLANT SCHEDULE

KEY	SPECIES	SIZE	COMMENTS
DECIDUOUS TREES			
AC	*Amelanchier x grandiflora 'Autumn Brilliance'* Canadian Serviceberry	2 1/2" CAL.	B&B, SINGLE TRUNK, LIMB UP TO 4'
DECIDUOUS SHRUBS			
FO	*Fothergilla gardenii* Gardenii Dwarf Fothergilla	#5 CONT.	3' O.C., MULCHED BED
IT	*Itea virginica 'Little Henry'* Littly Henry Itea	#3 CONT.	4' O.C., MULCHED BED
IV	*Ilex verticillata 'Red Sprite'* Red Sprite Winterberry	#5 CONT.	4' O.C., MULCHED BED
EVERGREEN SHRUBS			
JC	*Juniperus conferta 'Blue Pacific'* Blue Pacific Juniper	#2 CONT.	18" O.C., MULCHED BED
CD	*Cotoneaster dammeri 'Lowfast'* Lowfast Cotoneaster	#3 CONT.	18" O.C., MULCHED BED
NATIVE PERENNIALS/ GRASSES			
SH	*Sporobolus heterolepsis* Prairie Dropseed	PLUGS	18" O.C., MULCHED BED
RH	*Rudbeckia hirta* Black Eyed Susan	PLUGS	18" O.C., MULCHED BED
EP	*Echinacea purpurea* Purple Coneflower	PLUGS	18" O.C., MULCHED BED
JE	*Juncus effusus* Common Rush	PLUGS	18" O.C., MULCHED BED
EH	*Equisetum hyemale* Scouring Rush	PLUGS	18" O.C., MULCHED BED
CM	*Carex muskingumensis* Palm Sedge Grass	PLUGS, CLUSTER PER PLAN	18" O.C., MULCHED BED



SPACING SCHEDULE	
SPACING "X"	ROW "A"
8" O.C.	7"
12" O.C.	10 1/2"
18" O.C.	15 1/2"
24" O.C.	20 3/4"
30" O.C.	26"
36" O.C.	31"
42" O.C.	3'-0"
5' O.C.	4'-4"

2 PLANT SPACING
SCALE: NTS

GENERAL NOTES

1. BASE INFORMATION PROVIDED BY STRAND ASSOCIATES, 615 ELSINORE PLACE, SUITE 230, CINCINNATI, OH 45202. 513.861.5600

2. CONTRACTOR SHALL LOCATE ALL UTILITIES, STRUCTURES, PAVEMENT AND VEGETATION TO REMAIN, AND TAKE THE NECESSARY PRECAUTIONS FOR THEIR PROTECTION DURING CONSTRUCTION. UTILITIES SHOWN ON PLANS ARE APPROXIMATE AND ONLY UTILITIES ON RECORD. FIELD LOCATE ALL UTILITIES. CONTRACTOR IS RESPONSIBLE FOR ALL UTILITIES. ANY FIELD ADJUSTMENTS REQUIRED SHALL BE REVIEWED BY THE LANDSCAPE ARCHITECT PRIOR TO IMPLEMENTATION.

3. CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES, LAWS, ORDINANCES, RULES AND REGULATIONS DURING THE COURSE OF THIS PROJECT, INCLUDING BUT NOT LIMITED TO OSHA REQUIREMENTS FOR PUBLIC AND WORKER SAFETY. SITE SHOULD BE KEPT IN A SAFE MANNER THAT WOULD NOT JEOPARDIZE THE GENERAL PUBLIC SAFETY.

4. CONTRACTOR SHALL COORDINATE WITH THE WORK OF OTHER TRADES TO INSURE PROPER AND TIMELY EXECUTION OF THE WORK.

5. SEE CIVIL ENGINEER DRAWINGS FOR GRADING PLAN.

PLANTING NOTES

1. FINAL GRADING SHALL BE COMPLETED PRIOR TO PLANTING OR PLANTING LAYOUT. THIS SHOULD INCLUDE DRAINAGE PER THE GRADING PLAN AND TOPSOIL AS SPECIFIED.

2. ALL PLANT MATERIAL SHALL BE MAINTAINED IN A HEALTHY AND GROWING CONDITION, AND MUST BE REPLACED WITH PLANT MATERIAL OF SIMILAR VARIETY AND SIZE IF IT IS DEAD, DAMAGED, DESTROYED, OR REMOVED UP TO ONE YEAR AFTER INSTALLATION.

3. TREE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL STAKE OUT ALL TREE LOCATIONS IN FIELD FOR REVIEW BY THE LANDSCAPE ARCHITECT PRIOR TO EXCAVATION. LANDSCAPE ARCHITECT RESERVES THE RIGHT TO ADJUST PLANTS TO EXACT LOCATION IN FIELD.

4. ALL SHRUB & GROUNDCOVER BED LAYOUTS SHALL BE STAKED FOR REVIEW BY LANDSCAPE ARCHITECT PRIOR TO EXCAVATION. LANDSCAPE ARCHITECT RESERVES THE RIGHT TO ADJUST PLANTS TO EXACT LOCATION IN FIELD. DO NO DISTURB ROOTZONES OR EXISTING TREES FOR PLANTING BED PREPARATION.

5. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ADVISE THE LANDSCAPE ARCHITECT OF ANY CONDITION FOUND ON THE SITE WHICH PROHIBITS INSTALLATION AS SHOWN ON THESE DRAWINGS.

6. REFERENCE PLANTING DETAIL SHEETS & PLANT SCHEDULE.

7. LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR FINE GRADING, REMOVAL OF MISCELLANEOUS DEBRIS AND ANY ADDITIONAL FILL REQUIRED TO CREATE A SMOOTH CONDITION PRIOR TO PLANTING IN ALL PLANTING AREAS.

8. SEED ALL DISTURBED AREAS WITH LAWN MIX UNLESS OTHERWISE INDICATED.

9. LANDSCAPED AREAS SHALL BE KEPT FREE OF TRASH, LITTER, AND WEEDS AT ALL TIMES DURING CONSTRUCTION.

10. PLANT SPACING IS AS INDICATED ON 'PLANT SCHEDULE' UNLESS OTHERWISE NOTED. IT IS THE CONTRACTORS RESPONSIBILITY TO PROVIDE FULL COVERAGE IN ALL PLANTING AREAS AS SPECIFIED IN THE PLANT SCHEDULE REMARKS.

PLUG NOTES

1. PLUGS TO BE INSTALLED IN ALL AREAS AS INDICATED ON PLAN.

2. PLUGS SHALL HAVE A MINIMUM SIZE OF 2 INCH DIAMETER AND 3 INCH DEPTH. PLUGS SHALL BE THOROUGHLY ROOTED THROUGH THE CONTAINER. NO SPECIES SHALL BE SUBSTITUTED WITHOUT APPROVAL OF THE LANDSCAPE ARCHITECT.

3. REFER TO SHEET 6 FOR MULCH REQUIREMENTS.

4. USE AN AUGER OR OTHER APPROPRIATE TOOL TO EXCAVATE PLANTING HOLES ON 1 FOOT CENTERS IN A STAGGERED PATTERN

5. PLANT PLUGS LEVEL WITH EXISTING SOIL GRADE. BE CERTAIN THAT SOIL IS PLACED AROUND THE PLUGS AND FIRMED INTO PLACE. DO NOT FILL AROUND PLUGS WITH MULCH.

6. THOROUGHLY SOAK PLUGGED AREA WITH WATER UNTIL SOIL IS MOIST TO A DEPTH OF 4 INCHES.

BOULDER & STONE NOTES

1. BOULDERS SHOULD RANGE IN SIZE FROM 18" - 30" DIAMETER IN ANY DIRECTION.

2. CONTRACTOR TO PROVIDE SAMPLE OR SUBMIT PHOTOS TO THE LANDSCAPE ARCHITECT OF SAMPLE COLOR, SIZE AND CHARACTER. BOULDERS & STONES SHALL BE FREE OF MUD AND GRAVEL AT TIME OF PHOTO.

3. CHARACTER: BOULDERS SHALL BE GRANITE GLACIAL ERRATICS, ROUNDED IN FORM, WITH A SMOOTH SURFACE. LIMESTONE SLABS SHALL BE RECTANGULAR IN SHAPE, 3'-4' IN LENGTH, 6"-9" THICK. RIVERSTONE SHALL BE 'RAINBOW MIX', 4"-6" ROUNDED.

4. HANDLING: CONTRACTOR SHALL CAREFULLY TRANSPORT AND HANDLE BOULDERS TO AVOID MARRING, STRATCHING OR CHIPPING. DAMAGED BOULDERS WILL BE REJECTED AT THE JOB SITE.

5. PLACEMENT & ORIENTATION: CONTRACTOR TO STAKE BOULDERS ACCORDING TO DESIGN INTENT ON DRAWINGS. LANDSCAPE ARCHITECT TO REVIEW BOULDER PLACEMENT AND ORIENTATION OF INDIVIDUAL BOULDERS.

6. INSTALLATION: CONTRACTOR SHALL BURY THE BASE OF EACH BOULDER BETWEEN 4 TO 8" AS DIRECTED BY LANDSCAPE ARCHITECT.

PLANTING LEGEND

KEY	LANDSCAPE ITEM
	DECIDUOUS TREE
	SHRUBS
	PRAIRIE DROPSEED; SEE PLANT SCHEDULE
	PURPLE CONEFLOWER; SEE PLANT SCHEDULE
	BLACK-EYED SUSAN; SEE PLANT SCHEDULE
	COMMON RUSH; SEE PLANT SCHEDULE
	SCOURING RUSH; SEE PLANT SCHEDULE
X / XX	PLANT QUANTITY / PLANT KEY

NORTH
0' 5' 10' 20' 40'

STATE OF KENTUCKY GARY R. MOLNITZER REGISTERED LANDSCAPE ARCHITECT

DATE:	REVISIONS	NO.

DATE: JANUARY 2010
DES BY: JM CHK BY: DW
RECORD DRAWING
BY:
DATE:
CONTRACTOR:

PLANTING PLAN

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

HUMAN NATURE

STRAND ASSOCIATES, INC.® ENGINEERS

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JOB NO. 3522.001

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GENERAL NOTES

1. BASE INFORMATION PROVIDED BY STRAND ASSOCIATES, 615 ELSINORE PLACE, SUITE 230, CINCINNATI, OH 45202. 513.861.5600

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3. CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES, LAWS, ORDINANCES, RULES AND REGULATIONS DURING THE COURSE OF THIS PROJECT, INCLUDING BUT NOT LIMITED TO OSHA REQUIREMENTS FOR PUBLIC AND WORKER SAFETY. SITE SHOULD BE KEPT IN A SAFE MANNER THAT WOULD NOT JEOPARDIZE THE GENERAL PUBLIC SAFETY.

4. CONTRACTOR SHALL COORDINATE WITH THE WORK OF OTHER TRADES TO INSURE PROPER AND TIMELY EXECUTION OF THE WORK.

5. SEE CIVIL ENGINEER DRAWINGS FOR GRADING PLAN.

HARDSCAPE NOTES

1. EXPANSION JOINTS AS SHOWN ON PLAN. CONTROL JOINTS AS SHOWN ON PLAN, ¼ DEPTH OF SLAB THICKNESS.

2. STEPPING STONES TO BE LIMESTONE FIELD STONE SLABS, 18"-24" DIA., 3"-4" THICKNESS.

3. PERMEABLE PAVERS TO MEET THE FOLLOWING SPECIFICATIONS, OR APPROVED EQUAL:
   - NAME: HydraStone™
   - MANUFACTURER: READING ROCK
   - COLOR: OTTOWA CREEK II
   - SIZE: 9.65" x 4.72" x 3.125"

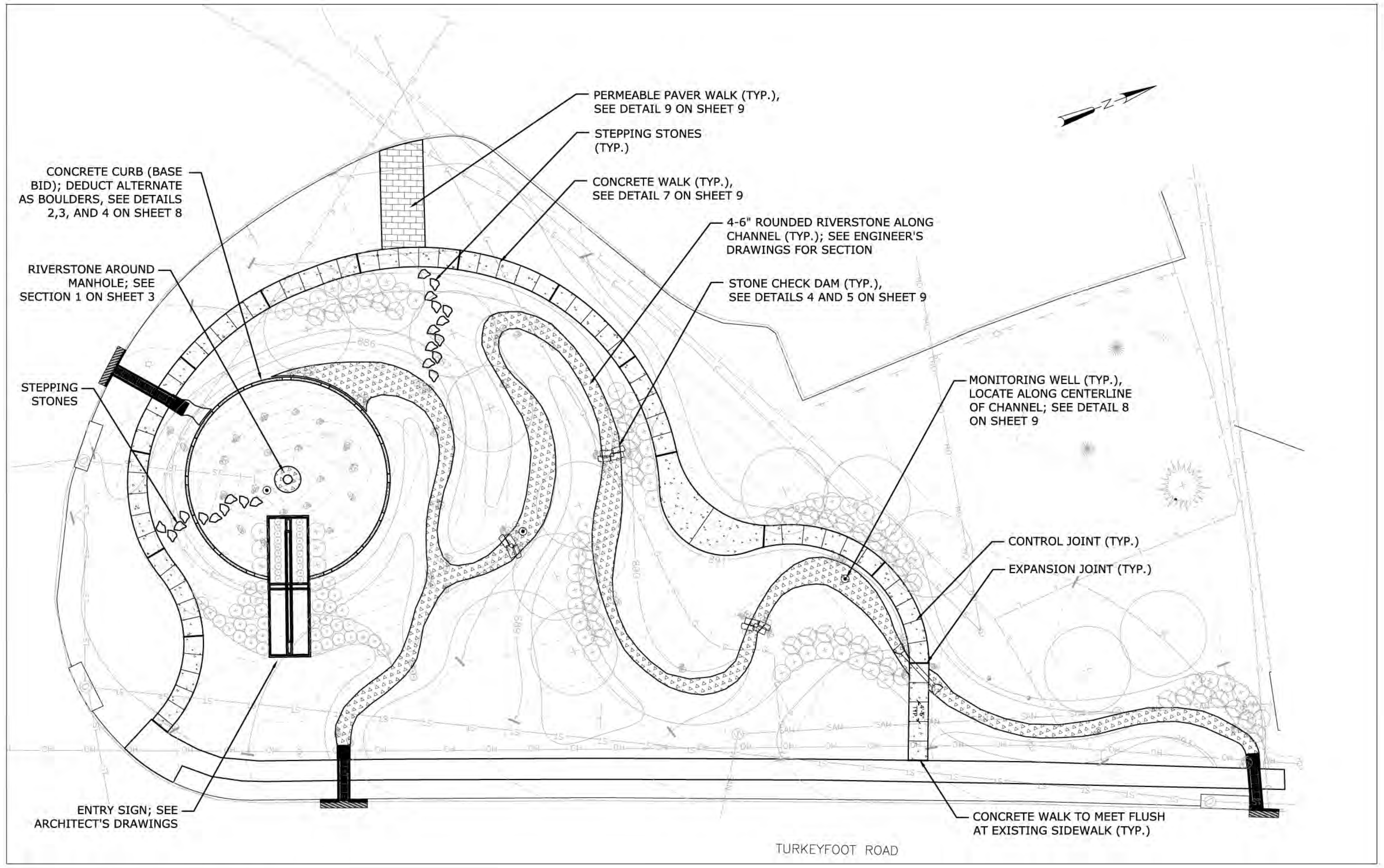
4. PERMEABLE PAVERS TO BE LAID IN RUNNING BOND PATTERN AS SHOWN ON PLAN WITH SOLDIER COURSE PERIMETER.

BID ALTERNATES

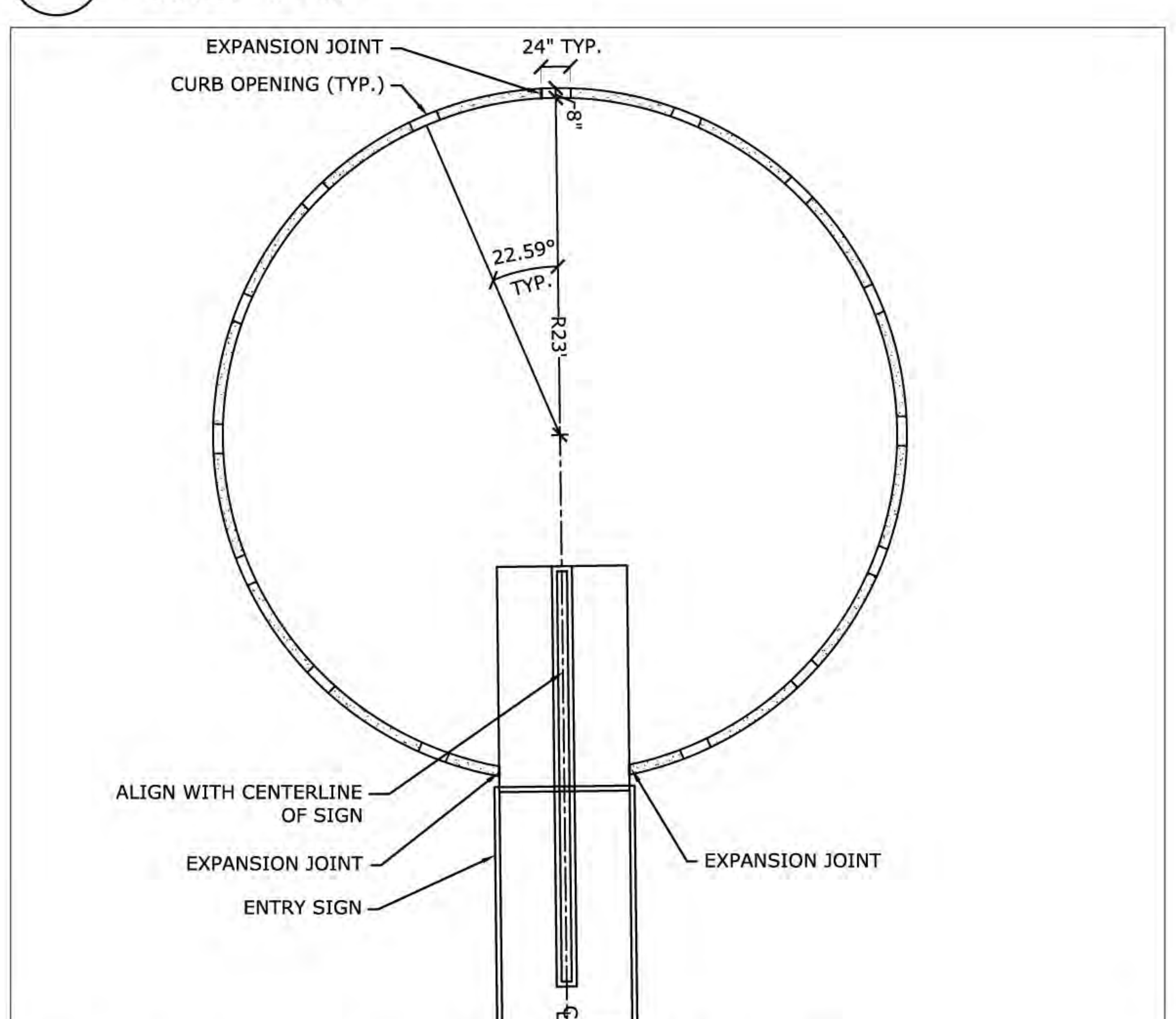
1. **DEDUCT ALTERNATE** - UTILIZE BOULDERS IN PLACE OF CONCRETE CURB AROUND RAIN GARDEN BASIN. DISTRIBUTE APPROXIMATELY 32 BOULDERS EQUALLY SPACED AROUND PERIMETER OF RAIN GARDEN, IN THE SAME LOCATION OF THE CONCRETE CURB. REFER TO SHEET 7 FOR ADDITIONAL BOULDER NOTES.

2. **DEDUCT ALTERNATE** - STANDARD CONCRETE WALK IN PLACE OF PERMEABLE PAVERS AT ENTRY WALK. REFER TO SHEET 9 FOR CONCRETE WALK DETAIL.

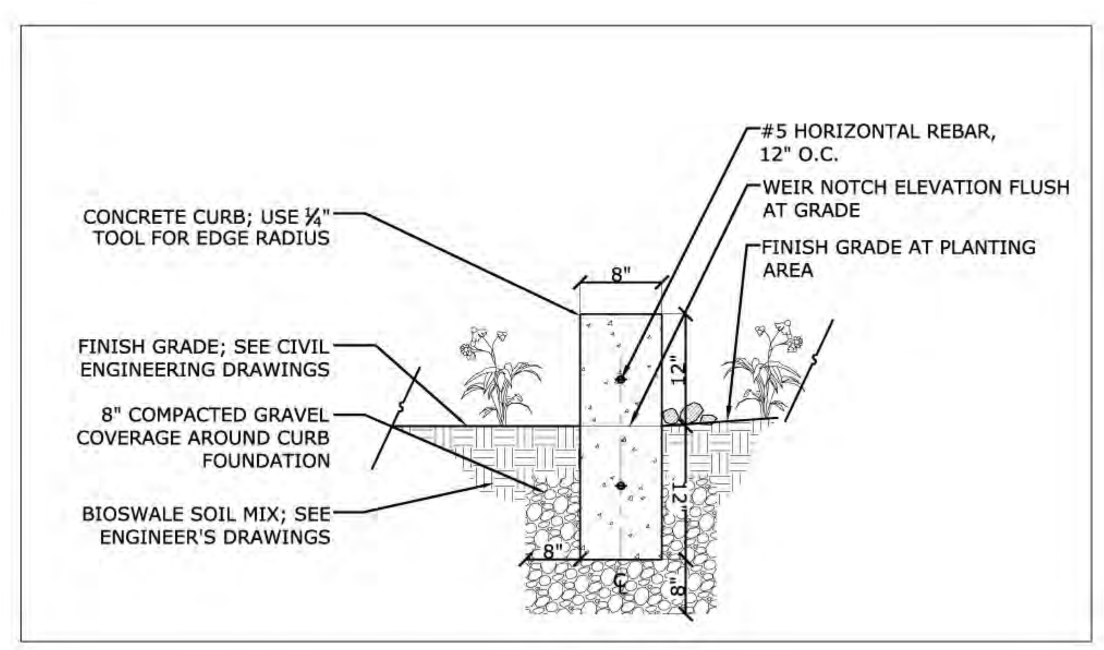
3. **DEDUCT ALTERNATE** - LIMESTONE CHIP WALKS IN PLACE OF CONCRETE WALKS THROUGHOUT SITE. APPLY 3" COMPACTED LIMESTONE CHIPS WITH FINES OVER 4" GRAVEL SUBBASE.



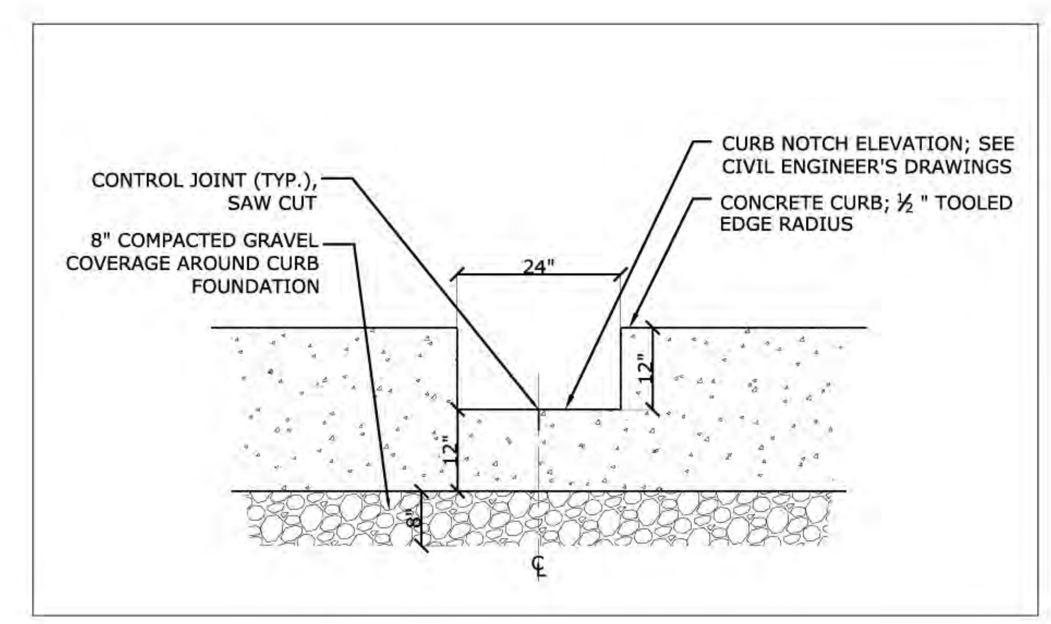
1 MATERIALS PLAN
SCALE: 1"=20'



2 CONCRETE CURB AT RAIN GARDEN
PLAN ENLARGEMENT
SCALE: 1"=10'



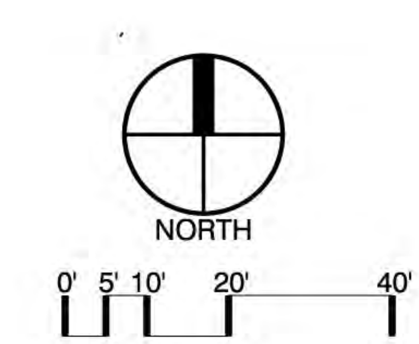
3 CONCRETE CURB AT RAIN GARDEN
SECTION
SCALE: 1/2" = 1'-0"



4 CONCRETE CURB OPENING
SCALE: 1/2" = 1'-0"

MATERIALS LEGEND

KEY	LANDSCAPE ITEM
	CONCRETE WALK
	RIVERSTONE
	STONE SLABS AT CHECK DAMS
	STEPPING STONE



DATE: | REVISIONS | NO.

DATE: JANUARY 2010
DES BY: JM CHK BY: DW
RECORD DRAWING
BY:
DATE:
CONTRACTOR:

MATERIALS PLAN

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

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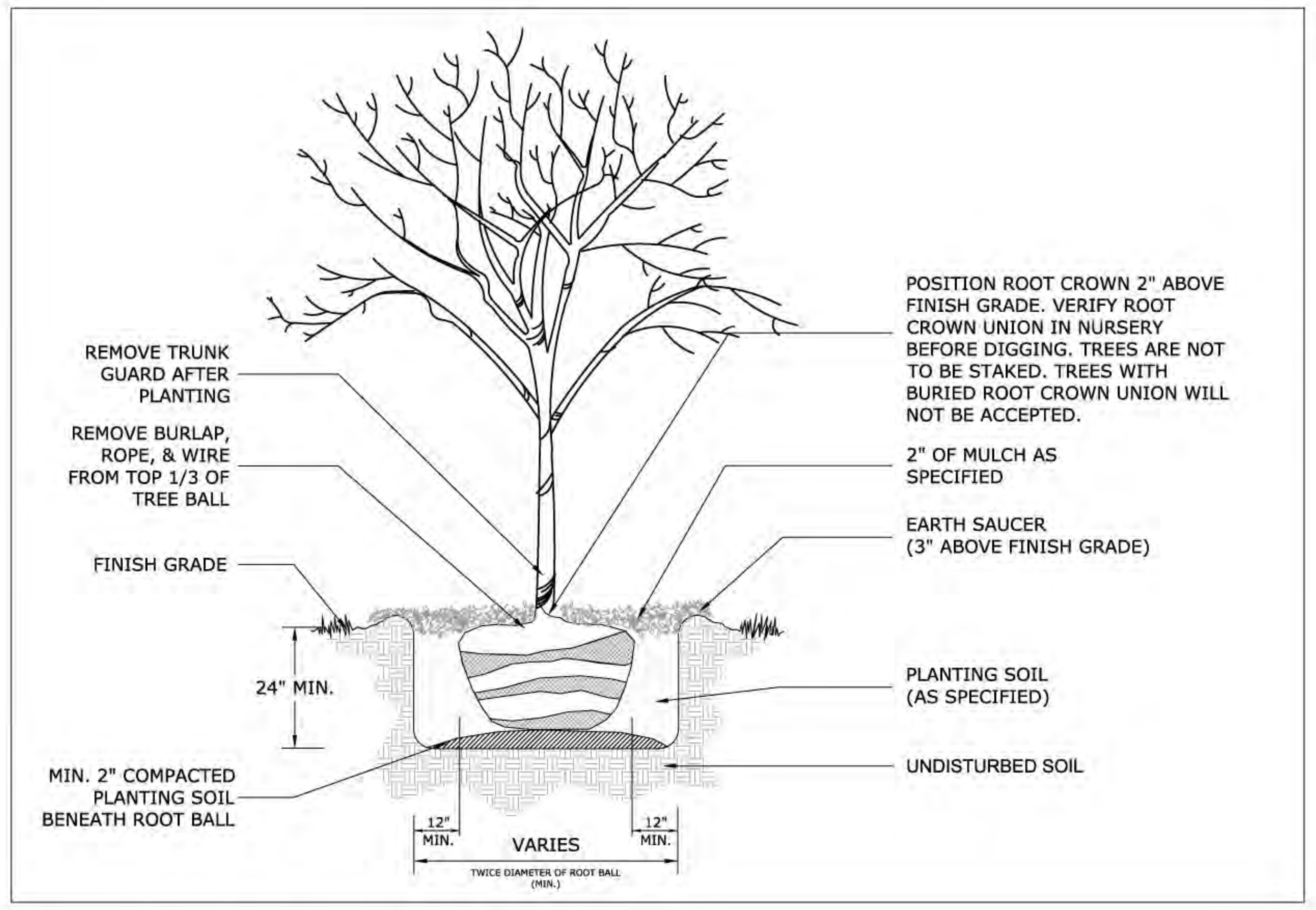
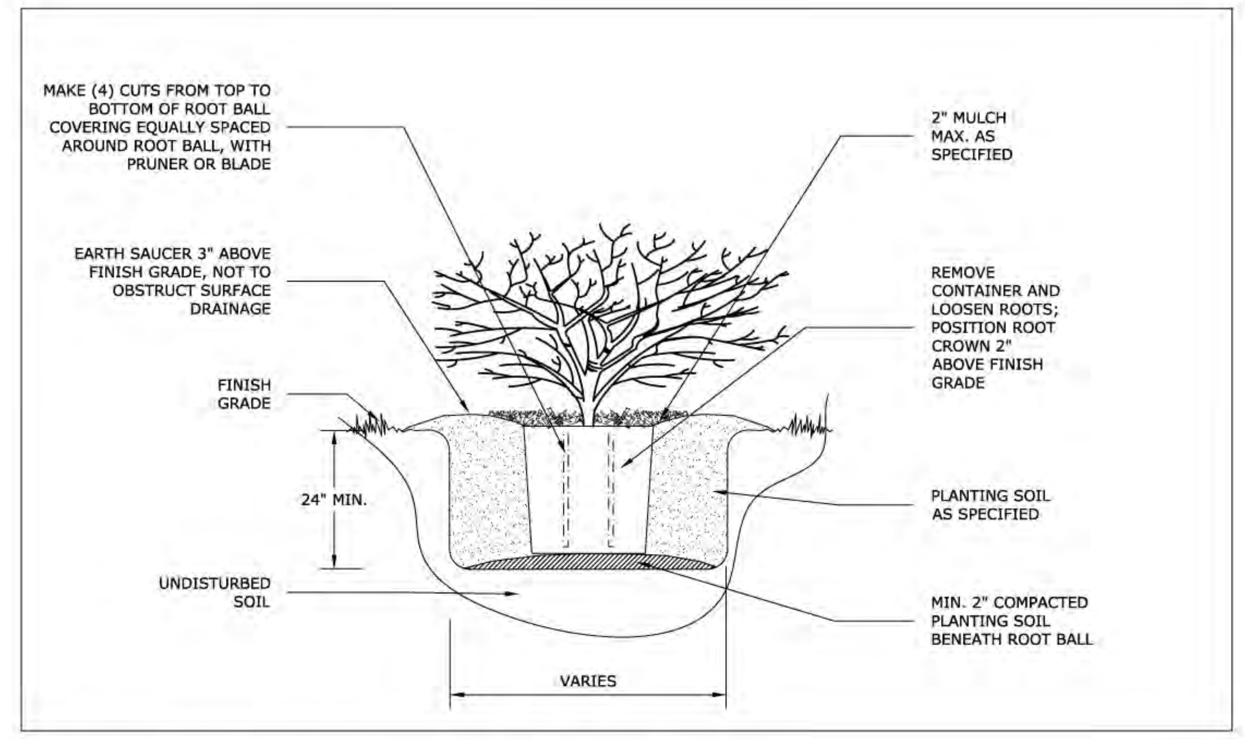
JOB NO. 3522.001

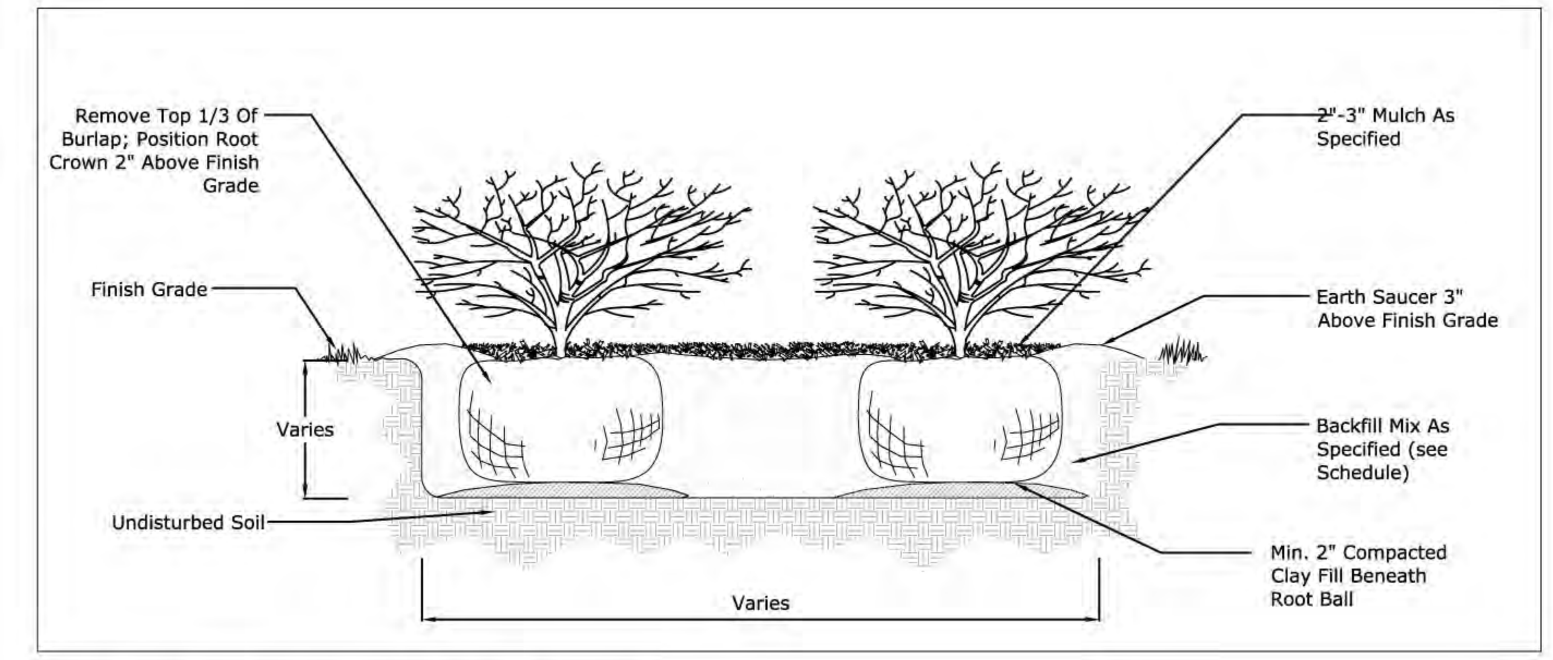
File: X:\20820.1 (Kenton Co. Green Campus KDOW Project)\acad_drawings\CD\20820.1-KDOW-(8)-Materials-Plan.dwg Time: Feb 04, 2010 - 2:33pm



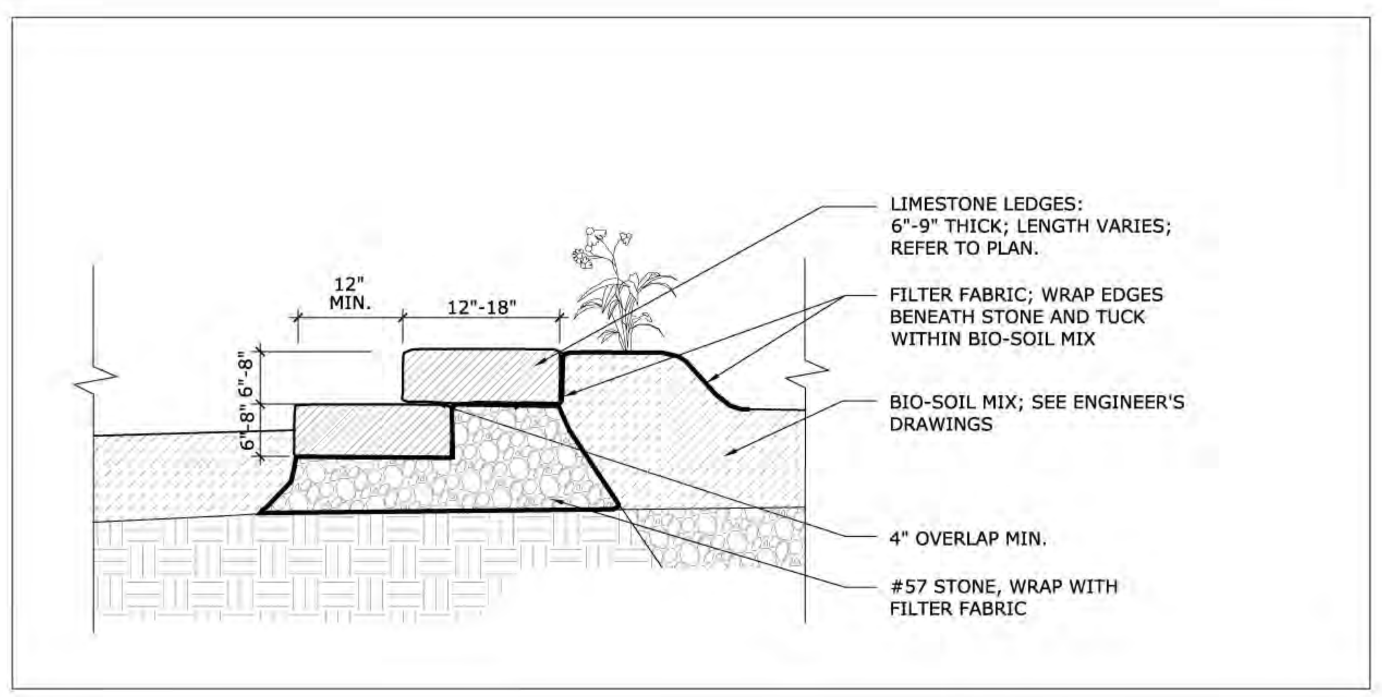
1 TREE PLANTING
SCALE: 1/2"=1'-0"



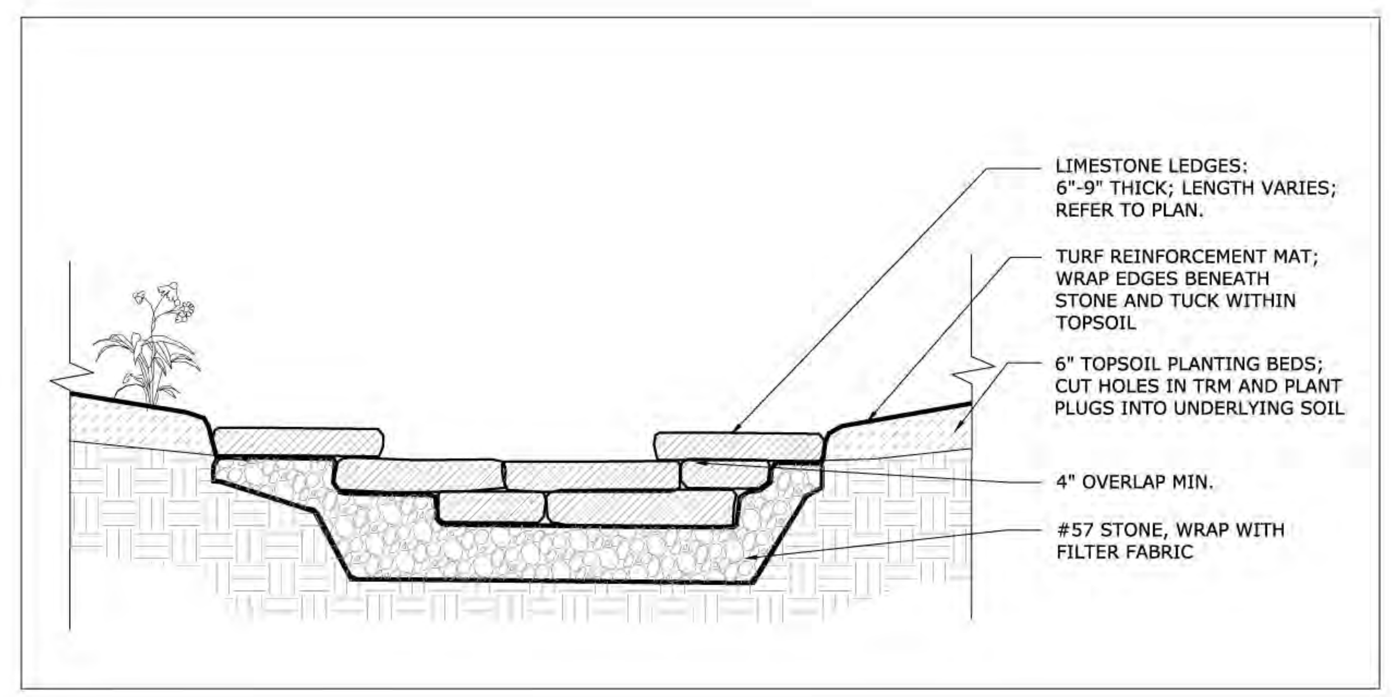
2 CONTAINER SHRUB PLANTING
SCALE: 1/2"=1'-0"



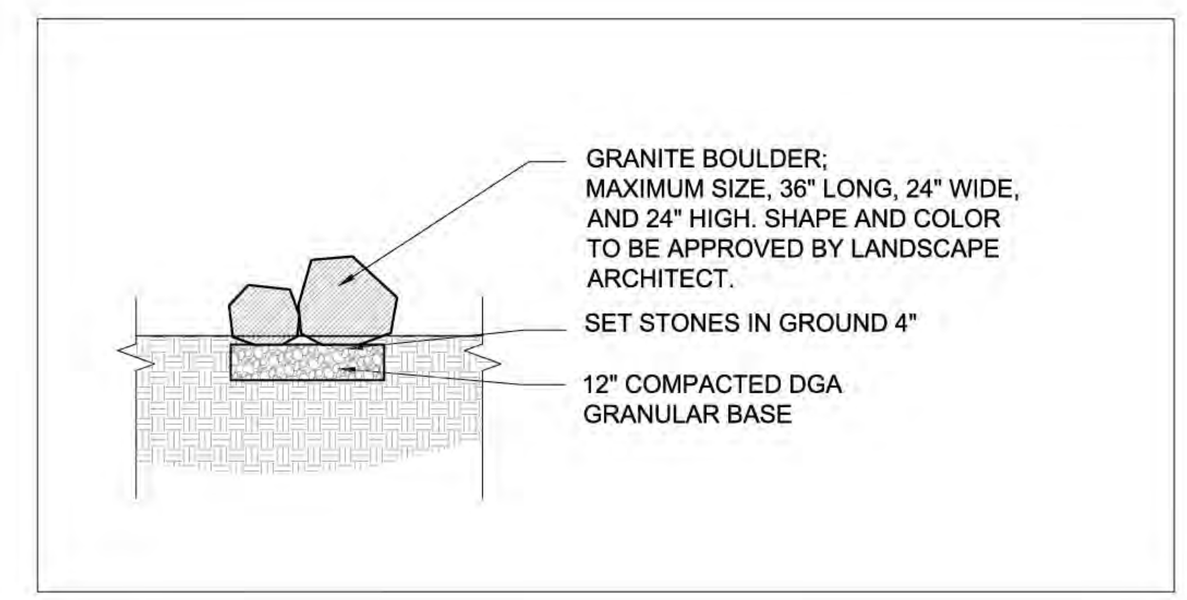
3 B&B SHRUB PLANTING
SCALE: 1/2"=1'-0"



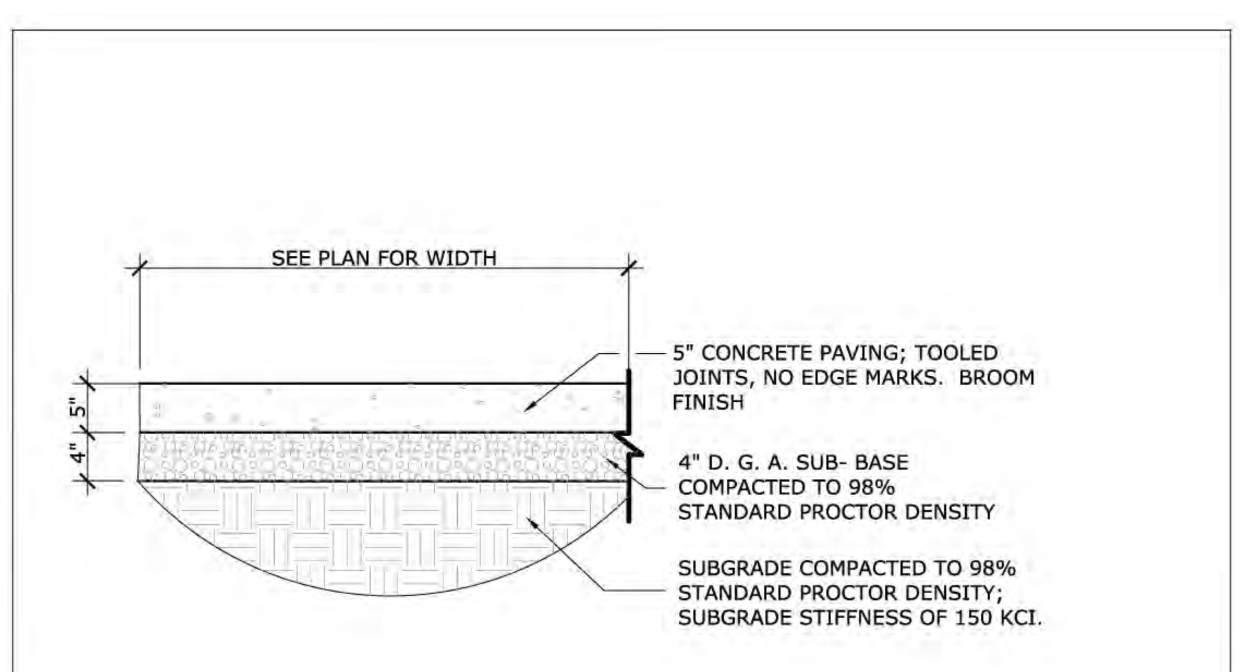
4 STONE CHECK DAM
SCALE: NTS



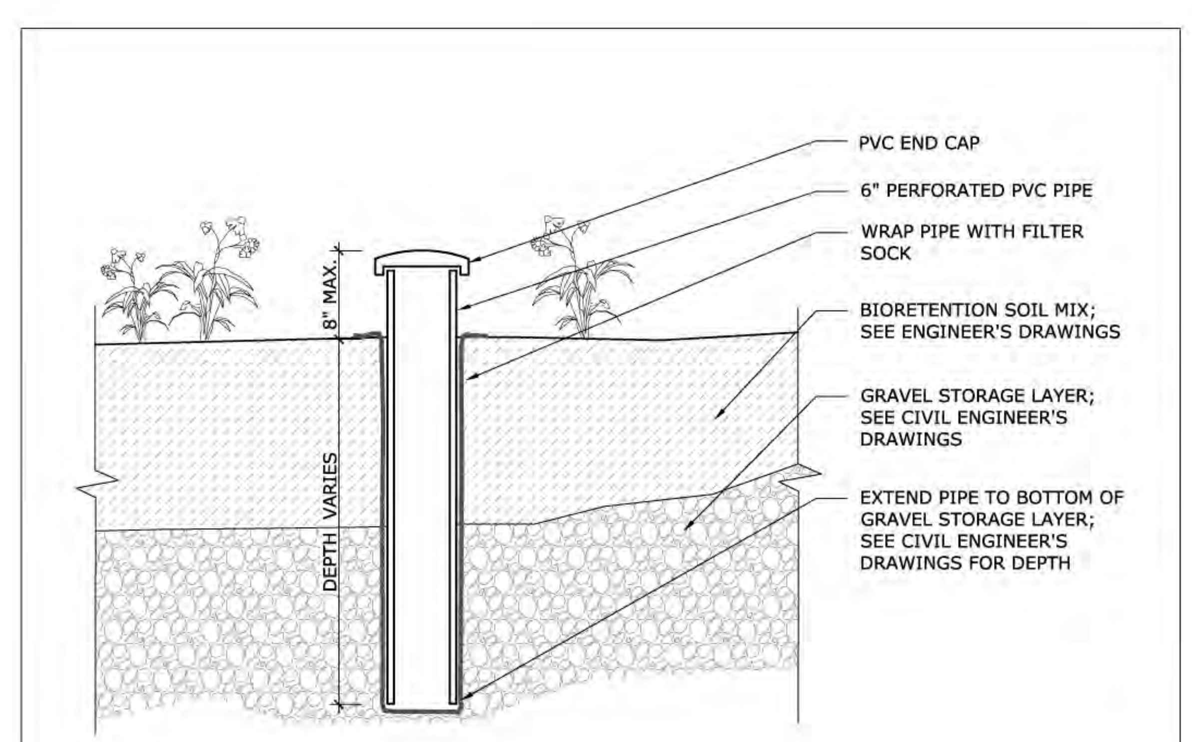
5 STONE CHECK DAM
SECTION-ELEVATION
SCALE: NTS



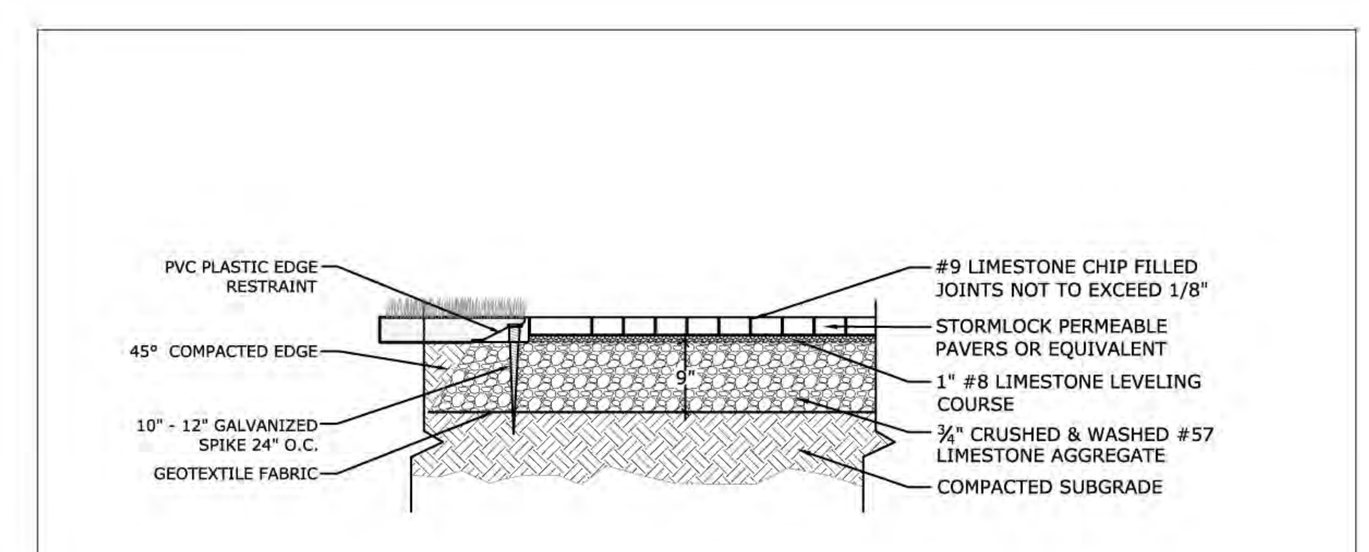
6 BOULDERS
SCALE: NTS



7 CONCRETE WALK
SCALE: NTS



8 MONITORING WELL AT RAIN GARDEN
SCALE: NTS



9 PERMEABLE PAVERS
SCALE: NTS

STATE OF KENTUCKY
GARY R. MOENTZEN
REGISTERED LANDSCAPE ARCHITECT

DATE:
REVISIONS
NO.

DATE: JANUARY 2010
DES BY: JM CHK BY: DW
RECORD DRAWING
BY:
DATE:
CONTRACTOR:

PLANTING DETAILS

GREEN CAMPUS MASTERPLAN RAIN GARDEN ENTRY FEATURE
KENTON COUNTY SCHOOL DISTRICT
EDGEWOOD, KENTUCKY

HUMAN NATURE

STRAND ASSOCIATES, INC.®
ENGINEERS

9

JOB NO. 3522.001

APPENDIX I
CONSTRUCTION PHOTOS

3-31-10: Manhole Installation

3-31-10: Storage Bowl Excavated

4-6-10: Gravel Storage Over Filter Fabric

4-6-10 Excavation of Swales Begins

4-6-10 Excavation of Swales

4-6-10 Excavation of Micropools Begins

4-13-10 Excavation of swale from curb cut

4-13-10 Culvet to convey water under walking path


4-13-10 Monitoring Well in Micropool, leading into gravel/rock swale


4-13-10 Engineered soil mix of compost sand and clean topsoil

4-13-10 View of raingarden from Caywood entry drive

4-13-10 Micropools and channels under construction

4-13-10 View swale entering gravel chamber

4-13-10 Gravel wrapped in filter fabric with surface course of river stone


4-13-10 View of construction looking East from Parking lot


4-13-10 View of swale before curb cuts complete

4-15-10 Swale from Turkeyfoot Road with filter fabric

4-15-10 Stone Check Dam installed at end of micropool section

4-15-10 Topsoil is tilled into perimeter areas to allow for plant growth

4-22-10 Raingarden view from Caywood entry drive

4-22-10 Stone check dam at end of micropool, beginning of graven channel

4-22-10 Shrubs and Trees Beginning to Be Installed

APPENDIX J
DESIGN CALCULATIONS

Summary for Pond 4P: Raingarden

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 1.29" for 2 year event
Inflow = 4.01 cfs @ 11.96 hrs, Volume= 0.290 af
Outflow = 3.38 cfs @ 12.04 hrs, Volume= 0.272 af, Atten= 16%, Lag= 5.1 min
Primary = 3.38 cfs @ 12.04 hrs, Volume= 0.272 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 884.13' @ 12.04 hrs Surf.Area= 0.034 ac Storage= 0.048 af

Plug-Flow detention time= 65.3 min calculated for 0.272 af (94% of inflow)
Center-of-Mass det. time= 31.2 min (850.3 - 819.1)

Volume	Invert	Avail.Storage	Storage Description
#1	876.44'	0.058 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) 0.167 af Overall x 35.0% Voids
#2	886.00'	0.034 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.093 af	Total Available Storage

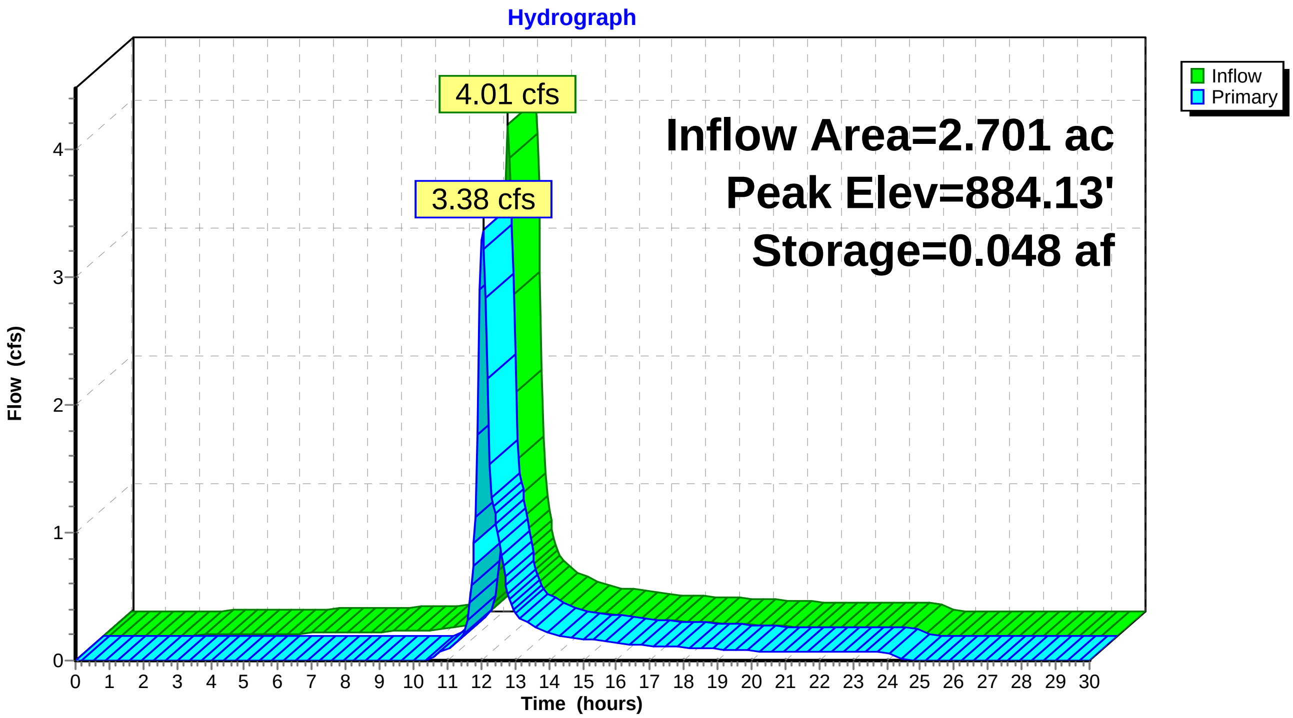
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
876.44	0.000	0.000	0.000
876.45	0.004	0.000	0.000
877.00	0.005	0.002	0.002
878.00	0.009	0.007	0.009
879.00	0.011	0.010	0.019
880.00	0.015	0.013	0.032
881.00	0.020	0.017	0.050
882.00	0.025	0.022	0.072
883.00	0.031	0.028	0.100
884.00	0.034	0.032	0.133
885.00	0.034	0.034	0.167

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
886.00	0.062	0.000	0.000
886.50	0.076	0.034	0.034

Device	Routing	Invert	Outlet Devices
#1	Primary	876.44'	**24.0" x 147.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 869.30' S= 0.0486 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	881.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	883.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	885.50'	**16.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=3.37 cfs @ 12.04 hrs HW=884.12' (Free Discharge)
└─**1=Culvert** (Passes 3.37 cfs of 31.38 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.60 cfs @ 8.16 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.76 cfs @ 4.49 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P: Raingarden



Summary for Pond 4P: Raingarden

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 0.42" for 3 month event
Inflow = 1.24 cfs @ 11.92 hrs, Volume= 0.095 af
Outflow = 0.85 cfs @ 12.01 hrs, Volume= 0.078 af, Atten= 31%, Lag= 5.0 min
Primary = 0.85 cfs @ 12.01 hrs, Volume= 0.078 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 882.06' @ 12.01 hrs Surf.Area= 0.025 ac Storage= 0.026 af

Plug-Flow detention time= 146.9 min calculated for 0.078 af (82% of inflow)
Center-of-Mass det. time= 60.5 min (887.7 - 827.1)

Volume	Invert	Avail.Storage	Storage Description
#1	876.44'	0.058 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) 0.167 af Overall x 35.0% Voids
#2	886.00'	0.034 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.093 af	Total Available Storage

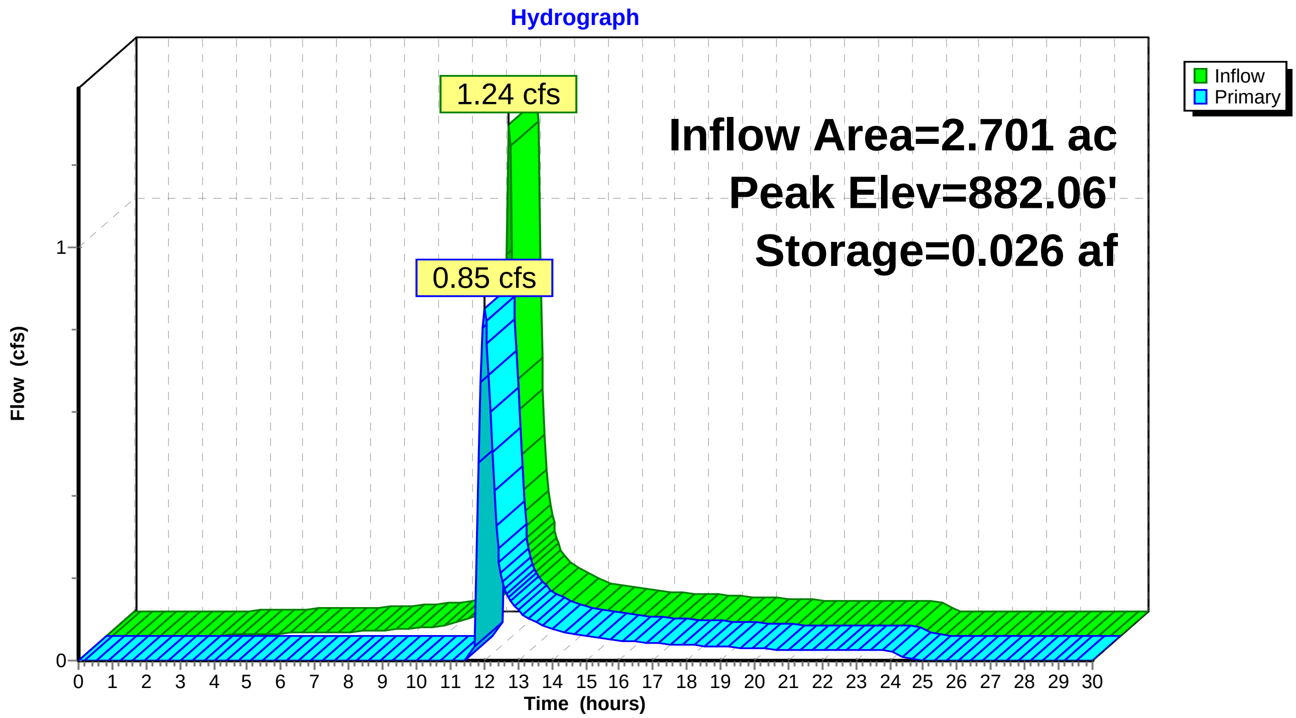
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
876.44	0.000	0.000	0.000
876.45	0.004	0.000	0.000
877.00	0.005	0.002	0.002
878.00	0.009	0.007	0.009
879.00	0.011	0.010	0.019
880.00	0.015	0.013	0.032
881.00	0.020	0.017	0.050
882.00	0.025	0.022	0.072
883.00	0.031	0.028	0.100
884.00	0.034	0.032	0.133
885.00	0.034	0.034	0.167

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
886.00	0.062	0.000	0.000
886.50	0.076	0.034	0.034

Device	Routing	Invert	Outlet Devices
#1	Primary	876.44'	**24.0" x 147.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 869.30' S= 0.0486 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	881.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	883.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	885.50'	**16.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=0.85 cfs @ 12.01 hrs HW=882.06' (Free Discharge)
└─**1=Culvert** (Passes 0.85 cfs of 28.74 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.85 cfs @ 4.33 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P: Raingarden



Summary for Pond 4P: Raingarden

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 0.65" for 6 month event
Inflow = 1.91 cfs @ 11.94 hrs, Volume= 0.147 af
Outflow = 1.21 cfs @ 12.07 hrs, Volume= 0.130 af, Atten= 37%, Lag= 8.0 min
Primary = 1.21 cfs @ 12.07 hrs, Volume= 0.130 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 882.89' @ 12.07 hrs Surf.Area= 0.030 ac Storage= 0.034 af

Plug-Flow detention time= 106.5 min calculated for 0.129 af (88% of inflow)
Center-of-Mass det. time= 45.8 min (871.4 - 825.6)

Volume	Invert	Avail.Storage	Storage Description
#1	876.44'	0.058 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) 0.167 af Overall x 35.0% Voids
#2	886.00'	0.034 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.093 af	Total Available Storage

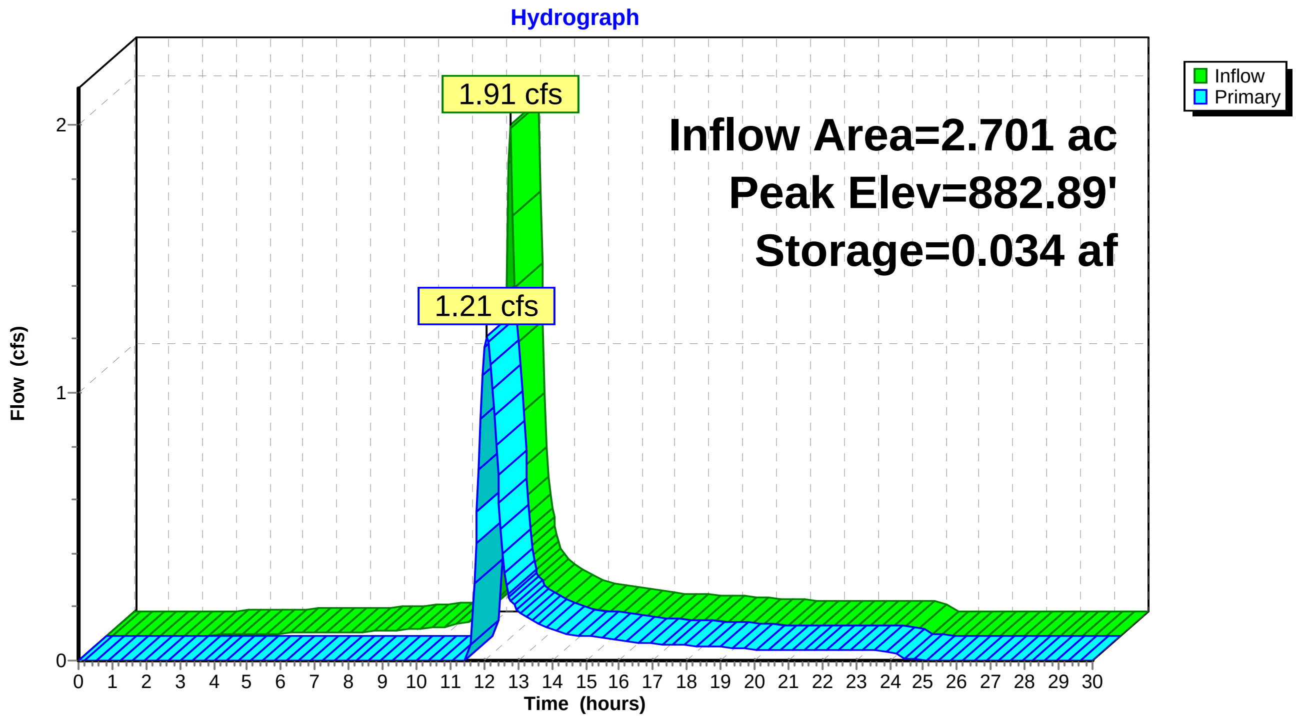
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
876.44	0.000	0.000	0.000
876.45	0.004	0.000	0.000
877.00	0.005	0.002	0.002
878.00	0.009	0.007	0.009
879.00	0.011	0.010	0.019
880.00	0.015	0.013	0.032
881.00	0.020	0.017	0.050
882.00	0.025	0.022	0.072
883.00	0.031	0.028	0.100
884.00	0.034	0.032	0.133
885.00	0.034	0.034	0.167

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
886.00	0.062	0.000	0.000
886.50	0.076	0.034	0.034

Device	Routing	Invert	Outlet Devices
#1	Primary	876.44'	**24.0" x 147.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 869.30' S= 0.0486 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	881.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	883.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	885.50'	**16.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=1.21 cfs @ 12.07 hrs HW=882.88' (Free Discharge)
└─**1=Culvert** (Passes 1.21 cfs of 29.82 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.21 cfs @ 6.14 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P: Raingarden



Summary for Pond 4P: Raingarden

[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 2.28" for 10 year event
Inflow = 7.39 cfs @ 11.97 hrs, Volume= 0.514 af
Outflow = 7.60 cfs @ 11.99 hrs, Volume= 0.497 af, Atten= 0%, Lag= 1.2 min
Primary = 7.60 cfs @ 11.99 hrs, Volume= 0.497 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 885.83' @ 11.99 hrs Surf.Area= 0.034 ac Storage= 0.058 af

Plug-Flow detention time= 42.9 min calculated for 0.497 af (97% of inflow)
Center-of-Mass det. time= 22.6 min (833.7 - 811.1)

Volume	Invert	Avail.Storage	Storage Description
#1	876.44'	0.058 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) 0.167 af Overall x 35.0% Voids
#2	886.00'	0.034 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.093 af	Total Available Storage

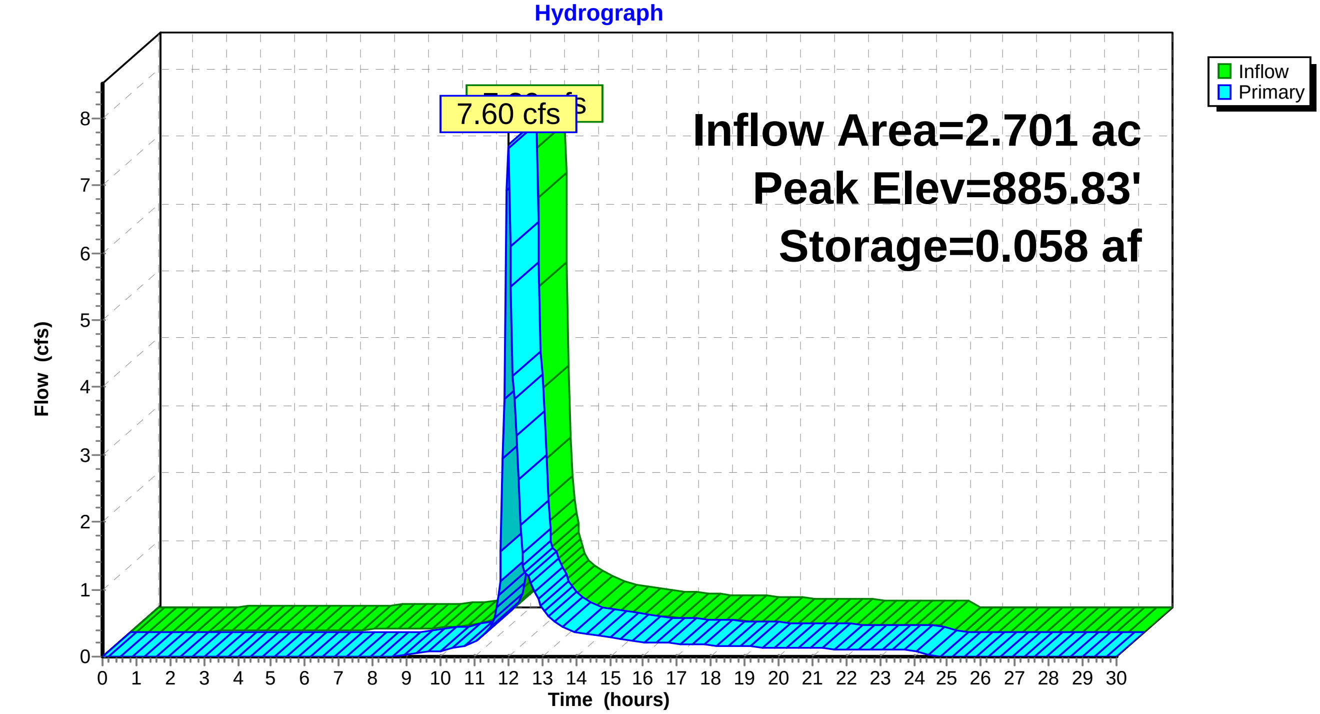
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
876.44	0.000	0.000	0.000
876.45	0.004	0.000	0.000
877.00	0.005	0.002	0.002
878.00	0.009	0.007	0.009
879.00	0.011	0.010	0.019
880.00	0.015	0.013	0.032
881.00	0.020	0.017	0.050
882.00	0.025	0.022	0.072
883.00	0.031	0.028	0.100
884.00	0.034	0.032	0.133
885.00	0.034	0.034	0.167

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
886.00	0.062	0.000	0.000
886.50	0.076	0.034	0.034

Device	Routing	Invert	Outlet Devices
#1	Primary	876.44'	**24.0" x 147.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 869.30' S= 0.0486 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	881.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	883.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	885.50'	**16.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=7.43 cfs @ 11.99 hrs HW=885.81' (Free Discharge)
└**1=Culvert** (Passes 7.43 cfs of 33.39 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.02 cfs @ 10.28 fps)
  ├**3=Orifice/Grate** (Orifice Controls 3.03 cfs @ 7.71 fps)
  └**4=Orifice/Grate** (Weir Controls 2.39 cfs @ 1.83 fps)

Pond 4P: Raingarden



Summary for Pond 4P: Raingarden

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 3.47" for 50 year event
Inflow = 11.39 cfs @ 11.98 hrs, Volume= 0.782 af
Outflow = 10.62 cfs @ 12.03 hrs, Volume= 0.764 af, Atten= 7%, Lag= 3.2 min
Primary = 10.62 cfs @ 12.03 hrs, Volume= 0.764 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 886.13' @ 12.03 hrs Surf.Area= 0.100 ac Storage= 0.067 af

Plug-Flow detention time= 31.1 min calculated for 0.763 af (98% of inflow)
Center-of-Mass det. time= 17.7 min (821.7 - 804.0)

Volume	Invert	Avail.Storage	Storage Description
#1	876.44'	0.058 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) 0.167 af Overall x 35.0% Voids
#2	886.00'	0.034 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.093 af	Total Available Storage

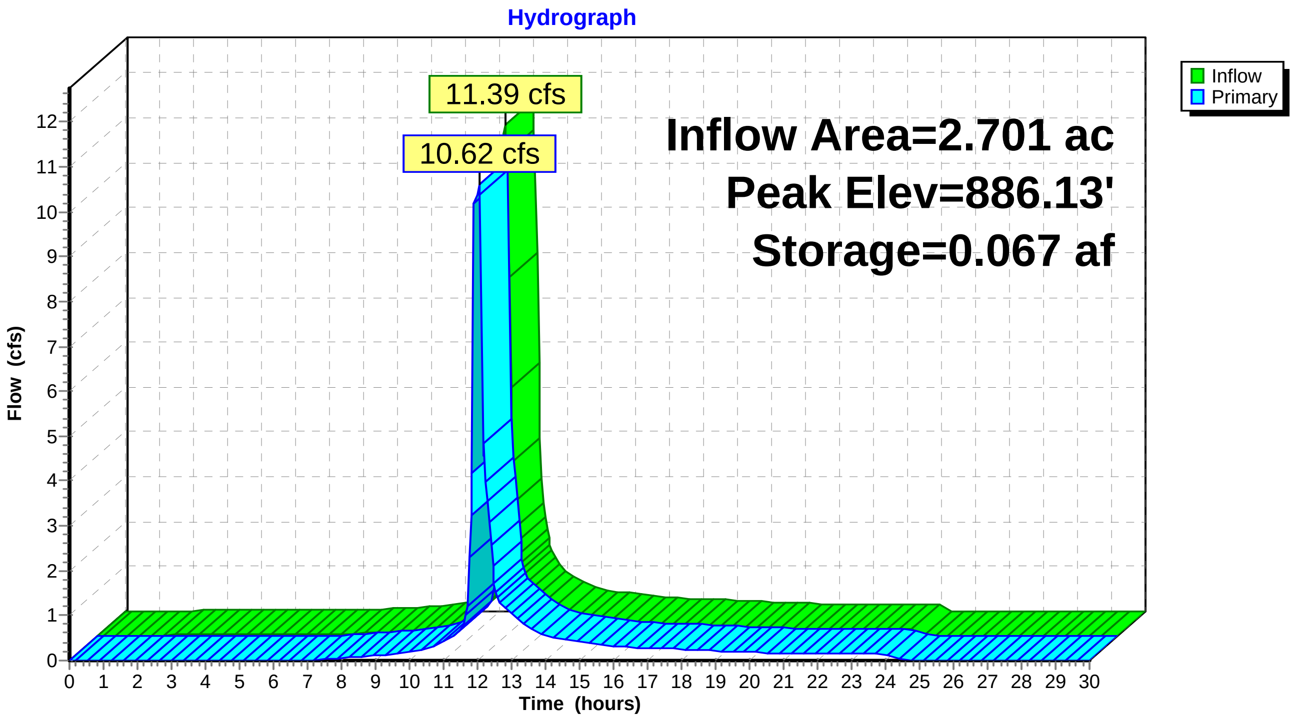
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
876.44	0.000	0.000	0.000
876.45	0.004	0.000	0.000
877.00	0.005	0.002	0.002
878.00	0.009	0.007	0.009
879.00	0.011	0.010	0.019
880.00	0.015	0.013	0.032
881.00	0.020	0.017	0.050
882.00	0.025	0.022	0.072
883.00	0.031	0.028	0.100
884.00	0.034	0.032	0.133
885.00	0.034	0.034	0.167

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
886.00	0.062	0.000	0.000
886.50	0.076	0.034	0.034

Device	Routing	Invert	Outlet Devices
#1	Primary	876.44'	**24.0" x 147.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 869.30' S= 0.0486 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	881.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	883.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	885.50'	**16.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=10.56 cfs @ 12.03 hrs HW=886.12' (Free Discharge)
└─**1=Culvert** (Passes 10.56 cfs of 33.73 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.09 cfs @ 10.62 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 3.20 cfs @ 8.15 fps)
  └─**4=Orifice/Grate** (Orifice Controls 5.27 cfs @ 3.78 fps)

Pond 4P: Raingarden



Summary for Pond 4P: Raingarden

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 4.05" for 100 year event
Inflow = 13.36 cfs @ 11.98 hrs, Volume= 0.911 af
Outflow = 11.67 cfs @ 12.05 hrs, Volume= 0.894 af, Atten= 13%, Lag= 4.4 min
Primary = 11.67 cfs @ 12.05 hrs, Volume= 0.894 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Peak Elev= 886.35' @ 12.05 hrs Surf.Area= 0.106 ac Storage= 0.082 af

Plug-Flow detention time= 28.3 min calculated for 0.894 af (98% of inflow)
Center-of-Mass det. time= 16.3 min (817.6 - 801.2)

Volume	Invert	Avail.Storage	Storage Description
#1	876.44'	0.058 af	**Custom Stage Data (Prismatic)** Listed below (Recalc) 0.167 af Overall x 35.0% Voids
#2	886.00'	0.034 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.093 af	Total Available Storage

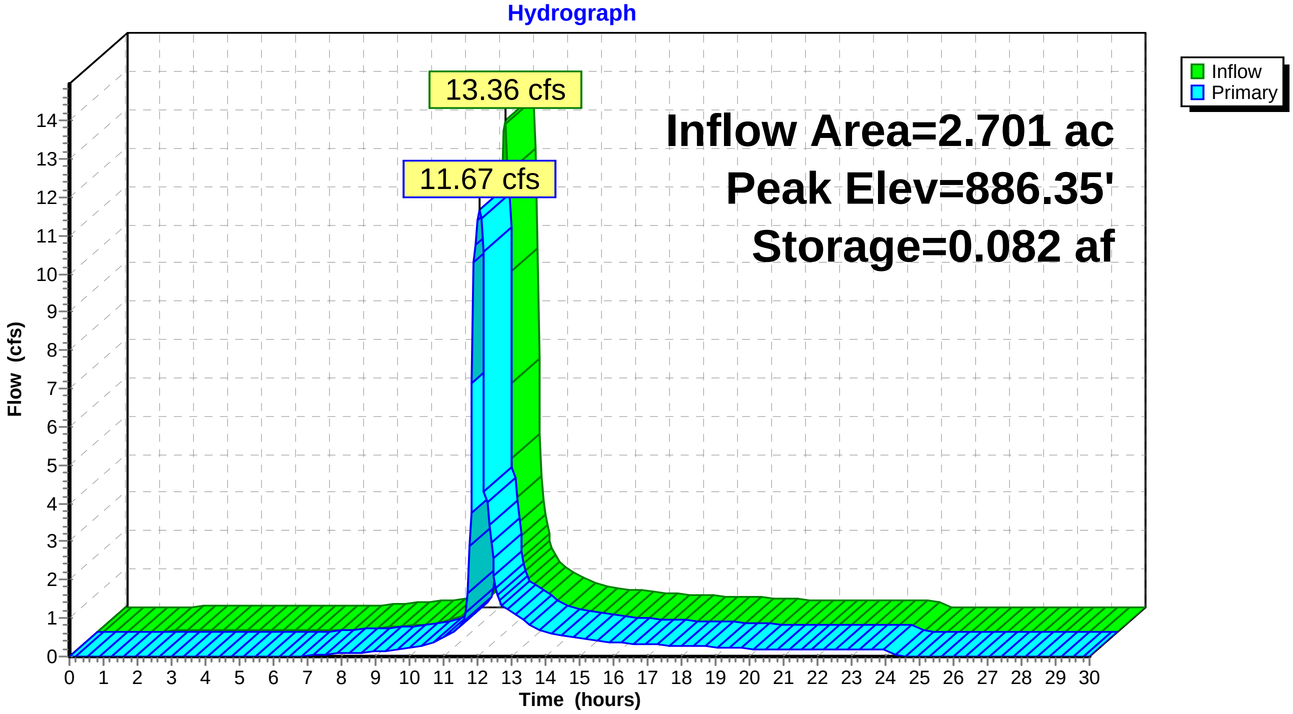
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
876.44	0.000	0.000	0.000
876.45	0.004	0.000	0.000
877.00	0.005	0.002	0.002
878.00	0.009	0.007	0.009
879.00	0.011	0.010	0.019
880.00	0.015	0.013	0.032
881.00	0.020	0.017	0.050
882.00	0.025	0.022	0.072
883.00	0.031	0.028	0.100
884.00	0.034	0.032	0.133
885.00	0.034	0.034	0.167

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
886.00	0.062	0.000	0.000
886.50	0.076	0.034	0.034

Device	Routing	Invert	Outlet Devices
#1	Primary	876.44'	**24.0" x 147.0' long Culvert** CMP, end-section conforming to fill, Ke= 0.500 Outlet Invert= 869.30' S= 0.0486 '/' Cc= 0.900 n= 0.025 Corrugated metal
#2	Device 1	881.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	883.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	885.50'	**16.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=11.65 cfs @ 12.05 hrs HW=886.35' (Free Discharge)
└─**1=Culvert** (Passes 11.65 cfs of 34.00 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.13 cfs @ 10.87 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 3.33 cfs @ 8.47 fps)
  └─**4=Orifice/Grate** (Orifice Controls 6.19 cfs @ 4.43 fps)

Pond 4P: Raingarden



Summary for Reach 18R: pipe under entry

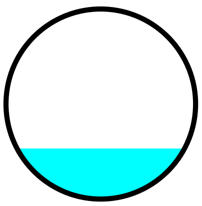
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

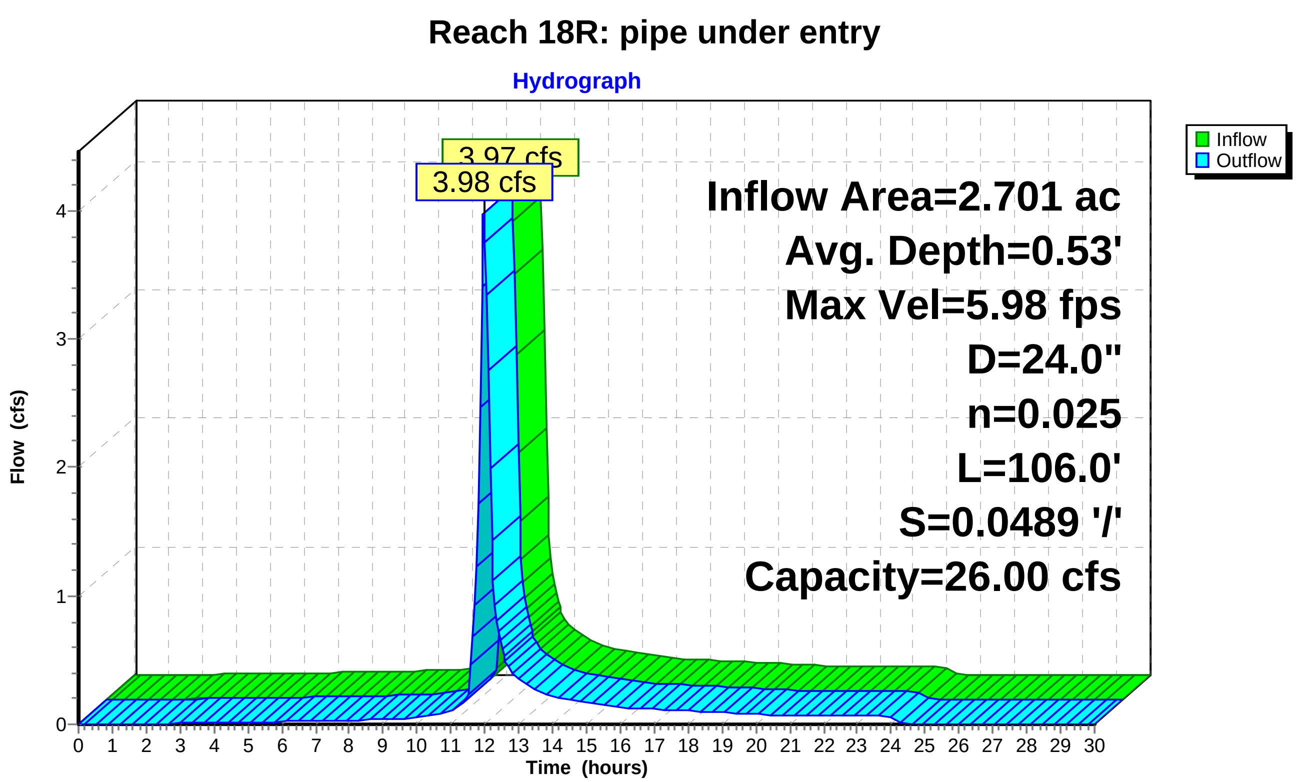
Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 1.29" for 2 year event
Inflow = 3.97 cfs @ 11.96 hrs, Volume= 0.290 af
Outflow = 3.98 cfs @ 11.96 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 5.98 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 1.0 min

Peak Storage= 70 cf @ 11.96 hrs, Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 26.00 cfs

24.0" Diameter Pipe, n= 0.025 Corrugated metal
Length= 106.0' Slope= 0.0489 '/'
Inlet Invert= 874.48', Outlet Invert= 869.30'





Summary for Reach 18R: pipe under entry

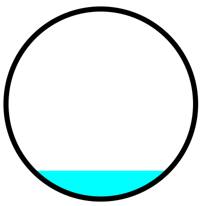
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 0.42" for 3 month event
Inflow = 1.23 cfs @ 11.92 hrs, Volume= 0.095 af
Outflow = 1.24 cfs @ 11.93 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.5 min

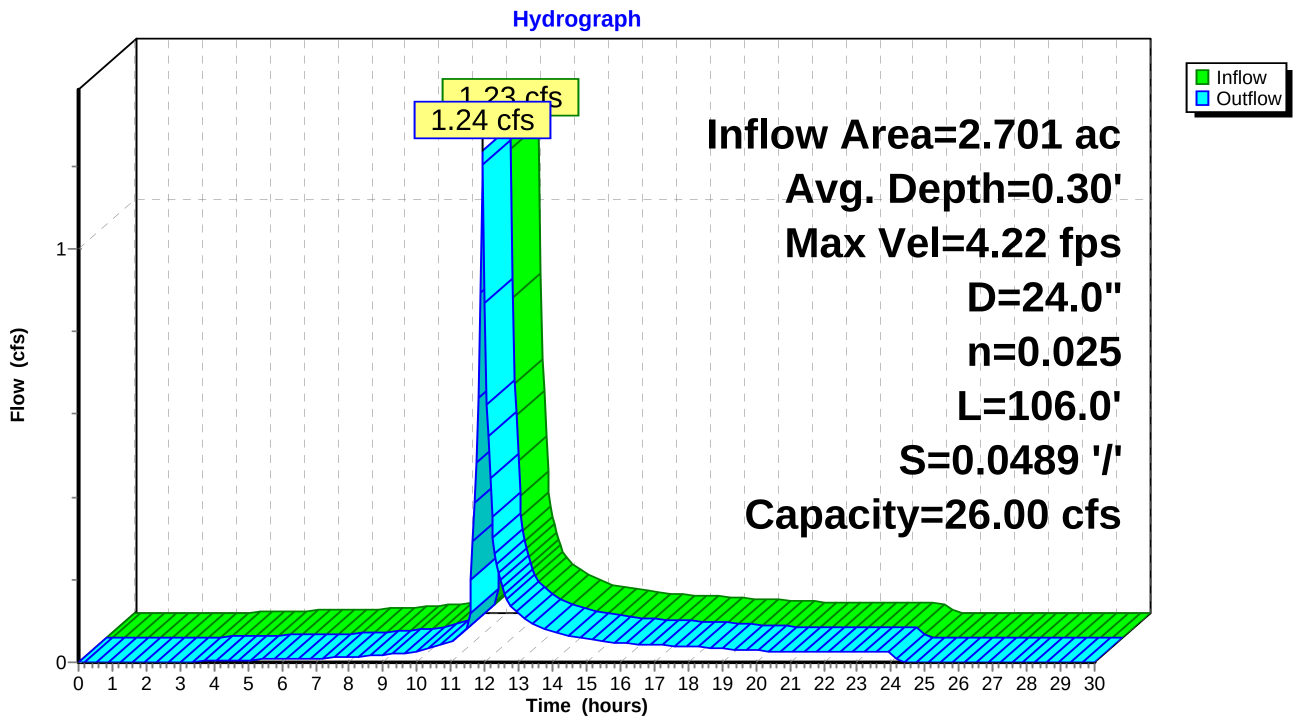
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 4.22 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 1.3 min

Peak Storage= 31 cf @ 11.93 hrs, Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 26.00 cfs

24.0" Diameter Pipe, n= 0.025 Corrugated metal
Length= 106.0' Slope= 0.0489 '/'
Inlet Invert= 874.48', Outlet Invert= 869.30'



Reach 18R: pipe under entry



Summary for Reach 18R: pipe under entry

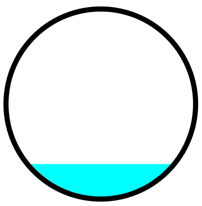
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

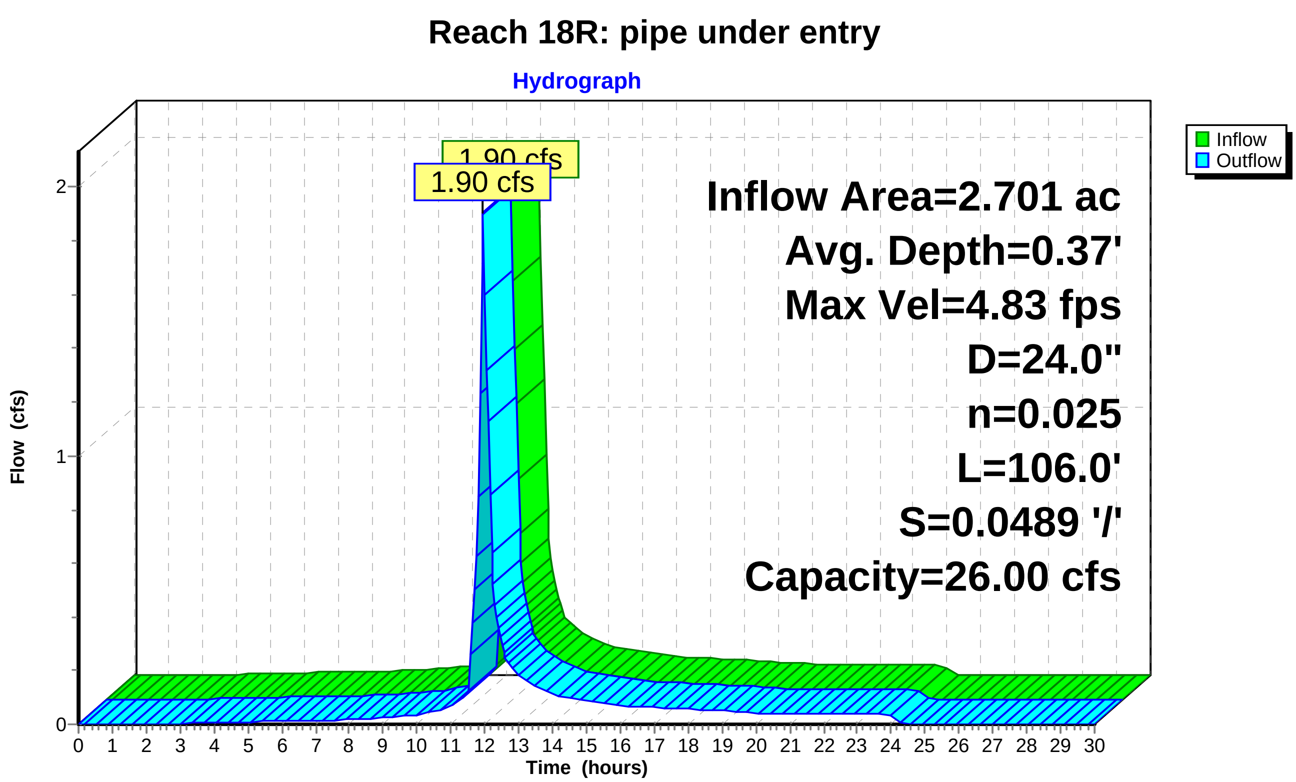
Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 0.65" for 6 month event
Inflow = 1.90 cfs @ 11.94 hrs, Volume= 0.147 af
Outflow = 1.90 cfs @ 11.94 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 4.83 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.55 fps, Avg. Travel Time= 1.1 min

Peak Storage= 42 cf @ 11.94 hrs, Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 26.00 cfs

24.0" Diameter Pipe, n= 0.025 Corrugated metal
Length= 106.0' Slope= 0.0489 '/'
Inlet Invert= 874.48', Outlet Invert= 869.30'





Summary for Reach 18R: pipe under entry

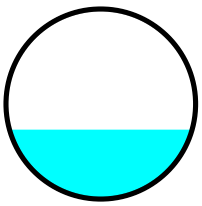
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 2.28" for 10 year event
Inflow = 7.35 cfs @ 11.97 hrs, Volume= 0.514 af
Outflow = 7.36 cfs @ 11.97 hrs, Volume= 0.514 af, Atten= 0%, Lag= 0.1 min

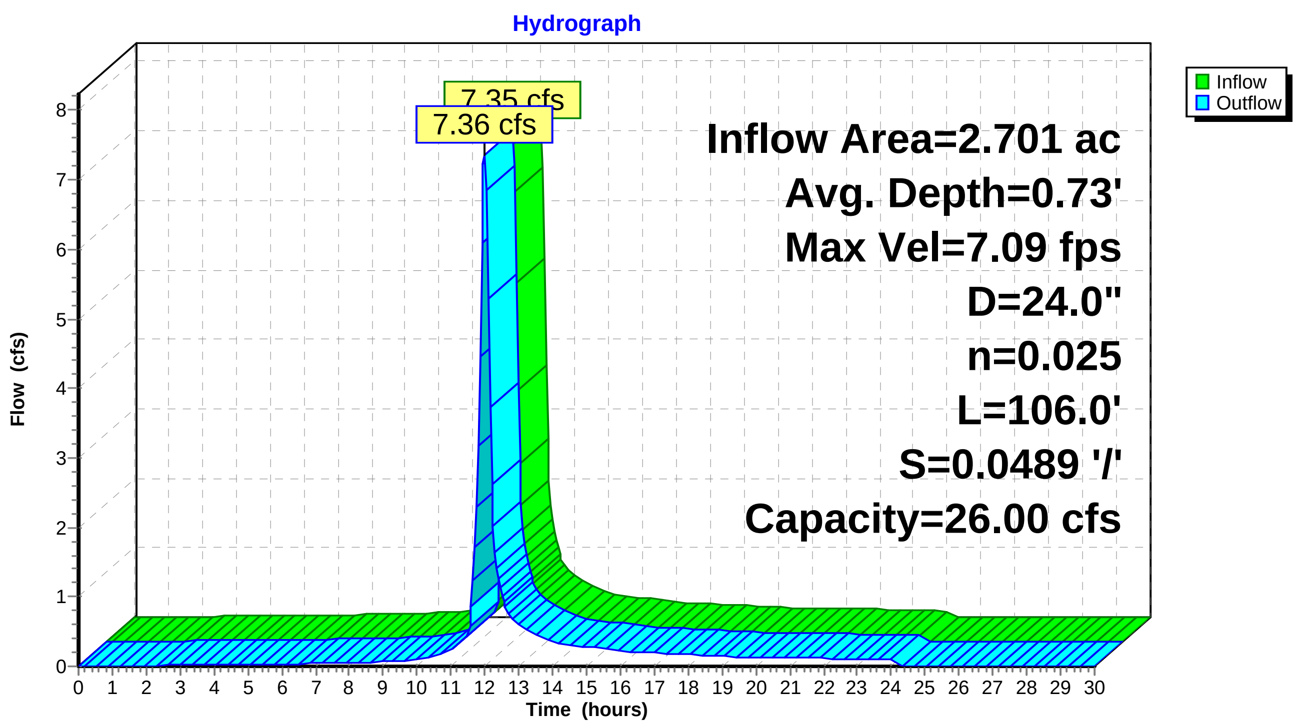
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 7.09 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.11 fps, Avg. Travel Time= 0.8 min

Peak Storage= 110 cf @ 11.97 hrs, Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 26.00 cfs

24.0" Diameter Pipe, n= 0.025 Corrugated metal
Length= 106.0' Slope= 0.0489 '/'
Inlet Invert= 874.48', Outlet Invert= 869.30'



Reach 18R: pipe under entry



Summary for Reach 18R: pipe under entry

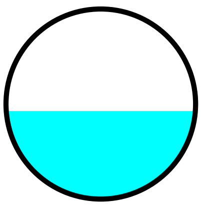
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 3.47" for 50 year event
Inflow = 11.34 cfs @ 11.98 hrs, Volume= 0.782 af
Outflow = 11.35 cfs @ 11.98 hrs, Volume= 0.782 af, Atten= 0%, Lag= 0.2 min

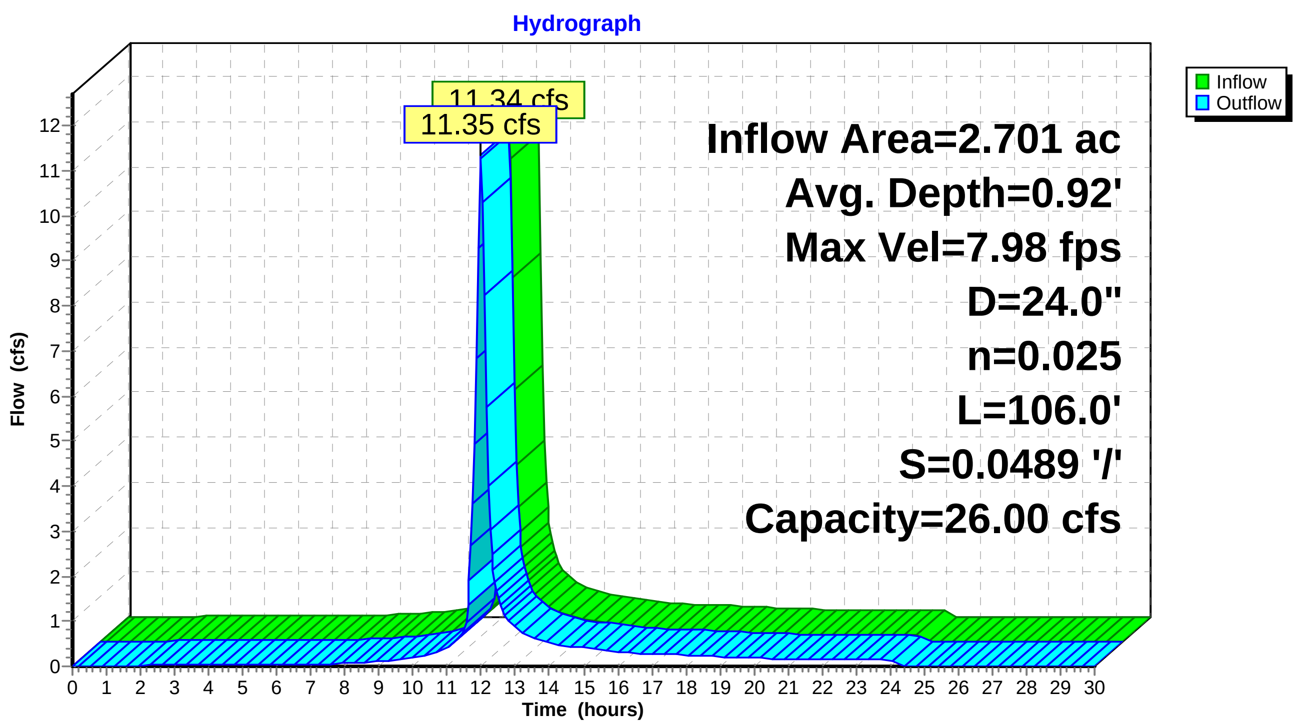
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 7.98 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.7 min

Peak Storage= 150 cf @ 11.98 hrs, Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 26.00 cfs

24.0" Diameter Pipe, n= 0.025 Corrugated metal
Length= 106.0' Slope= 0.0489 '/'
Inlet Invert= 874.48', Outlet Invert= 869.30'



Reach 18R: pipe under entry



Summary for Reach 18R: pipe under entry

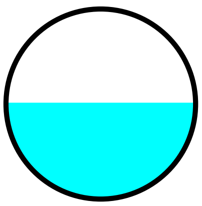
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 2.701 ac, 18.55% Impervious, Inflow Depth = 4.05" for 100 year event
Inflow = 13.31 cfs @ 11.98 hrs, Volume= 0.911 af
Outflow = 13.31 cfs @ 11.98 hrs, Volume= 0.911 af, Atten= 0%, Lag= 0.2 min

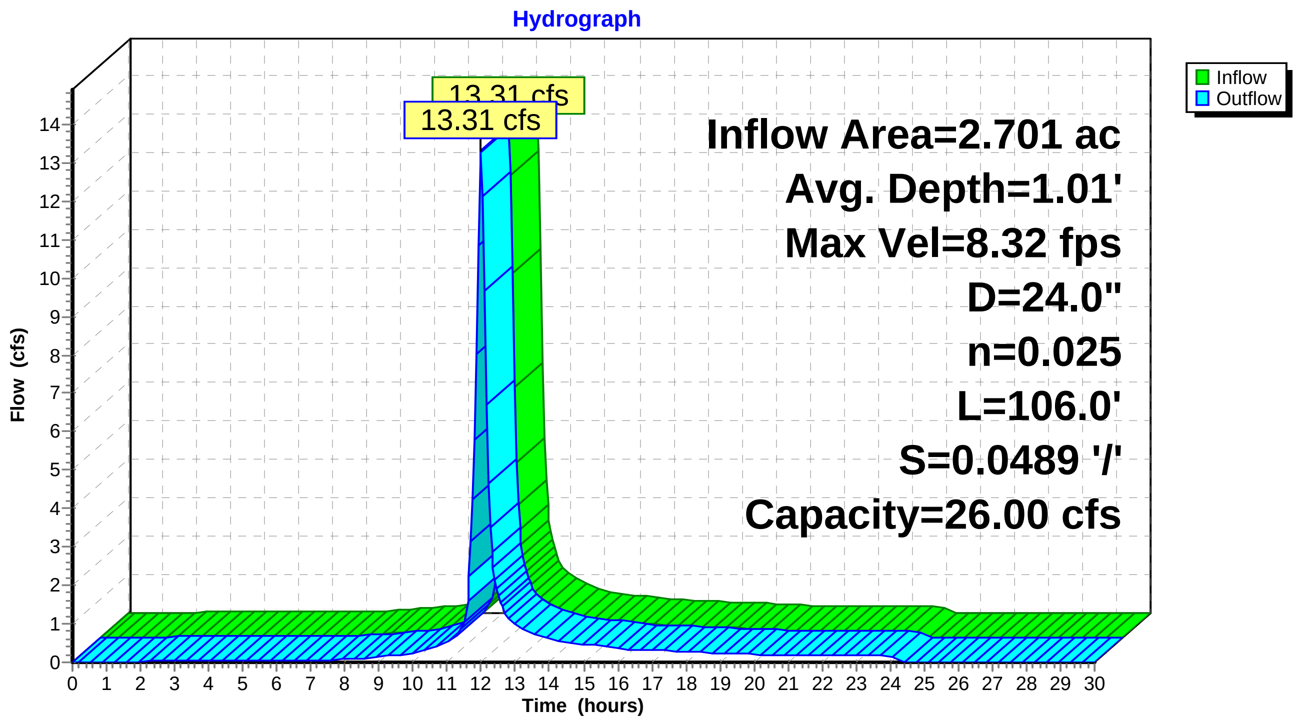
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 4
Max. Velocity= 8.32 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.48 fps, Avg. Travel Time= 0.7 min

Peak Storage= 169 cf @ 11.98 hrs, Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 26.00 cfs

24.0" Diameter Pipe, n= 0.025 Corrugated metal
Length= 106.0' Slope= 0.0489 '/'
Inlet Invert= 874.48', Outlet Invert= 869.30'



Reach 18R: pipe under entry

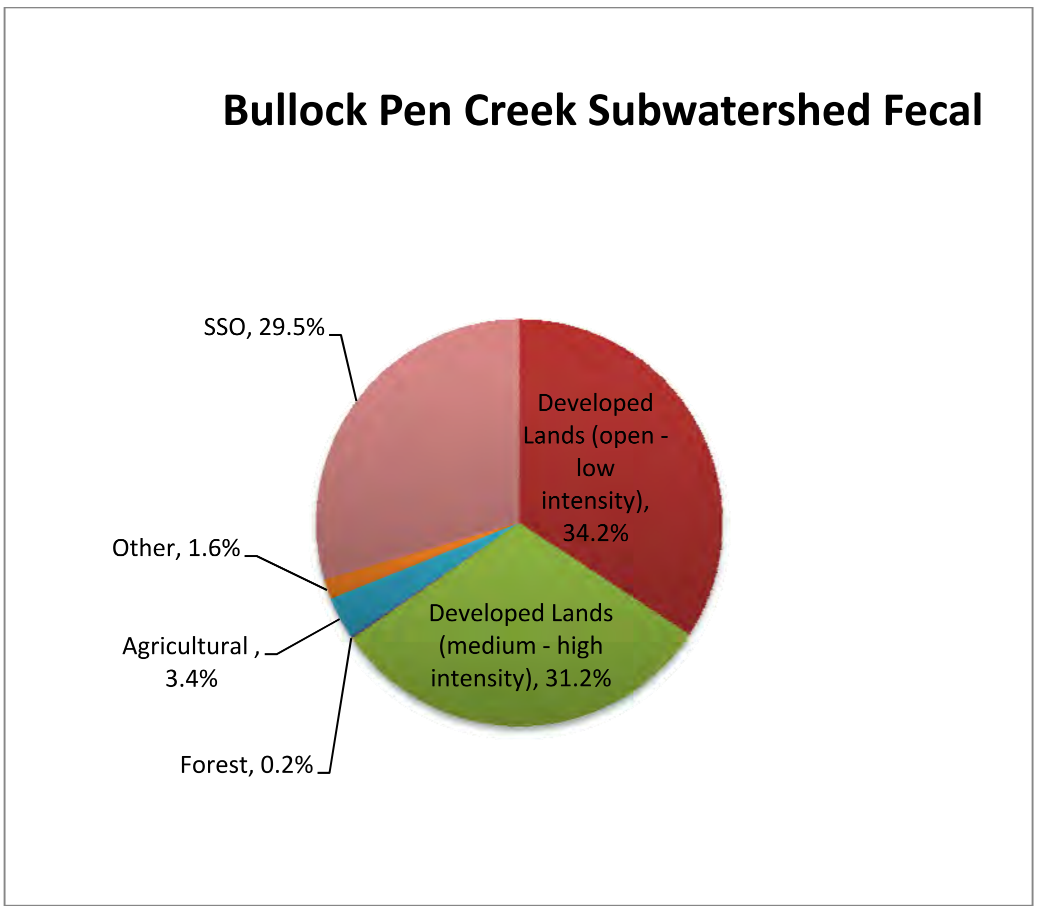


APPENDIX K
WATER QUALITY DATA

Fecal Coliform Loadings in Bullock Pen Creek

Source: Sanitation District No. 1

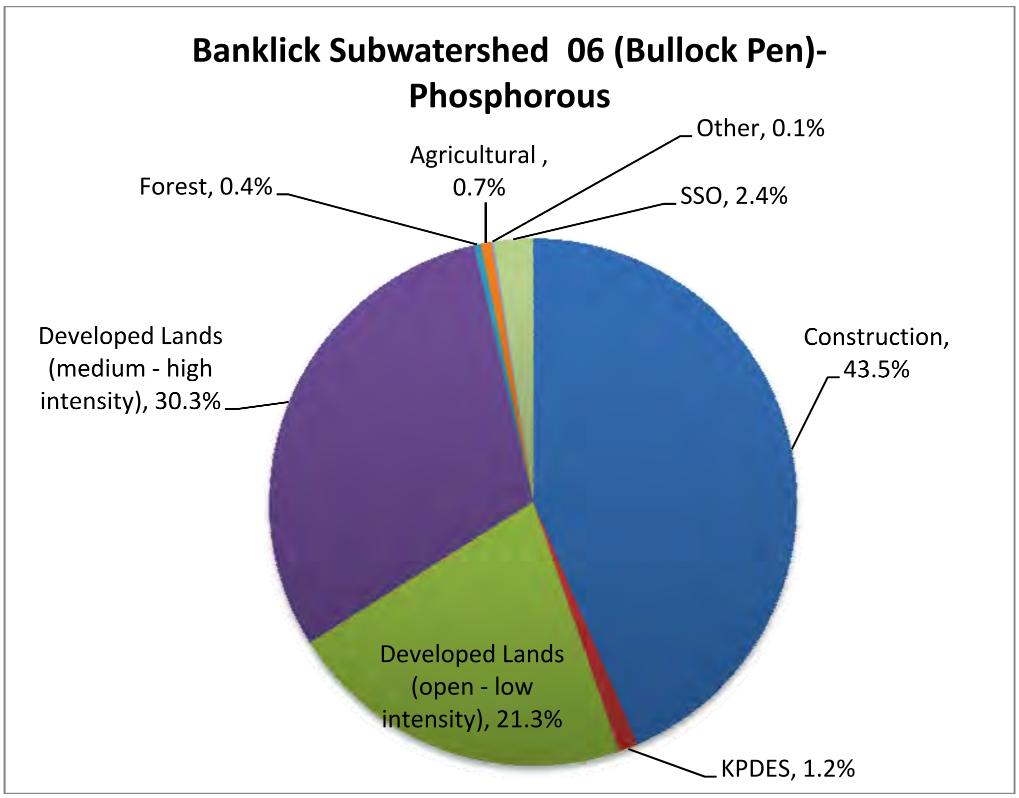
Source	**Fecal Loading (cfus/year)**
KPDES	1.88481E+11
Developed Lands (open - low intensity)	1.41288E+15
Developed Lands (medium - high intensity)	1.28563E+15
Forest	6.45433E+12
Agricultural	1.38753E+14
Other	6.50248E+13
CSO	0
SSO	1.21744E+15
Septic	7.70975E+11
Total	4.12714E+15



Phosphorous Loadings in Bullock Pen Creek

Source: Sanitation District No. 1

Source	Phosphorous Loading (Kg/year)
Construction	6929.711
KPDES	185.882
Developed Lands (open - low intensity)	3398.404
Developed Lands (medium - high intensity)	4830.805
Forest	66.313
Agricultural	105.450
Other	22.828
CSO	0.000
SSO	377.600
Septic	0.617
Total	15917.609



TSS Loadings in Bullock Pen Creek

Source: Sanitation District No. 1

Source	TSS Loading (Kg/year)
Streambank Erosion	5377312.26
Construction	3299862.28
KPDES	1518.14
Developed Lands (open - low intensity)	3398.40
Developed Lands (medium - high intensity)	4830.81
Forest	66.31
Agricultural	105.45
Other	22.83
CSO	0.00
SSO	14667.80
Septic	0.00
Total	8701784.28