

1. Report No. SWUTC/13/161306-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle DEVELOPING THE SEDIMENT AND EROSION CONTROL LABORATORY TO BECOME A HANDS-ON TRAINING AND EDUCATION CENTER				5. Report Date November 2013	
				6. Performing Organization Code	
7. Author(s) Ming-Han Li, Pengzhi Li, Jett McFalls, Beverly Storey and Galen Newman				8. Performing Organization Report No. Report 161306-1	
9. Performing Organization Name and Address Texas A&M Transportation Institute Texas A&M University System College Station, Texas 77843-3135				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. 10727	
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas A&M Transportation Institute Texas A&M University System College Station, Texas 77843-3135				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Supported by general revenues from the State of Texas.					
16. Abstract <p>The Sedimentation and Erosion Control (SEC) Laboratory has an established reputation as a renowned soil erosion research facility in the United States since its inception in 1990. During the past two decades, the lab has expanded its original performance evaluation task to cutting-edge stormwater research, as well as professional training development. The researchers affiliated with the SEC Lab have also developed numerous training courses.</p> <p>In the market of continuing education industry, a popular business is to provide courses on soil erosion and Low Impact Development (LID) subjects. As the growing demand on these topics, there are more and more continuing education programs starting to set up training courses on this topic. However, those programs rarely can provide hands-on training. Therefore, the opportunity arises where Texas A&M Transportation Institute can depend on the SEC Lab for hands-on exercises to be integrated in professional training, continuing education and high-impact learning experiences for current TAMU students, regional municipalities, and other professionals in the design and construction industries.</p> <p>Considering SEC Lab has never developed a master plan and the demand of continuing education, the research proposed a master plan for the lab and developed a pilot LID course. Tasked conducted include: cases review, SWOT (strength, weakness, opportunity and challenge) analysis, course module development, conceptual plan design, model build, propagation, and final master plan.</p>					
17. Key Words Low impact development, soil erosion, stormwater management, continuing education,			18. Distribution Statement No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages 142	22. Price

Developing the Sediment and Erosion Control Laboratory to Become a Hands-on Training and Education Center

Project Report



Developing the Sediment and Erosion Control Laboratory to Become a Hands-on Training and Education Center: Project Report

by

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ACKNOWLEDGEMENT

The authors recognize that support for this research was provided by a grant from the U.S. Department of Transportation, University Transportation Centers Program to the Southwest Region University Transportation Center which is funded, in part, with general revenue funds from the State of Texas.

The authors also thank the following personnel for their help, comments and guidance throughout the project.

Joe Zietsman, *Division Head, Texas A&M Transportation Institute*

Dock Burke, *Director, Texas A&M Transportation Institute*

Jolanda Prozzi, *Research Scientist, Texas A&M Transportation Institute*

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EXECUTIVE SUMMARY

The Sedimentation and Erosion Control (SEC) Laboratory has an established reputation as a renowned soil erosion research facility in the United States since its inception in 1990. During the past two decades, the lab has expanded its original performance evaluation task to cutting-edge stormwater research, as well as professional training development. The researchers affiliated with the SEC Lab have also developed numerous training courses.

In the market of continuing education industry, a popular business is to provide courses on soil erosion and Low Impact Development (LID) subjects. As the growing demand on these topics, there are more and more continuing education programs starting to set up training courses on this topic. However, those programs rarely can provide hands-on training. Therefore, the opportunity arises where Texas A&M Transportation Institute can depend on the SEC Lab for hands-on exercises to be integrated in professional training, continuing education and high-impact learning experiences for current TAMU students, regional municipalities, and other professionals in the design and construction industries.

Considering SEC Lab has never developed a master plan and the demand of continuing education, the research proposed a master plan for the lab and developed a pilot LID course. Tasks conducted include: cases review, SWOT (strength, weakness, opportunity and challenge) analysis, course module development, conceptual plan design, model build, propagation, and final master plan.

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PART 1

Introduction



SOUTH REGION WEST UNIVERSITY TRANSPORTATION CENTER

1. Project Problem Statement
2. Background
3. Objectives of Study
4. Work Plan
5. Schedule of Activities
6. Anticipated Products

1. PROJECT PROBLEM STATEMENT

Transportation professionals need continuing education to update their knowledge in their respective areas of expertise. An on-going demand is on the soil erosion control. The latest growing demand is on the low impact development (LID) techniques that emphasize on-site comprehensive stormwater management such as bioretention, porous pavement, etc. A popular business in the industry is to provide continuing education courses on soil erosion and LID subjects. The demand for soil erosion and LID topical areas is high. The problem is that all of those available continuing education courses do not offer hands-on experiences. Complaints from professionals about existing training courses includes the similarity of most content and the lack of practical demonstration. Therefore, the opportunity arises where TTI can depend on the Sediment and Erosion Control Lab (SEC) for hands-on exercises to be integrated in professional training, continuing education and high-impact learning experiences for current TAMU students, regional municipalities, and other professionals in the design and construction industries.

2. BACKGROUND

The SEC Lab has an established reputation as a renowned soil erosion research facility in the United States since its inception in 1990. The SEC Lab began performance evaluation for erosion control products, materials and techniques in the early 1990s. During the past two decades, the lab has expanded its original performance evaluation task to cutting-edge stormwater research, as well as professional training development. The researchers affiliated with the SEC Lab have also developed numerous training courses, such as:

- South Texas Environmental Institute at Texas A&M University Kingsville with the Lower Rio Grande Valley Stormwater Task Force
 - Developing and Implementing Soil Erosion Management Plan at Construction Sites
 - How to Inspect Construction Sites and How to Enforce a TPDES Program
 - Low Impact Development Integrated Management Practices and Stormwater Management

- Federal Highway Administration (FHWA) - Context Sensitive Solutions Workshops
- EPA/DOT/HUD Sustainability/Livability Workshop
- Texas Department of Transportation (TxDOT) - Erosion and Sediment Control Course (ENV 102)
- South Dakota Department of Transportation's Water Quality Enhancement Program
- Erosion and Sediment Control Course, train-the-trainer and Certification Program

Through this experience, the researchers have learned that while professionals need to acquire continuing education credits to update their knowledge base, there are limited hands-on learning options.

The SEC Lab has been expanding and improving its abilities over the years without a master plan. The approach has inevitably been opportunistic, that is, physical amenities are added when grants or funds are secured. The timing for a master plan to guide the development of hands-on training and future lab improvements has arrived. Recently, the SEC Lab is in its expansion phase. A new rainfall simulation building has been completed in the end of summer 2013. Several past stormwater research projects have provided the SEC Lab a variety of equipment, including a large footprint detention chamber, large-scale bioretention cells, a shallow-and-wide flume for simulating roadside drainage, and rainfall simulation systems. The proposed master plan addresses the immediate demands and future needs in soil erosion and LID hands-on training.



3. OBJECTIVES OF STUDY

The objectives of this project are to:

- Develop a master plan for hands-on training for the SEC Lab
- Engage TAMU landscape architecture students in developing the master plan
- Develop soil erosion and LID training course modules with hands-on and demonstration activities using the SEC Lab
- Develop materials for announcement and advertisement (brochure, flyers, web site markup, etc.)
- Build one large-scale soil erosion and/or LID models for hands-on training

4. WORK PLAN

■ **Task 1: Collect and Review Training Courses in The Market**

The researchers collected information of soil erosion and LID training courses offered in the market. The researchers studied what specific subjects are included and how they are taught. Information gathered also includes duration, frequency of offerings, instructor background, continuing education requirements, etc. The researchers compared courses that are highly desired and those that are not. Disciplines considered in this task include civil engineering, soil erosion, landscape architecture, etc.

■ **Task 2: Identify the Strengths and Weaknesses of the SEC Lab in Terms of Professional Training Competiveness**

This analysis task is for the researchers to tailor current course materials for the new hands-on training. Data and information gathered from Task 1 were used to guide the direction of course development.

■ **Task 3: Conduct Design Charrette to Generate Design Ideas for the Master Plan**

During the Fall semester of 2012, information of the SEC Lab such as maps and facility/building plans was gathered. Preliminary training program ideas were generated. Based on the preliminary programs, the researchers collaborated with TAMU landscape architecture programs. The intention is to use the SWUTC project as a class design problem to generate alternatives for the master plan during the Spring semester of 2013. The researchers served as reviewers and provided design critiques. Competition-based scholarships were provided to students. Tentatively awards are to be provided in three categories: the best overall, the most innovative and the best communication.

■ **Task 4: Develop Training Course Modules**

This task is to specifically develop course modules that can be used, including soil erosion and sediment control, bioretention system, porous pavement, green roofs and rainwater harvesting.

■ **Task 5: Build Large-scale Models for Hands-on Training**

The researcher built two large-scale models: one for bioretention demonstration, the other for porous pavement.

■ **Task 6: Produce Training Program Brochures and Make Signs**

The design charrette conducted in landscape architecture studios included a task of designing brochures for advertisement and signs to be installed at the SEC Lab. The researchers used the various ideas generated from Task 3 for this task.

■ **Task 7: Master Plan and Final Report**

Master plan of the SEC Lab was proposed. The researchers included present equipment and the new models in the master plan. Future growth and phasing plans were addressed as well. The final report includes a complete description of the project, approach, methodology, design process, results, conclusions, and recommendations.

5. SCHEDULE OF ACTIVITIES

	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct
Task 1. Review training course												
Task 2. ID strengths & weaknesses												
Task 3. Design charrette												
Task 4. Course modules												
Task 5. Large-scale models												
Task 6. Program brochures												
Task 7. Master plan and final report												

6. DELIVERABLE OR PRODUCTS

Deliverable include a color rendered master plan, training course modules, program brochures, sign designs and two large-scale models.

7. FUTURE PLAN

(Describe: 1) actions that will be taken to extend the research effort and, 2) potential sponsors for the additional research).

The researchers anticipate offering the soil erosion and LID hands-on course soon after the project. The revenue of the training course will continuously support the update and development of the course.

PART 2

Case Study and Current Training Courses Review



SOUTH REGION WEST UNIVERSITY TRANSPORTATION CENTER

1. Introduction
2. Purpose
3. Overview of Continuing Education in the U.S.
4. Concerns of Review
5. Summary of Case Study
6. Appendix--Specific Information

1. INTRODUCTION

- The Southwest Region University Transportation Center (SWUTC) project started in the beginning of November, 2012.
- According to the Project Proposal by Dr. Ming-Han Li, the project consists of seven tasks, including
 - ▶ Reviewing training courses,
 - ▶ Identifying the strength and weakness,
 - ▶ Organizing design charrette,
 - ▶ Developing course modules,
 - ▶ Building large-scale models,
 - ▶ Designing program brochures, and
 - ▶ Completing master plan and final report.

■ The schedule

DONE
December, 2012

	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct
Task 1. Review training course												
Task 2. ID strengths & weaknesses												
Task 3. Design charrette												
Task 4. Course modules												
Task 5. Large-scale models												
Task 6. Program brochures												
Task 7. Master plan and final report												



Site Visit on Nov.15th, 2012

- Following the schedule, the first task was finished in the middle of December, 2012, coming out with this part of report as a phasing product.

2. PURPOSE

- The purpose of reviewing current training courses is to determine what kind of training courses have already been advertised on the market. Furthermore, by comparing current training courses with our project, we can identify the strength and weakness of our project, allow us to develop a feasible training program.

3. OVERVIEW OF CONTINUING EDUCATION IN THE U.S.

- Continuing education, known as adult education, traditionally is an educational approach designed for people who have already graduated from college, or people who are beyond the age of attending college.
- However, the definition today tends to be much wider than what people thought. In fact, more and more enrolled students in college also attend continuing education programs to extend their knowledge and skills, some of them even gain certificate from those programs. Besides, several licensed professionals, e.g. registered landscape architects, registered architects, are required to attend certain hours of training courses each year to earn Continuing Educational Units (CEUs), just for maintaining their licenses.
- The University of Wisconsin-Madison developed the first academically identifiable continuing education program in 1907. And Empire State College, as a unit of the State University of New York, is the earliest college exclusively focusing on providing high education for adults in 1969. In 1976, the first Division of Continuing Education was established in the University of Florida. Nowadays, most universities in the United States have established school of continuing education, accommodating professionals, students, and adults who intend to change or explore new careers.



CONTINUING Education
Sustains Success



<http://continuinged.uwf.edu>

A poster of CE program in University of West Florida



Continuing Education Resources for UW-Madison Schools and Colleges

<http://continuingstudies.wisc.edu>

CE program in Wisconsin-Madison University



<http://sln.suny.edu>

Empire State College



<http://www.dce.ufl.edu>

Division of Continuing Education of UF

4. CONCERNS OF REVIEW

There are 7 main concerns for the review process, which are key points we should consider for establishing a new continuing education program.

4.1 Course Topic/ Key Word

The main topics of SWUTC Project are Low Impact Development (LID), Erosion and Sediment Control. They are the currently available courses that we can provide immediately, while there may be more potential topics related to the Lab, which could be developed in the future.

4.2 Provider/ Organization

Commercial company as a provider

Typically, commercial company will invite speakers, prepare space, design brochures, advertise and spread the information, and provide logistical support. This type of organization is more like a conference. In this case, as an organizer, company usually does not give lectures in the event.

Academic institution as a provider

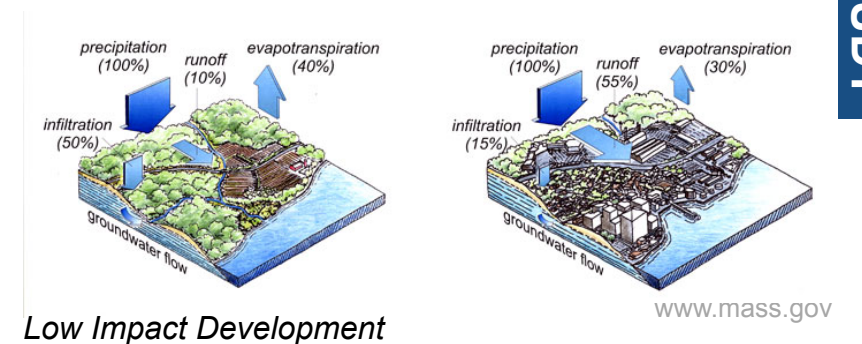
Academic institutions, such as universities, research centers, and colleges, can organize and also provide the educational courses for participants. This type of organization is more academically oriented, and usually more like workshops. Most speakers are professors or researchers.

Online courses

Most people, especially those who are required to earn CEUs will probably choose this approach. After all, these courses are easy to access, and also much cheaper than face-to-face education. However, comparing to live lectures or hands-on courses, the effect of learning tends to much weaker.

Webinars

Webinars are actually online courses, but still different from common online courses. In a webinar, Attendees and lecturer are online at a specific time, sharing the screen distantly through internet. Later on, the video of the lecture could be downloaded and reviewed by attendees.



Low Impact Development El Paso, TX - Thursday, October 11, 2012

5 reasons you won't want to miss this seminar!

- You'll learn what low impact development (LID) is and how it improves upon conventional development.
- You'll examine LID tools, including rainwater harvesting, vegetated buffers and bioretention.
- You'll learn to choose the correct plants for LID landscapes and explore maintenance techniques.

HalfMoon Education Inc.
PO Box 278
Ahoona, WI 54720-0278

halfmoonseminars.com

Brochures of Halfmoon Education Inc.

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agrilifeextension.tamu.edu

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Online

Webinar

www.pce.uw.edu/online-learning

■ 4.3 Location

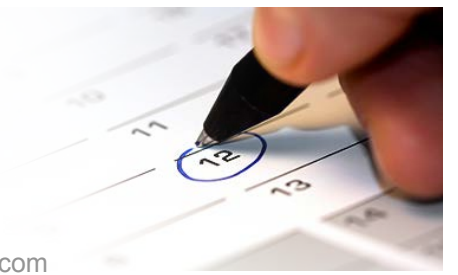
This refers to where the course is going to be provided. Considering our project is located in College Station, which is not quite near big cities, the potential market is probably smaller than those courses provided directly in large cities. Thus, one of the urgent questions for us to think about is, is there any market-acceptable cases located in small towns?



www.fullcontact.com

■ 4.4 Course Duration

This refers to the course schedule issue. Basically, the scheduled courses duration vary. There are workshops which may last up to 8 days, as well as lectures which may only take 1 hour. Thus, there are different choices for establishing a training program based on different settings.



www.squest.com

■ 4.5 Hands-on

This project can provide hands-on training courses, which could be more attractive and effective than lecture-only courses. Thus, reviewing the current hands-on courses on the market can help us to identify our strength.



sustainability.asu.edu

Hands-on Training in ASU

■ 4.6 Price

Of course, price is one of the most important factors influencing the choice of customers. Looking into this issue can help us find out the approximate value of similar training courses. Moreover, by comparing the price of different courses, we will understand the market trend better.



www.designer.com

■ 4.7 CEUs

Professionals, especially registered professionals, who are required to earn CEUs every year to maintain their licenses, are an important group of recipients. Based on the content of our course, we mainly focus on Landscape Architects, Urban Planners, Civil Engineers, and Architects. Besides, professionals with the license of LEED could also be considered as target users in our project.



Landscape Architecture Continuing Education System™

5. SUMMARY OF CASE STUDY

	Topic/Keyword	Provider	Location	Duration	Hands-on	Price	CEUs
1	Garden Design	Joseph Regenstein Jr. School of Chicago Botanic Garden	Chicago, IL	2-7 years	Design Studio	\$13/hr	Certificate
2	Healthcare Garden Design	Joseph Regenstein Jr. School of Chicago Botanic Garden	Chicago, IL	8 days	Field Trip	\$149 (one day) \$3,495 (full)	LA CES--56
3	Hazardous Waste Management	Environmental Resource Center	San Antonio, TX Dallas, TX Houston, TX	3 days	None	\$795	CEUs--1.6
4	Landscape Management	Rutgers University	New Brunswick, NJ	13 days scattered	None	\$2,055	Certificate
5	Pond Design, Management and Maintenance	Rutgers University	Hillsborough, NJ	1 day	None	\$325	LA CES--7.25
6	Water Management through Connectivity	Landscape Communications, Inc.	Long Beach, CA	1.5 hour	None	\$40	LA CES--1.25 LEED--1.5 APLD--1.5
7	Permeable Pavers as a Stormwater LID BMP	Landscape Communications Inc.	Long Beach, CA	1.5 hour	None	\$40	LA CES--1.25 LEED--1.5 ALPD--1.5
8	Low Impact Development	HalfMoon Education Inc.	El Paso, TX	1 day	None	\$259	CEPHs--7.0 AIA SD/HSW--7.0 LA CES--7.0
9	Stormwater Management	Rutgers University	New Brunswick, NJ	3 days	None	\$840	CEUs--1.8 New York PE--14
10	HEC-RAS	Rutgers University	New Brunswick, NJ	3 days	Computer Modeling Based	\$840	CEUs--1.8 New York PE--18

Topic/Keyword	Provider	Location	Duration	Hands-on	Price	CEUs
11 Soil Science, Hydrology, Geology, Water quality, Baseline Testing and Citizen Science	B.F. Environmental Consultant Inc. & Wikes University	Wikes-Barre, PA	1 day for each	Field Trip	\$310 for each	PDHs-8 for each
12 Slop Stability and Land Slides	University of Wisconsin-Madison	Santa Clara, CA	3 days	None	\$1,295	CEUs--2.1 PDHs--21
13 WinSLAMM v.10 Urban Stormwater Management Goals	University of Wisconsin-Madison	Madison, WI	2 days	None	\$995	CEUs--1.4 PDHs--14
14 Design of Stormwater, Erosion & Sediment Control System	University of Arkansas and Oklahoma State University	Bentonville, Arkansas	3 days	Computer Hands-on Exercises and Field Trip	\$875	CEUs--2.4 CEUs HSW--24
15 Georgia Stormwater Management Workshops	College of Environment + Design, University of Georgia	Athens, GA	3 days	Demo, Field Trip, Studio	\$420	CEUs--2.1
16 2011-2012 Stormwater Management Training Series	Cornell Cooperative Extention Orange County	Middletown, NY	1 day for each, 6 days in total	None	\$225 for each	CEUs--0.7 for each
17 Current Issues in Stormwater Regulation	Water Law Resource.com	Mechanicsburg, PA	1 day	None	\$349, or \$448 with manual and CD	PDHs--7.2 LA CES--6.0 AICP CMs
18 Stormwater Retrofitting Demystified	National Estuarine Research Reserve	Laure, MD	1 day	None	Unknown	AICP CMs--6.0
19 Designing with Natural Stone	Design Arts Seminars, Inc.	Dallas, TX	1 day	None	\$245	LA CES--8.0
20 SWAT Workshops	Texas A&M University	College Station, TX	5 days	Computer Based	\$500 first 2 days \$200 3rd day \$500 rest 2 days	CEUs--0.8 per day

	Topic/Keyword	Provider	Location	Duration	Hands-on	Price	CEUs
21	Professional Workshop Series	Lady Bird Johnson Wildflower Center	Austin, TX	3 days in total	None	\$170 per day	CEUs--0.7 per day (calculated)
22	Florida Stormwater, Erosion and Sedimentation Control Inspector Training and Certification Program	Cheryl L. Moore Constructing, LLC	Tampa, FL	2 days	None	\$175 per day	CEUs--1.2 PDHs--8.0 LA CES--12.0
23	Principles and Practices of Erosion and Sediment Control (ESC) CEU Series	Stormwater USA Online Training and Certification	Online	9 hours	None	\$449	CEUs--0.9 PDHs--9.0
24	Intro to Erosion and Sediment Control-Subcontractor Short Course	Stormwater USA Online Training and Certification	Online	1 hours	None	\$99	CEUs--0.1 PDHs--1.0
25	EPA Stormwater Management Training Course Online	EPAcampus.com	Online	8 hours	None	\$96	CEUs--0.8
26	Stormwater Management during Construction	EPAcampus.com	Online	8 hours	None	\$96	CEUs--0.8
27	Stormwater Management: An Introduction	RedVector.com, Inc.	Online	2 hours	None	\$78	CEUs--0.2 LA CES--2.0 PDHs--2.0
28	Erosion & Sediment Control	RedVector.com, Inc.	Online	8 hours	None	\$216	CEUs--0.8 LA CES--8.0 PDHs--8.0

Topic/Keyword	Provider	Location	Duration	Hands-on	Price	CEUs
29 Pervious Concrete: A Stormwater Solution	NRMCA Education and Training	Webinar	8 hours	None	\$295	CEUs--0.8 LA CES--8.0 PDHs--8.0 AIA LUs--8.0
30 On-Demand Webinar: Construction Stormwater BMPs	American Society of Civil Engineers	On-demand Webinar	1 hour	None	\$145 for one \$199 for 2~4 \$200 for >4	CEUs--0.1 PDHs--1.0
31 LEED Continuing Education (CMP) 15 & 30 Hour CE Package	Green Education Service	Webinar	15 hours or 30 hours	None	\$199 for silver \$299 for gold \$400 for platinum	CMPs--15.0 or CMPs--30.0 AIA LUs--15.0 or AIA LUs--30.0

* Note: CEUs stands for Continuing Education Units, it is a general name of all kinds of continuing education credits, those approved by authorized professional agencies can be considered as valid credits for specific professionals.

CREDIT	STANDS FOR	PROFESSIONALS	REQUIRED UNITS
LA CES	Landscape Architecture Continuing Education System	Registered Landscape Architect (RLA)	24 per year
PDHs	Professional Development Hours	Professional Engineer (PE)	15 per year
APLD	Association of Professional Landscape Designers	Association of Professional Landscape Designers (APLD)	30 per year
CMs	Certification Maintenance	American Institute Certificated Planner (AICP)	32 per year
LUs	Learning Units	The American Institute of Architects Registered Architect (AIA RA)	18 per year
CMPs	Credential Maintenance Programs	Leadership in Energy and Environmental Design (LEED) CISEC, CPESC, and CPSWQ	LEED GA--15 per 2 years LEED AP--30 per 2 years



6. APPENDIX--SPECIFIC INFORMATION

6.1 Chicago Botanic Garden Training Programs-General Review

Provider: Chicago Botanic Garden

Course Address: Chicago Botanic Garden

Time: All through the year

Education Period: from 2 hours to 7 years

Cost: from \$12 to thousands of dollars

Website: <http://www.chicagobotanic.org/school/>

1. Categories based on receivers. Chicago Botanic Garden continuing educational programs are organized based on the botanic garden. There are 4 categories of educational programs based on different receivers: 1) adult education, including horticulture, nature and birding, garden design, botanical arts, photography, wellness and fitness, certificate programs, professional programs, symposia; 2) youth program; 3) family program and 4) teacher program.

2. Various topics and choices. There are all kinds of courses, lectures, and even some fitness walking in the provider's list. People can easily find all kinds of topics they interested in on the website. For example, the horticulture and gardening curriculum covers topics from pruning, container, soil, bonsai, and even backyard chicken raising, so on and so forth.

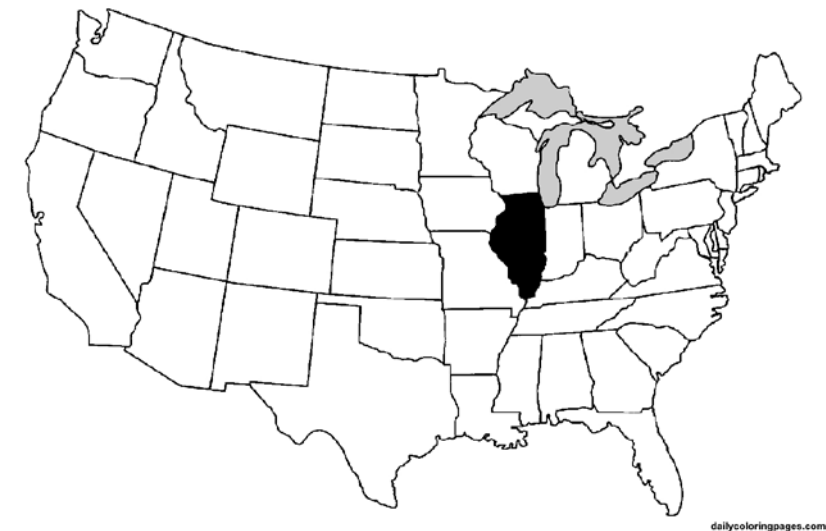
3. Arranging ahead. Their courses are mostly arranged in evening of weekdays or weekends to coordinate with most participants' schedule. Their calendar of next year has been worked out now, so people can easily plan their time to attend the courses they interested in.

4. Membership encouragement. They have established membership system to encourage people to register to become members of the program, who can benefit from 20% discount for most courses.

5. Located in big city. Chicago Botanical Garden located in the north of Chicago with a distance of 24 miles from Chicago downtown area. Within 1 hour driving, most people in Chicago, Buffalo Grove and Waukegan can reach there easily.

6. Considering the seasonal change. Several courses are related to seasonal change in Chicago Botanical Garden. For example, they have some courses talking about the pruning in November, which is a suitable season for pruning. The hands-on pruning course can be operated easily and effectively in November of Chicago.

7. Convenient access to register. All the available courses and schedules are posted and categorized clearly on official website. People who interested in can easily find what they want to learn. For each course, the website creates an index box serving as a commodity. People who want to register in one course just need to click a button "put into basket", and then continue shopping. Once they finish the choosing process, they can just click "check out" and get all the courses paid online.



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6.2 Certificate Program of Chicago Botanic Garden—Garden Design

The school has certificate programs in:

- 1) garden design,
- 2) professional garden level 1&2,
- 3) ornamental plant materials,
- 4) healthcare garden design,
- 5) Midwest gardening,
- 6) botanical art,
- 7) horticultural therapy.

Provider: Joseph Regenstein, Jr. School of Chicago Botanic Garden

Course Address: Chicago Botanic Garden

Time: Weekday evenings and weekends

Education Period: 2 years to 7 years, average 3 years

Cost: \$13 per instruction hour (e.g. botany 1 & 2 costs \$674 in total)

Website: <http://www.chicagobotanic.org/school/certificate/gdc>

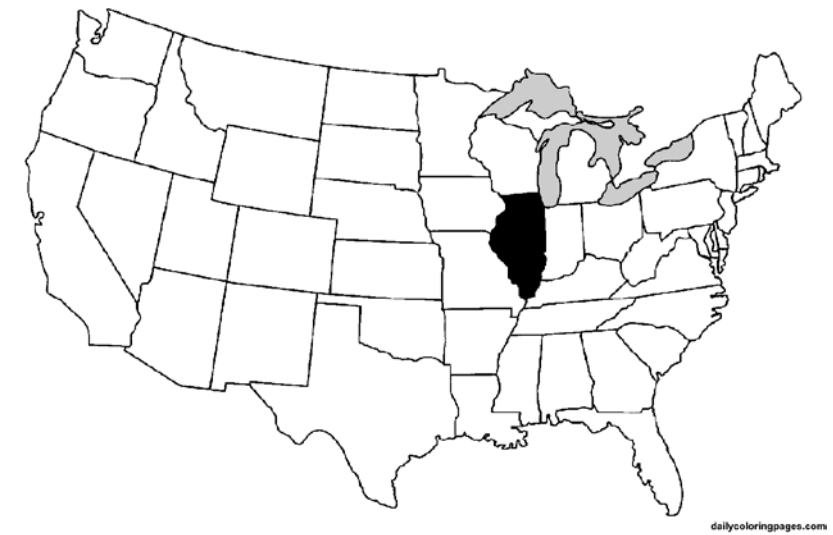
This program serves as a whole-aspect garden design school. The participants who complete this program can receive certificates of merit. “Certificates are awarded each year, and have been used by many individuals to prepare for entry-level positions in plant related occupations or to obtain salary raises or increased responsibilities in their current positions.” This program typically consists of 3 methods of training: lecture (50 students maximum), lab (20-24 students), and design course (16 students maximum).

The program focuses on “the unique role of plants in shaping space, creating a sense of place, and fostering well-being throughout the year and in a spectrum of settings, from private residences to municipal plantings, and streetscapes.” They aim to enable participants to “take on complex projects and offer complete garden design services.”

Comments:

This program has a full-view of garden design training. It can help participants who have no professional background to develop professional skills in this field. And the Certificate of Merit Program seems to be another attractive point. With this certificate, participants with some professional background may find an approach to promotion of their careers.

However, this program requires participants continuously studying, and people who want to get the certificate have to finish the required core courses in 7 years. The shortest approach is a 2-year period which may cost a lot and still requires a lot of time to engage comparing to other continuing educational courses.



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6.3 Certificate Program of Chicago Botanic Garden—Healthcare Garden Design

The school has certificate programs in:

- | | |
|--------------------------------------|---------------------------|
| 1) garden design, | |
| 2) professional garden level 1&2, | |
| 3) ornamental plant materials, | 5) Midwest gardening, |
| 4) healthcare garden design , | 6) botanical art, |
| | 7) horticultural therapy. |

Provider: Joseph Regenstein, Jr. School of Chicago Botanic Garden

Course Address: Chicago Botanic Garden

Time: May 15th to 22nd, 2013

Education Period: 1 day to 8 days

Cost: \$129 (early-bird) or \$149 for 1 day seminar, \$2,995 (early-bird) or \$3,495 for 8-day long certificate

Website: <http://www.chicagobotanic.org/school/certificate/hgd>

This program will introduce the latest research in healthcare garden design, reveal the benefits of healthcare gardens in terms of designing, managing, and evaluating such gardens. The session includes lectures, group projects, case studies, and field trips. Students will group up in multidisciplinary teams, and work on healthcare garden design project. Tours of healthcare facilities in great Chicago will be organized through the seminar.

The program covers various topics on healthcare garden design, including: (from website)

- Types of healthcare gardens and their defining characteristics
- Research, evidence-based design, and post-occupancy evaluation
- Passive and active garden experiences for positive health outcomes
- Characteristics of user groups (patients, family, visitors, and staff) and how they benefit
- How to reduce staff stress and increase satisfaction, retention, and recruitment
- Universal design, ADA, barrier-free design, regulations, codes, and specifications
- Integration of gardens into new and existing healthcare campus landscapes
- Connection of outdoor gardens to indoor spaces and therapeutic activities
- Plant selection and use, equipment, materials, safety, security, and privacy
- Construction and maintenance of new projects; performing renovations and redirecting uses of indoor and outdoor spaces, including rooftops
- Management of the garden facility and costs
- How to build winning healthcare garden design teams
- How to succeed in the client-centered marketplace
- Marketing, project proposals, and management; funding and resources

Comments:

1. Good opportunity for cooperating working with multidisciplinary professionals.
2. 8-day seminar can keep students in a good studying emotion, and cover various necessary aspects.
3. A field trip can enforce the learning effectively.



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6.4 Hazardous Waste Management in Texas

Provider: Environmental Resource Center

Course Address: San Antonio, Dallas, Houston

Time: 8:00 a.m. to 5 p.m.

Education Period: 2 days

Cost: \$795

CEUs: 1.6 credits

Additional: Lunch provided on both days

Website: <http://www.ercweb.com/training>

This course provides 4 physical products for participants: 1) a handbook for the management of hazardous waste, in the form of both hard copy and searchable CD-ROM; 2) state update which provides an overview of Texas State regulations that are different from the federal regulations; 3) certificate of completion for the records; and 4) 1.6 continuing education credits.

The course topics include:

- Overview of TCEQ and RCRA regulations
- How to classify solid and hazardous waste
- Classification of non-hazardous class 1, 2, and 3 wastes
- Waste container selection
- Accumulation point and satellite management
- Pre-transport requirements
- Emergency response
- Universal waste, used oil, CRTs
- Hazardous waste manifests
- Land disposal notices and certifications
- Record keeping and reporting requirements
- New and proposed rules

This course is one of the series courses provided by Environmental Resource Center. Their courses are opened in several different states. Basically, their system has 4 categories based on different focus: hazardous waste management, hazardous waste transportation, environmental consideration and safety consideration. Other courses may charge differently, for example, the course of Hazardous Waste Operation and Emergency Response provides 3 choices for participants: a 24-hour class is charged for \$549, a 40-hour class is charged for \$749, and an 8-hour class is charged for \$399.

Comments:

1. They provide multiple choices for people.
2. They provide web update courses for public to update the regulations in their professional field.
3. They provide Annual Subscription and Corporate Subscription service. The annual subscription price is \$2,496 (or \$1,479 for webcast), and corporate subscription price are \$3,750 (10 seats), \$7,000 (20 seats), \$9,750 (30 seats), \$12,000 (40 seats), and \$13,750 (50 seats).



6.5 Landscape Management I Certificate

Provider: Rutgers University Office of Continuing Professional Education

Course Address: New Brunswick, New Jersey

Time: From Nov.8 to Mar.4 (not continuously), courses length from 1 day to 3 days

Education Period: 13 days in total from Nov. to Mar.

Cost: \$2055

Website: www.cpe.rutgers.edu

This certificate requires 9 courses:

- Introduction To Plant Identification (2 days)
- Soil And Plant Relationships (2 days)
- Water Management And Drainage (1 day)
- Basics Of Turfgrass Management (1 day)
- Pest Management of Ornamental Landscape Plants (1d)
- Integrated Pest Management (3 days)
- Growing Ornamental Plants (1 day)
- Pest Management of Landscape Turf (1 day)
- Introduction To Pruning Techniques (1 day)

6.6 Pond Design, Management and Maintenance

Provider: Rutgers University Office of Continuing Professional Education

Course Address: Hillsborough, New Jersey

Time: 8:00 a.m. to 5 p.m., Apr.12, 2013

Education Period: 1 day

CEUs: 7.25 LA CES HSW PDHs

Cost: \$295 before Mar.29, \$275 each for multi person, \$325 after Mar.29

Website: <http://www.cpe.rutgers.edu/courses/current/ew0315ca.html>

This course is designed for pond owners, pond managers, landscape architects, engineers and anyone involved with the design, management or maintenance of ponds. This course includes:

- Properly select, use and apply aquatic pesticides to control invasive aquatic weeds and algae;
- Make use of non-pesticide, environmentally friendly techniques to control invasive aquatic weeds and algae;
- Design and implement a dredging project, including the proper navigation of the environmental rules and regulations;
- Correctly selecting, sizing and installing various types of aeration systems
- Establishment and enhancement of fish habitat;
- Stabilization of undercut and failing pond embankments;
- Creation of buffers for nutrient and pollutant removal;
- Implementationof vegetative strategies to control Canada geese.

Rutgers University provides various courses for continuing education. Their topics of courses include: Beekeeping; Electrical and Mechanical Programs;Environmental Management & Compliance; Equine Science; Food Safety Training & Food Science Courses; Golf Turf Management; Landscape and Grounds Management; Leadership, Management & Communications; Parks & Athletic Field Management; Pest Control; Public Grounds & Public Works; Public Health & Safety; Radon and Indoor Air Quality (Eastern Regional Radon Training Center); Recycling & Solid Waste; Spanish Language Courses; Teachers and School Employees; Water and Wastewater Operations; Wetland Delineation Training.



6.7 Water Management through Connectivity

Provider: Landscape Communications, Inc.

Course Address: Long Beach, CA

Time: 8:30 a.m. to 10:00 a.m., Saturday, Feb.9, 2013

Education Period: 1.5 hour

CEUs: 1.25LA CES, 1.5 LEED, 1.5 APLD

Cost: \$30 before 12/15/2012, otherwise \$40

Website: <http://landscapeonline.com/research/article/16893>

Connectivity is a multi-layered conceptual approach to guide, the re-defining of our living environments towards a sustainable model. Learning objectives include:

- Water - energy nexus for long distance transportation of resources;
- Increasing fluctuation of resource availability;
- Adapt local infrastructure to better harvest local resources;
- Create opportunity for all parts of the community to benefit;
- Applicable for use at global, regional and local scales.

6.8 Permeable Pavers as a Stormwater LID BMP

Provider: Landscape Communications, Inc.

Course Address: Long Beach, CA

Time: 8:30 a.m. to 10:00 a.m., Friday, Feb.8, 2013

Education Period: 1.5 hour

CEUs: 1.25LA CES, 1.5 LEED, 1.5 APLD

Cost: \$30 before 12/15/2012, otherwise \$40

Website: <http://landscapeonline.com/research/article/16888>

MS4 permits in California now require use of LID Stormwater BMP's for discretionary new and redevelopment projects. Permeable pavers are a proven solution for managing stormwater without restricting limited space for parking, pedestrian areas or light duty roadways. This course will include:

- Design Considerations – site selection, structural loading, soil infiltration
- Case Studies illustrating site specific applications
- Construction – proper techniques, proofing methods
- Maintenance – short term and remedial methods
- LEED and sustainability

These two courses are 2 of 30 courses in the 2013 LA Expo Seminar, which is a 2-day seminar in Long Beach, CA, on Feb.8, 2013-Feb.9, 2013. Each course of these 30 courses is cost \$30 (before 12/15). They also sell packages, 2 seminars for \$50, 3 seminars for \$68, 4 seminars for \$68, 5 or more for \$100.



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6.9 Low Impact Development

Provider: HalfMoon Education Inc.

Course Address: El Paso, TX

Time: 8:00 a.m. to 5 p.m., Oct.11, 2012

Education Period: 1 day seminar

Cost: \$259 for one or \$239 each for three or more

Additional: Lunch not provided

Website: www.halfmoonseminars.com

CEUs:

Architects:

7.0 Texas HSW CEPHs, including 1.0 Sustainable Design Hour

7.0 HSW CE Hours outside Texas

7.0 AIA SD/HSW Learning Units

Landscape Architects:

7.0 Texas HSW CEPHs, including 1.0 Sustainable Design Hour

7.0 HSW CE Hours outside Texas

7.0 LA CES HSW PDHs

Engineers:

7.0 PDHs

Course 3. Maintenance

--Choosing the right plant

- Role and benefits
- Drought vs. Inundation

--Creating a palette

- Formal vs. Informal
- Budget

--Maintenance

- Who?
- Techniques and equipment
- Comparing LID to conventional detention maintenance

Course 4. Hydrology considerations

--Defining hydrologic principles

--Identifying regional hydrologic considerations

--Hydrologic tools for LID

--Evaluating hydrologic outcomes

Course 5. Adapting LID

--Rainwater harvesting

- Chihuahuan Desert environment

Course 6. Case Study

--The Hahn Arroyo Rehabilitation project

The topics of this seminar include:

Course 1. Basic understanding of LID

- Understanding the status quo: conventional development and stormwater management
- Where does conventional “fail” development?
- Origins of low impact development (LID) concept
- Principles behind LID
- Benefits of LID

Course 2. Applications

- Bioretention/rain gardens
- Planter boxes
- Filter strips
- Vegetated buffers
- Vegetated swales
- Rain barrels
- Cisterns



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6.10 Stormwater Management

Provider: Rutgers University Office of Continuing Professional Education

Course Address: New Brunswick, NJ

Time: 8:30 a.m. -3:45 p.m., Oct. 24, 25 &26, 2012

Education Period: 3 days

CEUs: 1.8 CEUs,
18 TCHs for NJ water/wastewater license holders,
14 credit hours for New York State licensed professional engineers.

Cost: \$840, or \$756 for multi

Website: <http://www.cpe.rutgers.edu/courses/current/ew0302ca.html>

Managing stormwater runoff is becoming more complex every day. In order to comply with New Jersey's stormwater management rules, all types of professionals from engineers to project reviewers and developers need to acquire broader knowledge and new skills. This three-day course is designed to address these needs by presenting the most pertinent and up-to-date information on the scientific and regulatory aspects of stormwater management in New Jersey.

Featured Topics:

- New Jersey's Stormwater Management Rules, including groundwater recharge and stormwater quality requirements;
- The evaluation, selection and design of appropriate stormwater management practices and facilities;
- The design of groundwater recharging facilities using the NJDEP's Groundwater Recharge Spreadsheet;
- Methodologies to address the NJDEP's stormwater quality requirements;
- Computation of runoff volumes, rates, and hydrography using NRCS methodologies, including TR-55;
- How to incorporate maintenance, safety, and aesthetic considerations into facility design;
- The design and evaluation of non-structural stormwater measures using the New Jersey on-structural Points System (NSPS).



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6.11 HEC-RAS (A 3-day Hands-on Workshop)

Provider: Rutgers University Office of Continuing Professional Education

Course Address: New Brunswick, NJ

Time: 8:30 a.m. -3:45 p.m., Dec. 5, 6&7, 2012

Education Period: 3 days

CEUs: 1.8 CEUs,
18 credit hours for New York State licensed professional engineers.

Cost: \$840, or \$756 for multi

Website: <http://www.cpe.rutgers.edu/courses/current/ew0401ca.html>

This intensive three-day workshop will provide a comprehensive overview of the steady flow capabilities of the current version (V4.1) of the U.S. Army Corps of Engineers' Hydrologic Engineering Center River Analysis System program(HEC-RAS).

DAY 1: Beginning with a review of the program's theoretical basics, modeling capabilities, and limitations, and will continue with an explanation of program and project start-up, data input, and the various forms of output reporting. The day concludes with analysis of an example problem that will highlight such modeling decisions as cross section location and alignment, loss coefficient selection, and flood way determination.

DAY 2: Focusing on an overview of the program's capabilities, data requirements, and limitations for modeling bridge and culvert flow. It will also include a discussion of the various types of flow encountered at bridge and culverts and different modeling approaches available in the program. The course will also include analysis of a second example problem that will illustrate basic bridge and culvert modeling, including further guidance on selecting cross-section locations, loss coefficients, ineffective flow areas and overall computational approach.

DAY 3: Providing presentations and example problems on computing floodways and flood fringe volumes. The program will also include a workshop review problem and a Q&A session.

Specific topics will include:

- The basic theories of open channel, flood way, bridge and culvert flow used by HEC-RAS;
- HEC-RAS' capabilities, limitations, input needs and resources and output options;
- Appropriate bridge and culvert modeling methods
- Tips to help identify input errors and modeling problems to help insure "accurate and reasonable" output.

In addition to the presentations, a workbook and electronic copies of example problems will be provided to all attendees, who are encouraged to bring their own laptop computers (with HEC-RAS 4.1 installed) to the workshop to directly participate in the various example problems. Copies of Version 4.1 of HEC-RAS can be downloaded from the HEC website.



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6.12 Hands-on Training Courses in Soil Science, Hydrology, Geology, Water Quality, Baseline Testing, and Citizen Science

Provider: B.F. Environmental Consultants Inc.& Wilkes University

Course Address: Wilkes-Barre, PA

Time: 9:00 a.m. – 5:00 p.m. Apr.13, 2013 for Introduction to Soil Science and Morphology
9:00 a.m. – 5:00 p.m. Apr.5, 2013 for Hydric Soil Course and Field Indicators

Education Period: 1 day for each course

CEUs: 8 hours PDH for each

Cost: \$310 for each

Website: <http://www.water-research.net/course/soilsciencetraining.htm>

Course I: Introduction to Soil Science and Morphology

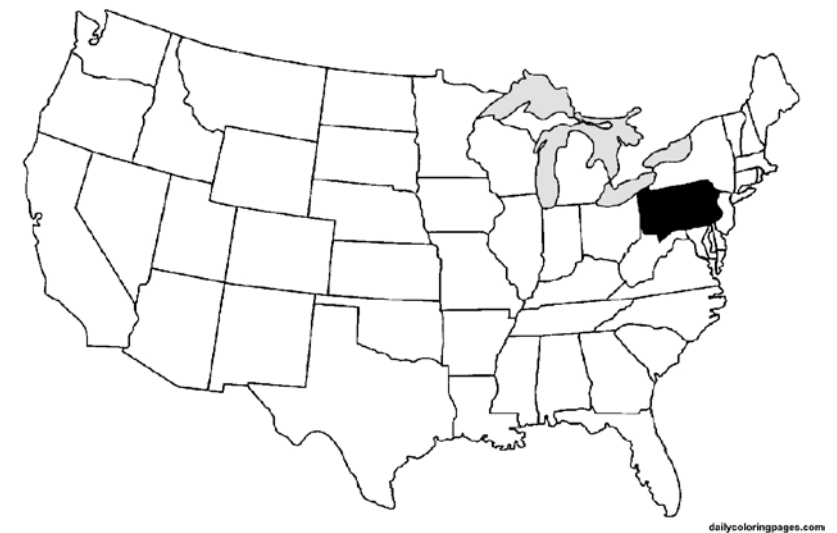
This course is an introduction to Soil Science and Soil Morphology for Engineers, PA Sewage Enforcement Officers, Geologists, and other Professionals. The course will provide an introduction into the environmental applications of soil science and soil morphology. During the presentation portion of the course, we will discuss the properties and characteristics of a soil, soil formation/transformation, and soil hydrology. During the field portion of the course, we will be learning how to describe some of the physical properties of a soil (soil texture, structure, consistency, and color), identifying soil horizons, and make interpretations related to the movement of water through the soil profile as it relates to on-site wastewater disposal and stormwater management.

Course II: Hydric Soil Course and Field Indicators

The course is an introduction to describing hydric soils and the use and meaning of the regional field indicators for hydric soils. The course is designed for the licensed profession (engineer, surveyor, and geologist), soil scientist, and wetland scientist. This class will teach you how to effectively describe soils, interpret soil reports, and who use the Hydric Soil Indicators in the Regional Supplements to the Corps of Engineers Wetland Delineation Manual. You will learn the basic processes that take place in saturated soil and how to “read the story” in a soil profile.

The training includes a field introduction to identifying layers, distinguishing concentrations and depletions, and preparing hydric soil descriptions from soil profiles. Each student will have a chance to describe and interpret a series of soils profiles and hydrological systems. This workshop is 50/50 lecture/field.

Comments: Both of these two courses are 50/50 lecture/field designed.



6.13 Slop Stability and Land Slides

Provider: University of Wisconsin-Madison

Course Address: Santa Clara, CA

Time: Mar.27-29, 2013

Education Period: 3 days

CEUs: 2.1 CEUs, or 21 PDH

Cost: \$1295, or \$1145 each for multi

Additional: Notebook and other course materials, break refreshments, lunches and certificate.

Website: <http://epdweb.engr.wisc.edu/Courses/Course.lasso?myCourseChoice=N904>

Topics include:

- Geological Aspects of Unstable Slopes
- Shear Strength of Soil Stress, Principles, and Strength Analysis Methods
- Field Investigations to Obtain Input for Slope Stability Analysis
- Slope Stability Analysis, Methods of Analysis, and Selection of Strength Parameters
- Slope Stability Analysis Programs and Modeling Procedures
- Slope Stabilization Design, Construction, and Remediation
- Rock Mechanics for Slopes and Remediation Case Studies
- Analysis and Remediation of Levee Systems
- Seismic Slope Stability
- Rock Fall and Debris Flow Mitigation
- Specialty Applications (unsaturated slopes, landfills, biostabilization)

The Department of Engineering Professional Development of University of Wisconsin-Madison provides hundreds of courses for continuing education, categorized into 7 columns. The civil engineering category contains 90 courses. They also provide courses outside of University.



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6.14 Using WinSLAMM v. 10: Meeting Urban Stormwater Management Goals

Provider: University of Wisconsin-Madison

Course Address: Madison, WI

Time: Apr.8-9, 2013

Education Period: 2 days

CEUs: 1.4 CEUs, or 14PDH

Cost: \$995

Additional: Notebook and other course materials, break refreshments, lunches and certificate

Website: <http://epdweb.engr.wisc.edu/Courses/Course.lasso?myCourseChoice=N591>

Topics include:

- The Integration of Flow with Water Quality Management Practices/Small Storm Hydrology
- Porous Pavement Control Practice
- Street Sweeping Control Practice
- Land Development Practices, Major Workshop
- Grass Swale Control Practice
- Wet Detention Pond Design and WinSLAMM
- Detention Ponds, Major Workshop
- Biofilter and Bioretention Control Practices
- Modeling Manufactured Stormwater Controls
- Catch basins and Hydrodynamic Separator Control Practices
- Cedar Hills, Example
- Comprehensive System Design, Major Workshop

The Department of Engineering Professional Development of University of Wisconsin-Madison provides hundreds of courses for continuing education, categorized into 7 columns. The civil engineering category contains 90 courses.



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6.15 Design of Stormwater, Erosion, & Sediment Control Systems

Provider: University of Arkansas and Oklahoma State University

Course Address: Bentonville, AR

Time: Sep.7-9, 2005

Education Period: 3 days

CEUs: 2.4 CEUs, or 24CEUs-HSW, or 24 PDHs

Cost: \$875

Additional: Computer lab hands-on and a field trip, course manuals

Website: <http://ce.ceat.okstate.edu/courses/dsescs.asp>

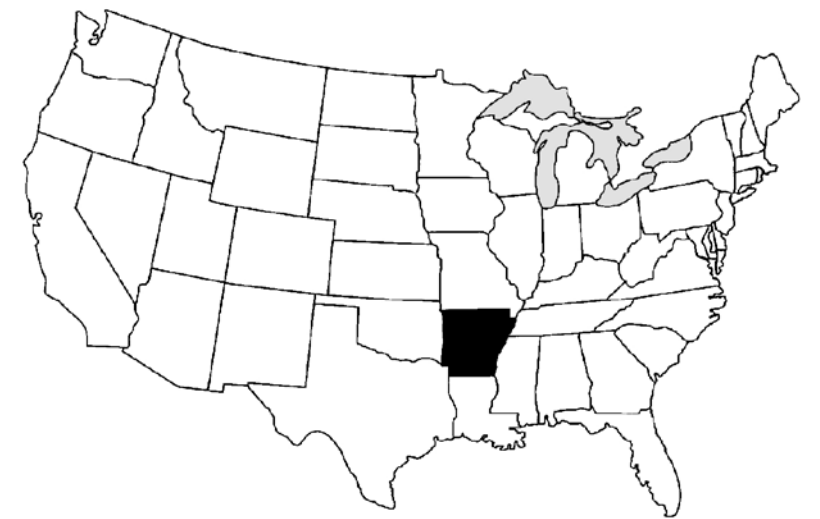
This comprehensive design course covers stormwater, sediment and erosion control from fundamental principles to practical design and field applications. The course includes use of the newest techniques and methodologies. Basic principles of environmental hydrology and sedimentology, design procedures and consideration for installation and maintenance will be covered. Attention is given to explaining why some stormwater designs work and why others do not. The course includes hands-on exercises in a computer lab and a field trip to local implementation sites. Useful software will be provided to use and take home.

Course includes:

- Introduction
- Overview of Erosion & Sediment Control Practices
- Rainfall, Runoff & Stormwater Management
- Sediment Properties & Principles of Sedimentation
- Channel Geomorphology
- Design of Stable Channels
- Erosion & Sediment Control
- Designing Sediment Retention Reservoirs
- Designing Barrier Control Systems (ditch checks, filter fences, etc.)
- New Stormwater BMPs and Low Impact Development (LID)
- Developing an effective Temporary Stormwater Erosion & Sediment Control Plan
- Field Tour

Comments:

The content of this course seems to be closely related to our project. Their course covers basic knowledge and basic skills of designing stormwater, erosion and sediment control systems, and it even includes a field trip to local implementation sites. However, they do not develop the lab-based education system. The hands-on part of this course is computer lab which can teach participants learning how to use existing tools to design, while the field trip can provide implementation view for the whole course.



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6.16 Georgia Stormwater Management Workshop

Provider: College of Environment + Design, University of Georgia

Course Address: Athens, GA

Time: Apr.4-6, 2012

Education Period: 3 days

Cost: \$420, or \$318 before Mar.20

CEUs: 2.1 CEUs

Additional: no lunch and no equipment provided (needs to be prepared)

Website: www.ced.uga.edu

This workshop includes 3 sessions and each session will be carried out for each day. The 3 sessions are Basics of Stormwater Hydrology, Using Stormwater BMPs to Control Hydrology, and Developing a Site Plan.

This course is intended for practicing engineers and landscape architects licensed in Georgia as well as related professionals such as architects, planners, erosion and sediment control design professionals. Participants will perform stormwater calculations, utilize computer-based stormwater software and, through passing the comprehensive post-test, be able to provide documentation as to their proficiency regarding the Manual and the Coastal Supplement. The test will be administered twice where necessary. All participants will receive a certificate for CEU credit.

The workshop's topics include:

Day 1

- The need for stormwater management
- Inputs for predeveloped or existing conditions
- Stormwater hydrology sizing criteria: flood protection, channel protection, water quality, and outlets
- Methods for estimating stormwater volumes
- Stormwater software exercises and demos

Day 2

- Cost and benefits of incorporating LID principles into erosion and sedimentation control plans
- Green Roofs
- Rainwater Harvesting
- Improved soil, natural area, vegetated filter strips, and level spreaders
- Infiltration practices, bioretention, swales, rain gardens
- Pervious pavers and porous pavement
- Detention and retention ponds
- Stormwater wetlands
- UGA Stormwater Tour, on campus visit to BMPs

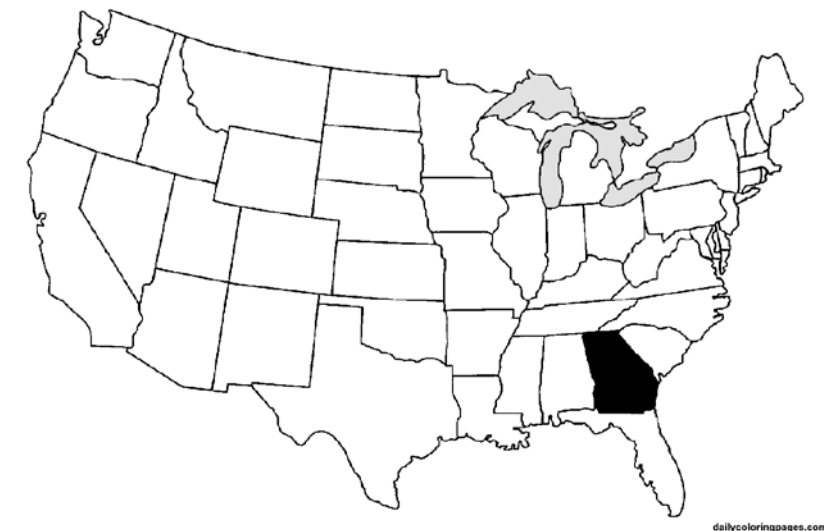
Day 3

- Inventory Analysis: critical site areas, waterways, soils, property lines
- Pre-development low-impact development: clustering, phasing, tree protection, and soil conservation
- Stormwater Design Criteria, Atlanta Regional Commission Coastal Supplement, Pollutant Load

Approach

- Sequencing practices
- LEED and sustainable site design
- Putting it all together: routing BMPs through various models, a case study site plan
- Test (2 hours)

This workshop is a university-based operation. They also developed some hands-on parts through the 3-day workshop. At the end of the first day, 1.5 hour was used for stormwater software exercises and demos; at the end of the second day, there was a two-hour UGA stormwater tour; and the afternoon of the third day is set for the design application.



6.17 2011-2012 Stormwater Management Training Series

Provider: Cornell Cooperative Extension Orange County

Course Address: Middletown, NY

Time: 8:30 a.m. - 4:30 p.m., on six different days from Nov. 2011 to May 2012

Education Period: 1 day for each class

Cost: \$225 per person/class

CEUs: 0.7 CEUs for each

Website: www.cce.cornell.edu/orange

March 8, 2012 Stormwater Management for Linear Projects

- Linear projects and the stormwater permit
- Erosion and sediment control specifics for linear projects
- Applicable SWM practices
- NYSDOT design criteria for SWM
- Hydrology and hydraulics
- Achieving runoff reduction
- Retrofits
- Maintenance

April 18, 2012 Illicit Discharge Detection and Elimination (IDDE)

- Introduction and lessons learned from Phase 1, basic program components
- IDDE terminology
- Outfalls and conditions
- Lab analysis protocols (Indoor work stations)
- Finding and fixing ID's
- Field assessment protocols
- Field exercise
- Generating sites assessment hot spots

May 10, 2012 SWPPP Preparation and Review

- The NYS Stormwater permits
- Critical elements of SWM for SWPPPs:
 - Erosion and sediment– Hydrology– Pollutant removal– Peak flow mitigation– Runoff reduction– Maintenance
 - Good housekeeping
- SWPPP outlines/checklists
- Preparation and review challenges
- Preparation of the NOI
- Roundtable with private sector, municipal and regulatory perspectives on the SWPPP process

Nov. 2, 2011 Soils and Hydrology for Green Infrastructure

- Soil characteristics and classifications
- Using the Soil Survey
- Compaction impacts
- Soil restoration techniques
- Infiltration testing
- Soil amendments for GI practices
- Basics of TR-55 Hydrology
- Impervious disconnection
- Hydrology modeling for source control/GI practices
- Small storm hydrology

Jan. 25, 2011 Applied Green Infrastructure

- Overview of the GI approach
- GI practices
- Practice selection
- Computing runoff reduction
- Design principles for GI practices
- Maintenance requirements for GI practices
- Roundtable with private sector, municipal, and regulatory perspectives on implementing GI

Feb. 29, 2011 Stormwater Ponds and Wetlands

- Characteristics
- Effectiveness and limitations
- Design elements
- Hydrology and hydraulics
- What's new and innovative
- Vegetation/planting
- Maintenance



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6.18 Current Issues in Stormwater Regulation

Provider: Water Law Resource.com

Course Address: Mechanicsburg, PA

Time: 8:30 a.m. - 4:30 p.m., Feb.19, 2013

Education Period: 1 day

Cost: \$349, or \$448 with CD & Manual

CEUs: 7.2 PDHs, 6.0 LA CES, CMs

Website: <http://www.waterlawresource.com/seminars/390521?tab=overview>

From recent litigation to changing permitting standards, failing to stay on top of current issues related to storm water regulation is risky. Participants can get answers of several questions, such as: What new case and policy decisions impact my practices? What are the latest trends in the water quality arena?

The main contents will include:

- Uncover the latest laws and regulations that will impact storm water discharges
- Discover the details in implementing Chapter 102, erosion and settlement control requirements
- Get updates on recent and future trends in storm water regulations
- Make sense of the storm water and wetland permitting controversies on brownfields sites

Topics include:

1. Legal Status of MS4s Applications and Related Stormwater Issues

- PaDEP reactions to MS4 NOIs and Applications
- USEPA Storm Water Rule Development
- Chesapeake Bay TMDL Update
- Other TMDL updates
- Empowerment of municipal authorities and update of municipal corporation codes
- PennDOT Right of Way policy update

2. Wetland and Stormwater Regulatory Issues at Brownfield Redevelopment Sites

- Overview of Federal and Pennsylvania Wetland Regulations and Permitting
- Regulatory Strategies for Properties Having Existing Wetland Contamination or Encroachment
- Storm Water Regulatory Issues for Properties Historically Impacted by Contamination
- Practical Site Design and Infrastructure Issues Related to Stormwater Management at Brownfield Properties

3. Pennsylvania's Stormwater Regulations from a Land Development Perspective

- Legal Perspective to Chapter 102 Regulations
- Permit Requirements, Compliance and Enforcement
- Future Trends in Storm Water Regulation

4. Storm Water Permit Compliance Options

- Storm Water Permit Offset Concepts
- Joint Permit PAG-13 Option
- Nutrient Trading in Pennsylvania
- Intra-Municipal and Integrated Permit Planning
- Implications for Land Development

5. Implementation of the New Chapter 102 Requirements

- Riparian Buffer Requirements
- When Buffers Are Required
- Regulatory Requirements of Buffers Waivers
- Long Term Obligations
- Notice of Termination
- Sample Instrument
- O&M Plans and Related Topics



6.19 Stormwater Retrofitting Demystified

Provider: National Estuarine Research Reserve

Course Address: Laure, MD

Time: 9:00 a.m. - 4:00 p.m., Jun.13, 2012

Education Period: 1 day

Cost: Unknown

CEUs: 6.0 CMs

Website: <http://www.coastaltraining-md.org/Course-Catalog/Watershed-Management-And-Sustainability/Stormwater-Retrofitting-Demystified!/75.aspx>

Topics include:

- State Perspectives on Stormwater Retrofitting
- Strategies to Consider Prior to Retrofits
- Basics of Stormwater Retrofitting
- The Retrofit Discovery Process
- Retrofit Costs, Delivery, and Maintenance
- Concluding Remarks

This training is a partnership with the Chesapeake Stormwater Network and DNR Habitat Restoration and Conservation program. For many communities, stormwater retrofits are a complex, mysterious and challenging topic. Local officials have a lot of questions and concerns about how on how they will impact their community and their limited budgets. At “Retrofitting Demystified!” we will present a practical, cost-effective approach to solve the local retrofit challenge. Learn about the latest retrofit techniques, including green street retrofits. Find how to quickly calculate pollutant reduction credits for your MS4 permit and Bay TMDL, as well as learning new strategies for getting the greatest reductions at the lowest cost, while maximizing local benefits.



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6.20 Designing with Natural Stone

Provider: Design Arts Seminars, Inc.

Course Address: Dallas, TX

Time: 8:00 a.m. - 5:15 p.m., Dec.12, 2012

Education Period: 1 day

Cost: \$245

CEUs: 8.0 LA CES

Website: <http://www.designartsseminars.com/courses/Course.cfm?CourseID=211>

Despite the natural durability found in stone, there are a number of applications -- both exterior and interior -- where issues can arise due to improper use, specification, installation, care, and/or maintenance. This seminar provides the knowledge base architects and designers need to successfully work with natural stone in both residential and commercial projects. Case studies provide a hands-on, problem-solving approach to designing with natural stone. We review pertinent accessibility issues and examine the sustainability of natural stone as it relates to LEED and the new International Green Building Code. Finally, we look at recent changes in the stone industry and how they impact design options.

Topics include:

Geology of Stone

- Granite characteristics
- Marble Characteristics
- Limestone Characteristics

How is Stone Processed and Packaged

- Quarrying Techniques for Stone
- Processing of Natural Stone Techniques Topic
- Finishing and Textures Techniques

Stone Applications

- Marble
- Granite
- Limestone
- Travertine

Installation Care & Maintenance

- Daily Cleaning of Stone
- Sealers Types and options
- Coating Enhancers for Stone
- Restoration and Problem solving

Stone 201

- Stone Resin Processing Changes
- Specialty Processing of textures of stone flaming new finishes
- Fabrication of Stone Slabs
- The truth about Radon and Stone

Protecting Stone

- Crack Isolation & Expansion Joints
- Waterproofing
- Soundproofing

Sustainability Issues Related to Designing with Natural Stone

- Green standards relevant to stone
- Natural Stone Council Green Standards
- Case Studies
- International Green Construction Code

Accessibility Issues Related to Designing with Natural Stone

- Stone and high traffic areas
- Texture and finishes that aid accessibility
- Stone in wet areas
- Changes in COF testing



6.21 Soil and Water Assessment Tool (SWAT) Workshops

Provider: Texas A&M University

Course Address: College Station, TX

Time: 8:30 a.m. - 5:00p.m, Feb.4-5 for Beginner, Feb.7-8 for Advanced, Feb.6 for Data Processing, 2013

Education Period: 5 days in total

Cost: \$500 or \$300 (graduate students) for the beginner and advanced, \$200 for Data Processing

Additional: 80% Hands-on designed, provides computers for attendees

CEUs: Beginner 1.6 CEUs

Advanced 1.6 CEUs

Data Processing 0.8 CEUs

Website: <http://swat.tamu.edu/education>

SWAT for Beginners (2 days)

- Introductions
- Model overview (theory)
- Model applications (theory)
- Introduction to SWAT/ArcGIS interface (GIS)
- Watershed delineation
- Land use and soil overlay
- HRU delineation
- Weather and remaining inputs to develop the SWAT model (including point sources)
- Review of summary outputs
- Finish SWAT simulation using SWAT/ArcGIS interface
- Visualization and interpretation of SWAT outputs through GenScn
- Introduction of calibration and validation techniques (theory)
- Review model calibration through the model interface
- Address user requests and clarify anything covered on the first two days

SWAT for Advanced Users (2 days)

- Welcome/introductions
- Sensitivity and calibration/validation (theory)
- Model applications
- Continue calibration/validation
- Uncertainty analysis
- Model applications
- Continue uncertainty analysis
- Discussion of individual participant's SWAT modeling issues

SWAT Data Processing for ArcSWAT Information (1 day)

The one-day Advanced Data Processing for ArcSWAT will provide users with the tools on extracting and formatting publicly available datasets for ArcSWAT (SSURGO, NEXRAD, crop data layers and point rainfall).



6.22 Professional Workshop Series

Provider: Lady Bird Johnson Wildflower Center

Course Address: Austin, TX

Time: 9:00 a.m. - 4:00 p.m., Feb.27, Mar.26, and Apr. 23, 2013

Education Period: 3 days in total

Cost: \$170 per day

CEUs: Unknown

Website: http://www.wildflower.org/edg_workshops/

Day 1: Site preparation and protection: plant-soil fundamentals

Topics will include: Vegetation Soil Protection Zones, soil survey, soil specifications, soil testing

Participants will be introduced to the concepts of a vegetation and soil management plan, including basic soil-plant relationships, soil surveys and types, soil testing and results, and testing for soil compaction and infiltration. Additionally, participants will review ecological site descriptions, map and classify vegetation types, and introduction to creating a management plan for invasive plant species using the Integrated Pest Management strategies.

Day 2: Soil preparation and installation: soil quality, characteristics and plant establishment

Topics will include: Compost, compaction, seed selection and establishment techniques

Participants will be introduced to soil preparation and protection strategies covering compost (testing and amendments), mineral soils (types and sourcing), compaction testing and BMP's, soil protection and site hygiene. Installation of plant material will focus on seed selection and sourcing, seeding rates and timing, supplemental irrigation and fertilization. Additional discussions will reinforce concepts of site ecological hygiene, erosion control, germination and vegetation monitoring.

Day 3: Site maintenance: short and long term techniques and plant identification

Topics will include: Short term and long term establishment, invasive and native species, BMPs, Integrated Pest Management

Participants will be introduced to maintenance strategies to maintain establishment and vigor of desired landscape plant material. Techniques considered include irrigation and mowing frequency, prescribed fire use, plant succession, over-seeding and monitoring of plant health. Additionally, monitoring and treatment (cultural, physical & chemical) of invasive species is discussed following the Integrated Pest Management strategy. Lastly, participants will discuss appropriate benchmarks in relation to establishing and maintaining sustainable landscapes.



6.23 Florida Stormwater, Erosion and Sedimentation Control Inspector Training and Certification Program

Provider: CHERYL L. MOORE CONSULTING, LLC

Course Address: Tampa, FL; East Point, FL; Palm Bay, FL; Deltona, FL; Orlando, FL;

Time: Depends on the address (see the table in the right)

Education Period: 2 days

Cost: \$175

CEUs: 1.2 CEUs, 12 LA CES, 8 PDHs

Website: <http://floridastormwater.com/floridastormwaterclass/Welcome.html>



February 11-12, 2013 in East Point, FL
February 19-20, 2013 in Palm Bay, FL
February 20-21, 2013 in Deltona, FL
March 14-15 in Orlando, FL
April 11-12 in Ft. Myers, FL
May 15-16, 2013 in Palm Bay, FL
August 21-22, 2013 in Palm Bay, FL
December 11-12, 2013 in Palm Bay, FL

The program curriculum was developed to educate the inspector on proper installation, inspection and maintenance of Best Management Practices (BMPs) for use during and after construction to minimize erosion and sedimentation and to properly manage runoff for both stormwater quantity and quality.

Implementation of the training program began in late 1997. To date, there are over 6500 certified inspectors throughout the state of Florida. FDEP approved instructors voluntarily teach the inspector training class throughout the year. This allows the instructors flexibility to arrange classes around their schedules.

The Inspector's Training Program

This program is a two-day class. The class follows the curriculum provided in the Florida Stormwater, Erosion, and Sedimentation Control Inspector's Manual. Upon the completion of the class, a proctored examination is administered and approximately 2-3 hours is given to complete the exam. In order to obtain the FDEP certification, a minimum passing grade of 70% must be made on the exam.

"Train The Trainer" Workshops

These workshops are offered by the FDEP twice a year in order to prepare new instructors for implementation of the inspector's training program. The workshop covers the guidelines that instructors are required to follow in order to teach the class, plus also it allows instructors the time to work on both their teaching skills and speaking abilities. In order to attend, all participants must be FDEP Certified Inspectors prior to the scheduled workshop date. Please contact Hal Lunsford if you are interested in becoming an instructor.

The objectives of this training and certification program are:

- To assure that the desired benefits of stormwater management systems are being achieved
- To assure that both the public and private sectors have enough inspectors trained in the proper installation and maintenance of BMPs during and after construction
- To assure a consistent level of technical expertise and professional conduct for all individuals responsible for inspecting erosion and sediment controls and stormwater management systems



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6.24 Principles and Practices of Erosion and Sediment Control (ESC) CEU Series

Provider: Stormwater USA Online Training and Certification

Course Address: Online

Education Period: 9 hours

Cost: \$449

CEUs: 0.9 CEUs, or 9.0 PDHs

Website: <http://www.stormwaterusa.com/PPESC.html>

This course is about the Erosion Control, Sediment Control and Pollution Prevention; The topic mainly focuses on how to identify and properly implement Best Management Practices (BMPs) to control sediment on a construction project site, as well as how to control erosion and prevent pollutant.

6.25 Intro to Erosion and Sediment Control - Subcontractor Short Course

Provider: Stormwater USA Online Training and Certification

Course Address: Online

Education Period: 1 hours

Cost: \$99

CEUs: 0.1 CEUs, or 1.0 PDHs

Website: <http://www.stormwaterusa.com/>

Educates and prepares subcontractors on the basics of stormwater compliance and the importance of maintaining erosion and sediment control Best Management Practices (BMPs) on a construction site.

These series of courses are relatively expensive comparing to other online courses.

This provider claims that they have several advantages:

- 1) 100% Money Back Guarantee
- 2) EPA Reviewed and Recognized
- 3) United States Green Build Council education provider
- 4) 24/7 access to your training
- 5) Enter and exit your course as needed
- 6) Print your certificate upon completion
- 7) Maintain full access to your course after completion
- 8) 400+ document library, which contains state specific and federal guidelines and forms



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6.26 EPA Stormwater Management Training Course Online

Provider: EPACampus.com

Course Address: Online

Education Period: 8 hours

Cost: \$95

CEUs: 0.8 CEUs

Website: <http://www.epacampus.com/stormwater-management-erosion-control-training.cfm#>

This course teaches the Best Management Practices (BMP) that Erosion Control supervisors and Project Managers must know in order to manage erosion and sedimentation at construction sites. Objectives of this course include the erosion and sedimentation process, the duties of an Erosion Control Supervisor/Project Manager, regulatory requirements, materials handling and BMPs for erosion and sediment control.

6.27 Stormwater Management during Construction

Provider: EPACampus.com

Course Address: Online

Education Period: 8 hours

Cost: \$95

CEUs: 0.8 CEUs

Website: <http://www.epacampus.com/online-environmental-compliance-safety-training/>

This course has been developed for the Erosion Control Supervisor Responsible for the proper installation, maintenance and inspection of Best Management Practices (BMPs) for the control of erosion and sedimentation at construction sites.

Both of the two courses cover similar topics:

- Regulatory Requirements
- The Problem of Erosion and Sedimentation
- Best Management Practices for Erosion Control
- Best Management Practices for Sediment Control
- Materials Handling and Waste Management



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6.28 Stormwater Management: An Introduction

Provider: RedVector.com, Inc.

Course Address: Online

Education Period: 2 hours

Cost: \$77.90

CEUs: 0.2 CEUs, or LA CES 2.0, or PDHs 2.0

Website: http://www.redvector.com/course-details.aspx?id=c6b9685b-b020-498d-954f-e0ba88eb2cf5&lp=ctR/Tw2+2Bs=&hours=2.00&backnavkey=CART_CATALOG

This 2-hour interactive online course reviews the basics of stormwater management, which is receiving increased scrutiny because of EPA Phase II stormwater regulations. Most of the information presented is available from public reports and vendor websites. This course is presented in two sections.

Contents include:

- List sources of stormwater.
- Explain regulatory driving forces behind stormwater mitigation.
- Discuss discharge options.
- Identify pollutants of concern.
- Demonstrate preliminary treatment design.

6.29 Erosion & Sediment Control

Provider: RedVector.com, Inc.

Course Address: Online

Education Period: 8 hours

Cost: \$215.60

CEUs: 0.8 CEUs, or LA CES 8.0, or PDHs 2.0

Website: http://www.redvector.com/course-details.aspx?id=bb6d86ac-4051-49f5-9b2a-7115a16dfb1c&lp=bk1UtEUWtTw=&hours=8.00&backnavkey=CART_CATALOG

This 8-hour online course will present an erosion and sediment control design manual and require the student to employ design standards that are applicable to construction projects anywhere. This course includes a multiple-choice quiz at the end.

Topics include:

- | | | |
|---------------------------|------------------------------|-------------------------------|
| --Site Preparation | --Runoff Conveyance Measures | --Sediment Traps and Barriers |
| --Surface Stabilization | --Outlet Protection | --Stream Protection |
| --Runoff Control Measures | --Inlet Protection | --Other Related Practices |

RedVector.com, Inc. is one of the most important providers of online credited courses for architects, engineers, and landscape architects.



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6.30 Pervious Concrete: A Stormwater Solution

Provider: NRMCA Education and Training

Course Address: Webinar

Education Period: 8 hours, 12:00-1:30p.m. (East), May 20-23, 2013

Cost: \$295

CEUs: 0.8 CEUs, 8.0 LA CES, 8.0 PDHs, 8.0 AIA-CES HSW LUs

Website: http://www.nrmca.org/education/Seminars/Pervious_Stormwater-Solution_ONLINE.htm

Topics include:

- Economic and Environmental Benefits
- Hydrological and Structural Design
- Specifications, Mix Design and Test Methods
- Construction Techniques
- Contractor Certification
- Durability and Maintenance
- Local Applications and Case Studies

This course is a distant education course. They invite instructors to give out lectures during a designated time. This online course consists of 4 live Webinars along with downloadable presentations, readings, and unit quizzes. Attendance at all four Webinar sessions is encouraged. However, if participants must miss a scheduled Webinar, you will have an opportunity to view a recording.

6.31 On-Demand Webinar: Construction Stormwater BMPs

Provider: American Society of Civil Engineers

Course Address: ON-demand Webinar

Education Period: 1hours

Cost: \$145 individual, \$199 less than five people, \$299 five or more

CEUs: 0.1 CEUs, 1.0 PDHs

Website: <http://www.asce.org/Content.aspx?id=12884903581>

This is a recording of the live webinar “Construction Stormwater BMPs”. Many construction projects include excavation and fill. These soil disturbing activities create the potential for erosion and necessitate the use of Best Management Practices (BMPs). A wide variety of BMPs have been developed, but some designers and contractors use only a few of them. Sometimes this is due to unfamiliarity with other options and sometimes it is due to the mistaken impression that one BMP can be used for all situations.

Contents:

- BMPs for slopes include silt fence, slope roughening and erosion control blankets.
- BMPs for small drainages include sedimentation basins, sediment traps, check dams, fiber rolls and straw bales.
- BMPs for inlets include silt fence, straw bales, fiber rolls and inlet covers.



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6.32 LEED Continuing Education (CMP) 15 & 30 Hour CE Packages

Provider: Green Education Service

Cost: \$199 for 15hr, \$399 for 30hr, or \$499 for self-choice package

Course Address: Webinar

CEUs: Depends

Website: <http://www.greenedu.com/leed-cmp-packages>

Education Period: 15 hours or 30 hours

1. Silver - 15-Hour Live Webinar Package for LEED GA - \$199

CEUs: 15.0 GBCI CE Hours (Including 8.5 LEED Specific Hours)
15.0 AIA HSW/SD LUs

Courses Included (CMP Hrs / LEED Specific Hrs):

Educating the Client (2/2)	Going Green Being Green Saving Green (1.5/0)	Understanding Green Roofs (1/0)
Introduction to Sustainable Sites (1/0)	Minimum Program Requirements (1.5/1.5)	Indoor Air Quality Overview (1/0)
Exemplary Performance for LEED NC (3/3)	Green Cleaning Strategies (2/2)	Water Efficiency (1/0)
Life-Cycle Assessments and Analysis (1/0)		

*These courses are NOT pre-recorded but are delivered by one of our LEED team faculty members.

This CMP package is pre-approved to fulfill the 2-year credential maintenance requirement for LEED Green Associates and can be completed in as quickly as 2 weeks.

2. Gold - 30-Hour Live Webinar Package for LEED AP - \$399

CEUs: 30.0 GBCI CE Hours (Including 8.5 LEED Specific Hours)
30.0 AIA HSW/SD LUs

Educating the Client On Green Building	Site Considerations: Where to Develop	Introduction Energy & Atmosphere
Low-Emitting Materials	Going Green, Being Green, Saving Green	Understanding Green Roofs
Exemplary Performance for LEED NC	Stormwater Management	Introduction to Indoor Environmental Quality
Process Water Management	Integrated Project Delivery	Urban Heat Island Effect
Green Cleaning Strategies	Minimum Program Requirements of LEED	Life-Cycle Assessments
		Water Efficiency

*These courses are delivered LIVE by one of our experienced faculty members.

These CMP webinar packages are pre-approved by GBCI to fulfill the 2-year Prescriptive Credential Maintenance requirements for LEED AP BD+C, LEED AP ID+C, or LEED AP O+M, and can be completed in as quickly as 2-3 weeks.

3. Platinum - Unlimited Online Anytime For LEED CMP - \$499

1 year of unlimited access to on-demand online training, covering topics on LEED, sustainable design, and general construction practices. This extensive course catalog contains over 1,000 hours of continuing education courses approved for GBCI CMP, AIA, IDCEC, PE and most other major continuing education requirements for professionals in the AEC industry.

All courses are prerecorded, you can easily fit them in around your busy schedule.

Residential Green Building (4)	Stormwater Harvesting: A Green Concept (3)	Solar Electric Generation: Technologies (5)
Biofilters: Approach to Pollutants (2)	Renewable Sources of Energy: Wind Power (3)	Sustainable Design in Brick Masonry (1)
Intro to High Performance Guidelines (2)	Stormwater Management (3)	Green Design: Brownfield Redevelopment (2)
Sustainable Design Materials & Resources (3)	Green Design: Sustainable Lighting Design (3)	Going Green with BIM and GIS (2)
Achieving LEED Credits in NC Projects (6)	Sustainable Design - A Primer (2)	Green Urban Design (2)

This CMP package fulfills the 2-year credential maintenance requirement for LEED GA & LEED AP (BD+C, ID+C, or O+M) and can be completed as quickly as 15 or 30 hours from the moment you login.



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PART 3

Analysis and SWOT



SOUTH REGION WEST UNIVERSITY TRANSPORTATION CENTER

1. Context Analysis
2. Site Analysis
3. SWOT-Strength
4. SWOT-Weakness
5. SWOT-Opportunity
6. SWOT-Threat

SCHEDULE REVIEW

- The schedule

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.
Task 1. Review training course.	█	█	█									
Task 2. ID strengths & weaknesses.	█	█	█									
Task 3. Design charrette.				█	█	█						
Task 4. Course modules.				█	█	█	█					
Task 5. Large-scale models.							█	█	█	█		
Task 6. Program brochures.										█		
Task 7. Master plan and final report.										█	█	█

DONE January, 2013

- Following the schedule, the second task was finished by the end of January, 2013, coming out with this part of report as a phasing product.

PURPOSE

- This part of the report is to analyze the existing environmental physical condition of the SEC Lab. Therefore, we can identify our strengths and weaknesses.

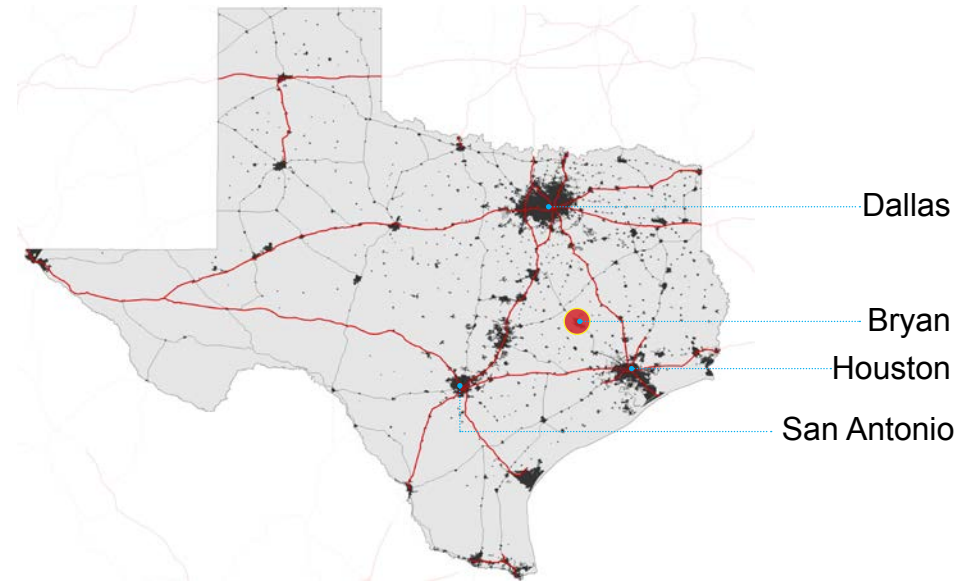
1. CONTEXT ANALYSIS

1.1 Regional Geological Context



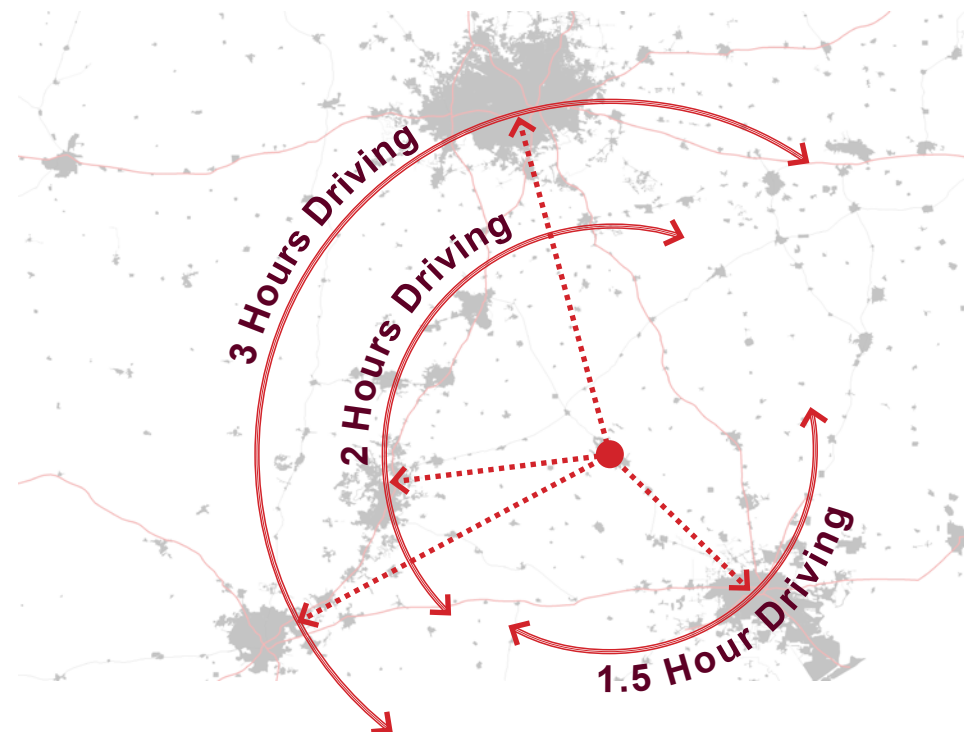
Texas in the United States

Texas is located in South Central United States. As the second largest and also second most populous state in the US, Texas includes Houston, the fourth largest city nationwide.



Texas Triangle

The Sediment & Erosion Control (SEC) Lab is located in Texas A&M Riverside Campus in Bryan, which is in the center of “Texas Triangle”.



- From Bryan to **Houston**: **1.5-Hour** Driving Distance
- From Bryan to **San Antonio**: **3-Hour** Driving Distance
- From Bryan to **Dallas**: **3-Hour** Driving Distance
- From Bryan to **Austin**: **2-Hour** Driving Distance

Data source: GIS data from Texas Natural Resources Information System (TNRIS), website: <http://www.tnris.org/>

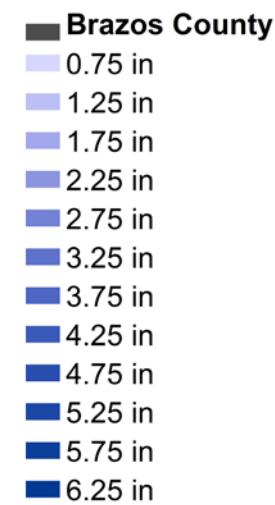
1.2 Climate Context

1.2.1 Precipitation



Monthly Average Precipitation in Texas

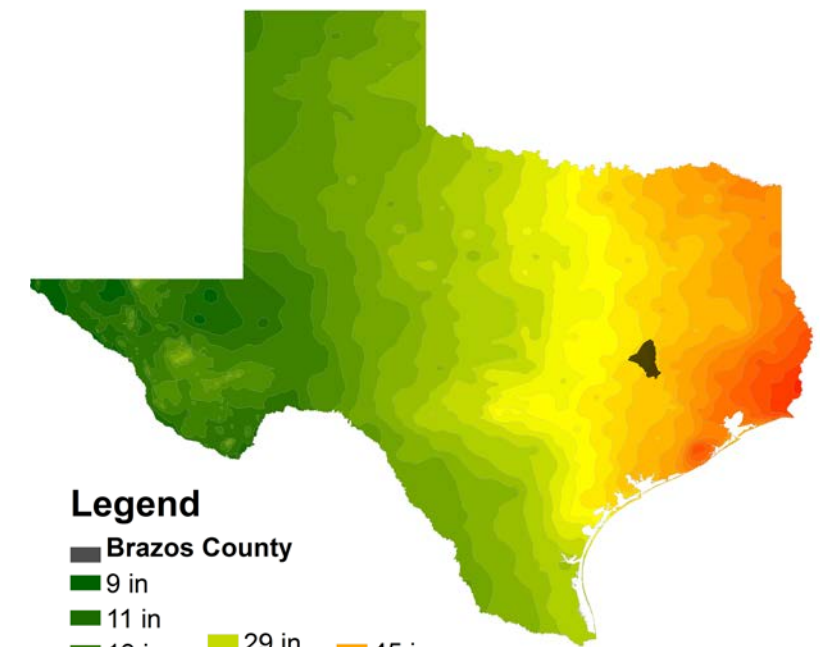
Legend



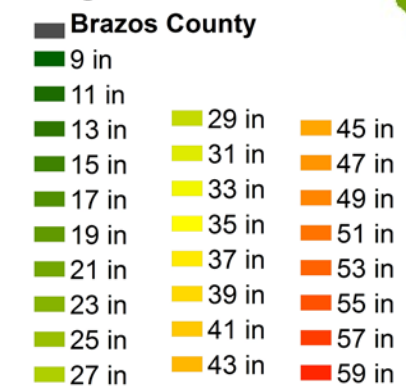
Typically, the most heavy rain events in Brazos county happen in **May**, reaching 5.75 inches per month. While in February, April and October, it is also rainy in Brazos County.

Precipitation of Texas

Basically, the precipitation decreases from east to west in Texas. Brazos county is located in the mid-east part of Texas, with the annual precipitation of 39 inches.



Legend



Annual Average Precipitation in Texas

Data source: GIS data from Texas Natural Resources Information System (TNRIS), website: <http://www.tnris.org/>

1.2 Climate Context

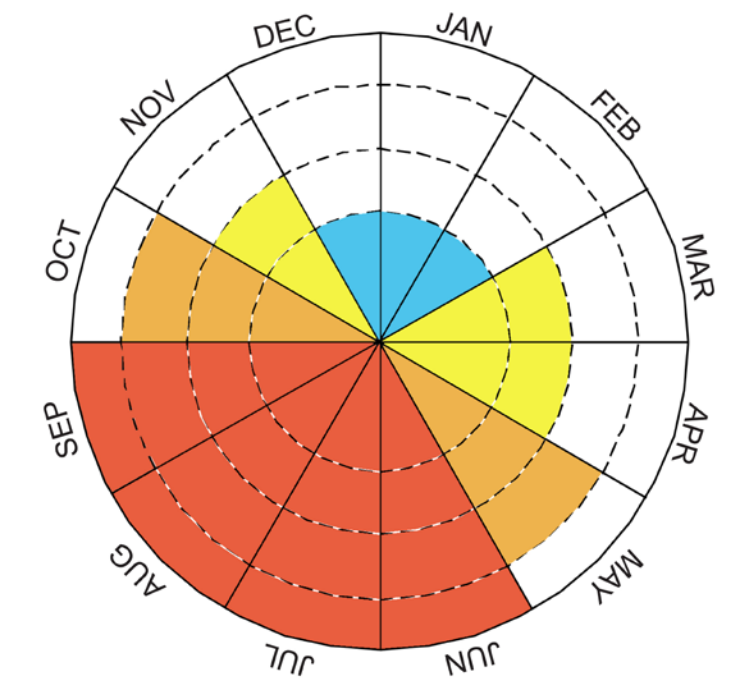
1.2.2 Temperature

Temperature in Brazos

According to the annual average temperature and monthly average temperature data of Brazos, we find that **from March to May** and **from October to November** the temperature is comfortable for outdoor activities.

The most comfortable months are **March, April, and November**.

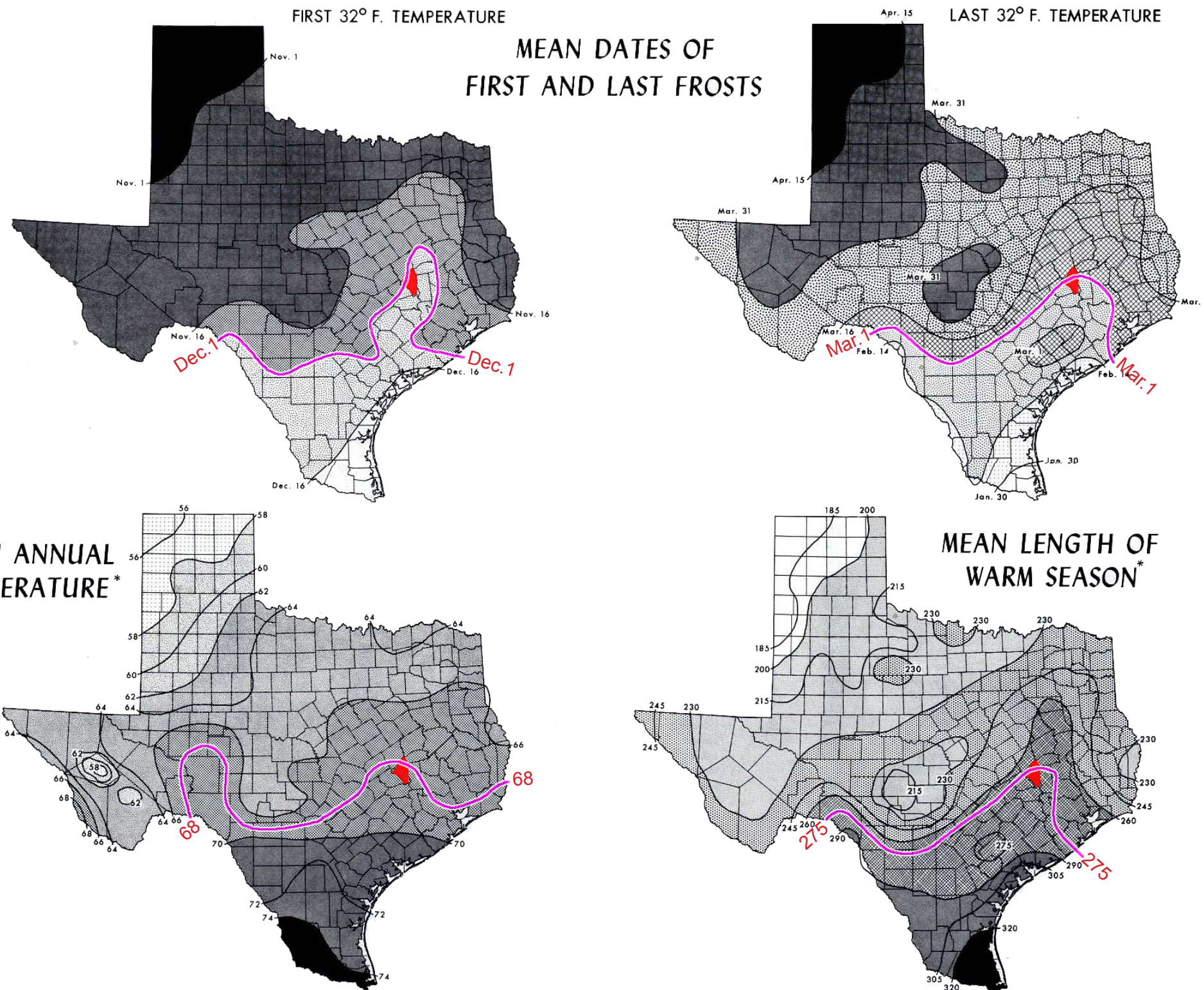
Season Wheel--Monthly Average High Temperature



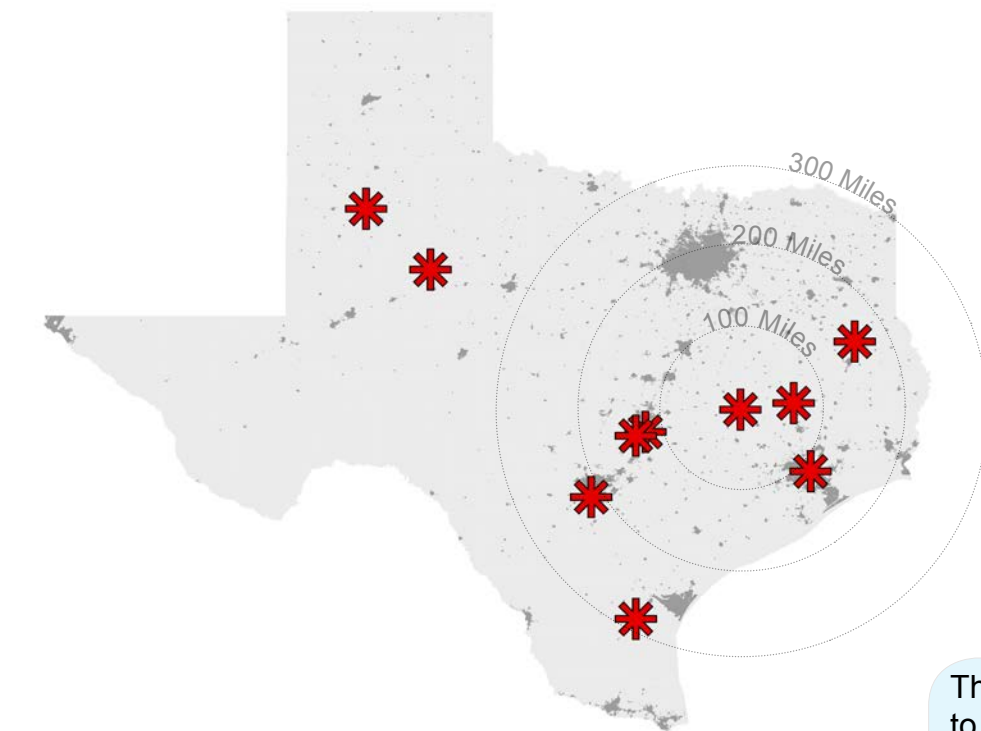
■ Cool <65°F ■ Warm 80°F-90°F
■ Comfortable 70°F-80°F ■ Hot >90°F

Sources: <http://www.weather.com/weather/wxclimatology/monthly/graph/77845>

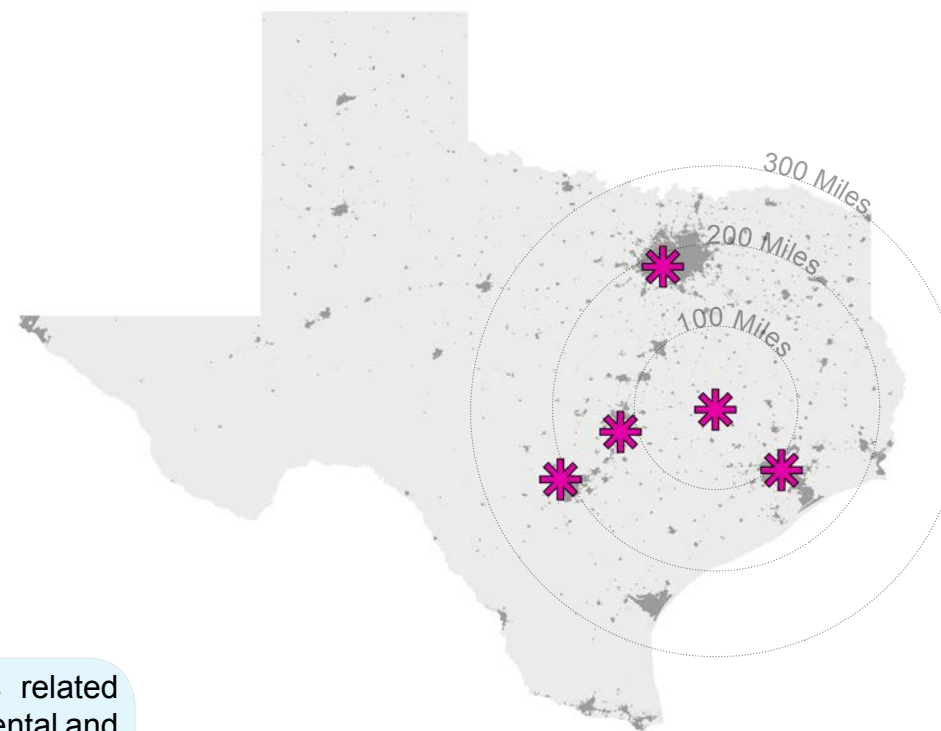
Map Source: Perry-Castañeda Library Map Collection
 Website: http://www.lib.utexas.edu/maps/atlas_texas/



1.3 Potential Market Context ---- Academic Schools

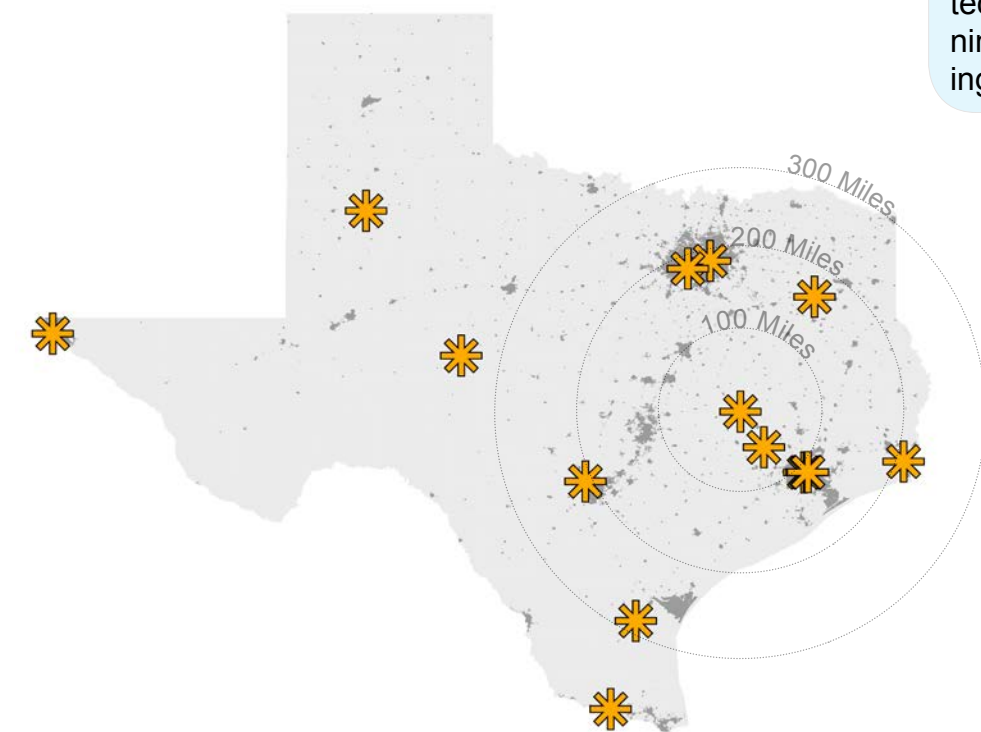


Landscape Architecture Schools in Texas

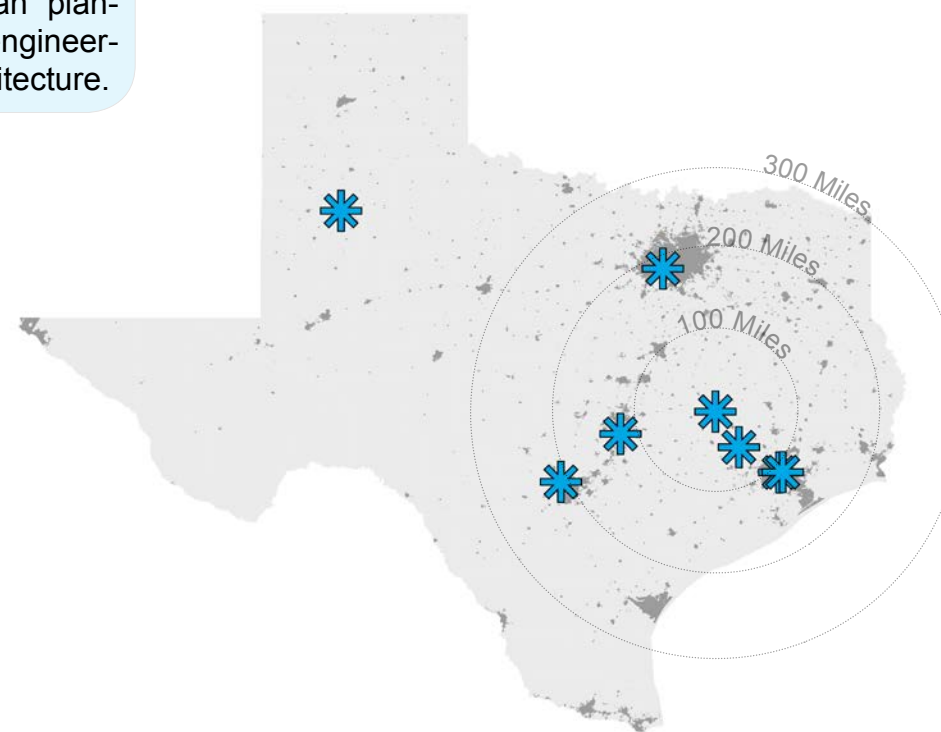


Urban Planning Schools in Texas

The careers related to Environmental and Planning Program are landscape architecture, urban planning, civil engineering and architecture.



Civil Engineering Schools in Texas



Architecture Schools in Texas

1. Landscape architecture Schools in Texas:

- Texas A&M University
- University of Texas -- Austin
- Austin Community College
- Houston Community College
- Palo Alto College
- Texas A&M University-Kingsville
- Texas Tech University
- Sam Houston State University
- Stephen F. Austin State University
- Western Texas College

2. Urban Planning Schools in Texas:

- Texas A&M University
- University of Texas -- Austin
- University of Texas -- Arlington
- University of Texas -- San Antonio
- Texas Southern University

3. Civil Engineering Schools in Texas:

- Texas A & M University
- The University of Texas at Arlington
- The University of Texas at El Paso
- U.S. News National University Ranking+
- The University of Texas at Tyler
- The University of Texas at San Antonio
- U.S. News National University Ranking+
- Texas Southern University
- Texas Tech University
- South Texas College
- University of Houston-Downtown
- University of Houston
- Lamar University
- Prairie View A & M University
- Rice University
- San Antonio College
- Southern Methodist University
- Texas A & M University-Kingsville

4. Architecture Schools in Texas:

- Texas A&M University
- Prairie View A&M University
- Rice University
- Texas Tech University
- The University of Houston
- The University of Texas at Arlington
- The University of Texas at Austin
- The University of Texas at San Antonio

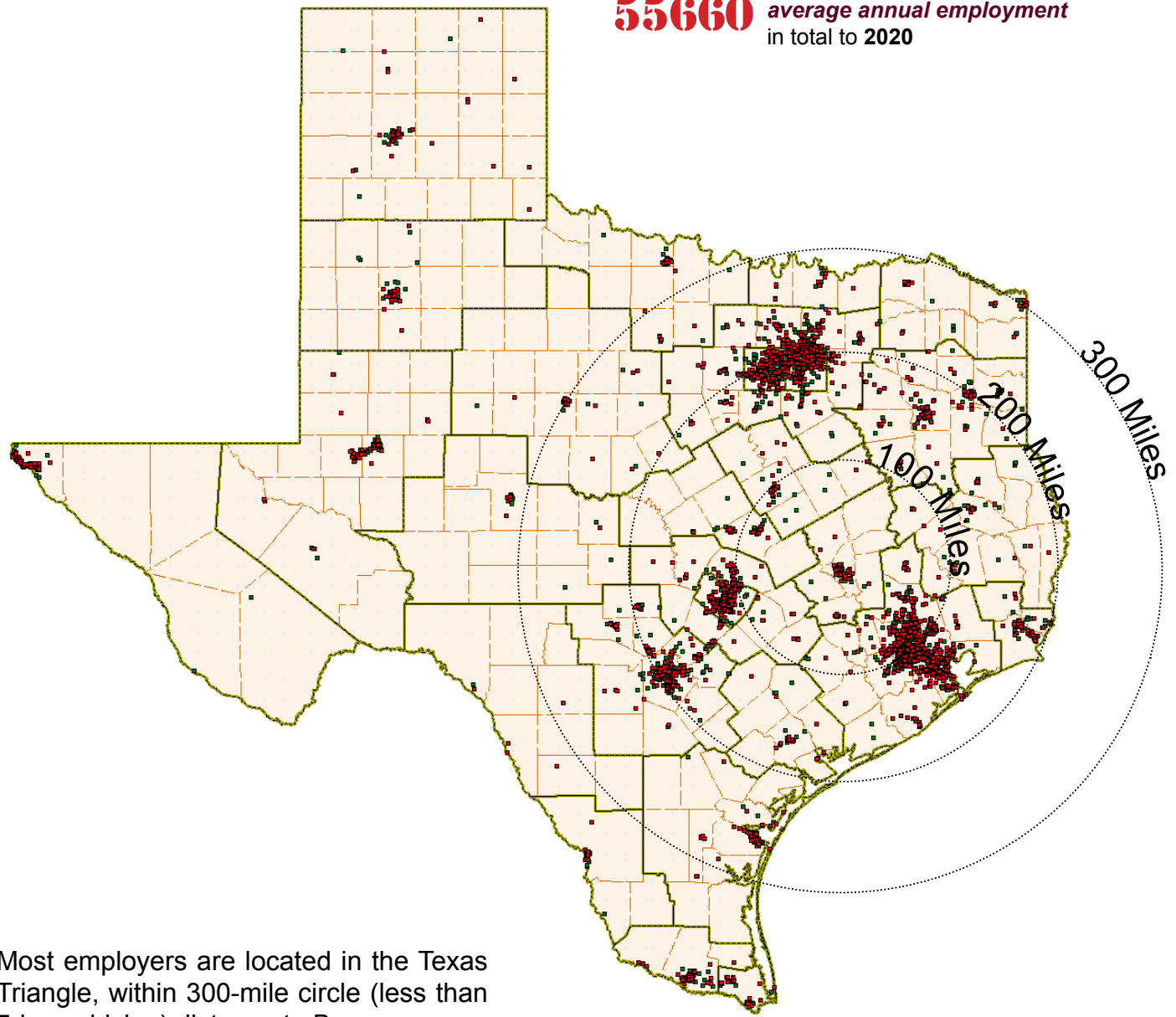
Data source: GIS data from Texas Natural Resources Information System (TNRIS).
Website: <http://www.tnr.is.org/>

1.4 Potential Market Context ---- Professionals

18 Potential professionals related to our project **percent increase** from 2010~2020

47160 Potential professionals related to our project **average annual employment** in total until **2010**

55660 Potential professionals related to our project **average annual employment** in total to **2020**



Most employers are located in the Texas Triangle, within 300-mile circle (less than 5-hour driving) distance to Bryan.

The Cluster of Architecture and Engineering Service Distribution in Texas
 Data source: GIS data from Texas Workforce Committee (TWC) Clusters Geographic Information System.
 Website: <http://www.texasindustryprofiles.com/apps/gis/clustersgis/>

OCC Code	Occupation Title	Annual Average Employment to 2010	Annual Average Employment to 2020	Number Change 2010~2020	Percentage Growth 2010~2020
17-0000	Architecture & Engineering Occupations	218,160	258,230	40,070	18.4%
17-1000	<u>Architects, Surveyors, and Cartographers</u>	<u>15,430</u>	<u>18,440</u>	<u>3,010</u>	<u>19.5%</u>
17-1011	Architects (Except Landscape and Naval)	8,450	10,030	1,580	18.7%
17-1012	Landscape Architects	1,220	1,400	180	14.8%
17-1021	Cartographers and Photogrammetrists	920	1,170	250	27.2%
17-1022	Surveyors	4,840	5,850	1,010	20.9%
17-2000	<u>Engineers</u>	<u>133,700</u>	<u>162,090</u>	<u>28,390</u>	<u>21.2%</u>
17-2011	Aerospace Engineers	8,990	10,530	1,540	17.1%
17-2021	Agricultural Engineers	290	350	60	20.7%
17-2031	Biomedical Engineers	1,440	2,490	1,050	72.9%
17-2041	Chemical Engineers	4,960	5,760	800	16.1%
17-2051	Civil Engineers	21,410	25,800	4,390	20.5%
17-2061	Computer Hardware Engineers	7,620	8,730	1,110	14.6%
17-2071	Electrical Engineers	11,730	13,750	2,020	17.2%
17-2072	Electronics Engineers, Except Computer	12,710	14,440	1,730	13.6%
17-2081	Environmental Engineers	3,160	3,860	700	22.2%
17-2111	Health and Safety Engineers, (Except Mining Safety Engineers and Inspectors)	2,200	2,530	330	15.0%
17-2112	Industrial Engineers	13,790	16,340	2,550	18.5%
17-2121	Marine Engineers and Naval Architects	740	910	170	23.0%
17-2131	Materials Engineers	1,650	2,050	400	24.2%
17-2141	Mechanical Engineers	16,920	20,060	3,140	18.6%
17-2151	Mining and Geological Engineers (Including Mining Safety Engineers)	600	760	160	26.7%
17-2161	Nuclear Engineers	490	580	90	18.4%
17-2171	Petroleum Engineers	17,670	24,420	6,750	38.2%
17-2199	Engineers, All Other	7,360	8,750	1,390	18.9%
17-3000	<u>Drafters, Engineering Technicians, and Mapping Technicians</u>	<u>69,030</u>	<u>77,700</u>	<u>8,670</u>	<u>12.6%</u>
17-3011	Architectural and Civil Drafters	8,740	8,820	80	0.9%
17-3012	Electrical and Electronics Drafters	3,900	4,220	320	8.2%
17-3013	Mechanical Drafters	5,390	6,260	870	16.1%
17-3021	Aerospace Engineering and Operations Technicians	920	1,050	130	14.1%
17-3022	Civil Engineering Technicians	11,310	12,570	1,260	11.1%
17-3023	Electrical and Electronics Engineering Technicians	16,190	18,110	1,920	11.9%
17-3025	Environmental Engineering Technicians	1,320	1,650	330	25.0%
17-3026	Industrial Engineering Technicians	3,890	4,660	770	19.8%
17-3027	Mechanical Engineering Technicians	4,340	4,990	650	15.0%
17-3029	Engineering Technicians, (Except Drafters, All Other)	4,840	6,020	1,180	24.4%
17-3031	Surveying and Mapping Technicians	6,220	7,150	930	15.0%

Table: Texas Long-term Employment Occupational Projections 2010~2020
 Data source: Texas Workforce Committee (TWC) -- Labor Market Information
 Methodology available on Website: <http://www.tracer2.com/?PAGEID=67&SUBID=114>

1.5 Potential Market Context ---- Public

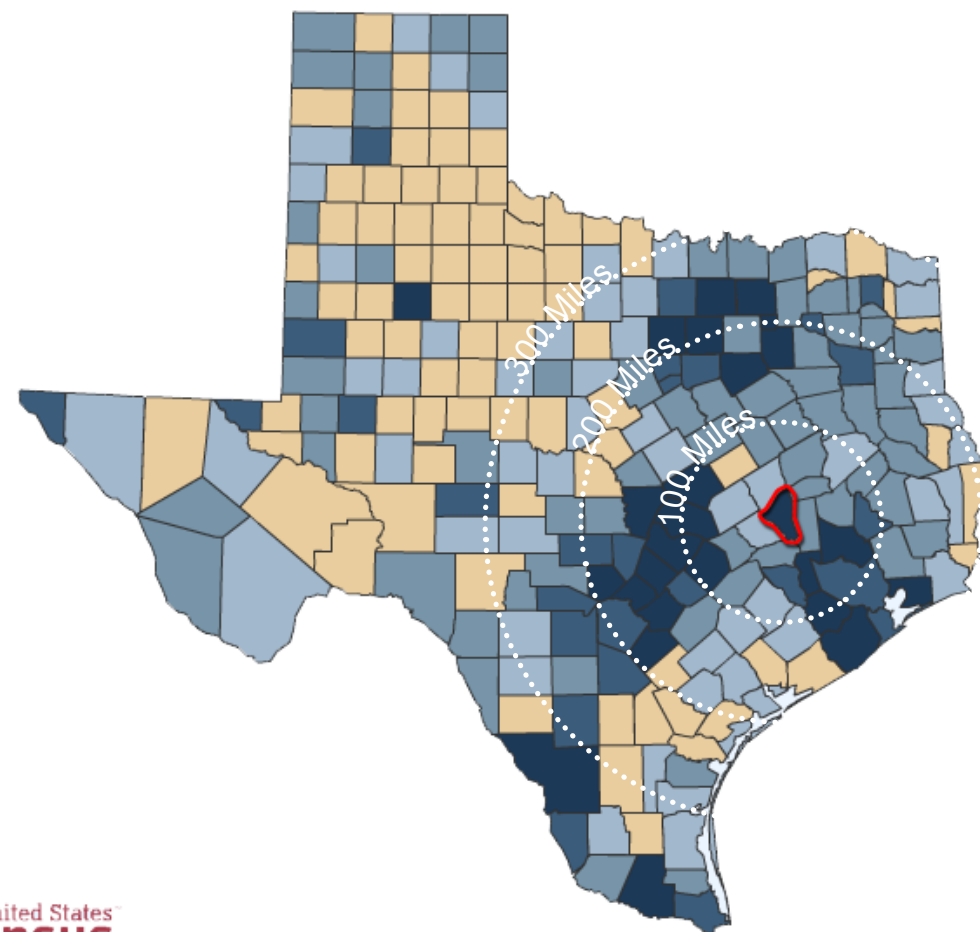
1.5.1 Increasing Population

2010 CENSUS RESULTS

Texas

STATE POPULATION: 25,145,561

POPULATION CHANGE BY COUNTY: 2000-2010



- State population greatly increased especially in the Texas Triangle area during the past decade, providing a great potential public market for our project.

2000~2010 Population Change at County Level in Texas

Map source: United States Census Bureau.

Website: <http://txsdc.utsa.edu/Data/Decennial/2010/Redistricting/IMap.aspx>

STATE POPULATION BY RACE
TEXAS: 2010

PERCENT OF POPULATION	CHANGE 2000-2010
White alone 70.4%	19.6% ↑
Black or African American alone 11.8%	23.9% ↑
American Indian and Alaska Native alone 0.7%	44.4% ↑
Asian alone 3.8%	71.5% ↑
Native Hawaiian and Other Pacific Islander alone 0.1%	50.0% ↑
Some Other Race alone 10.5%	7.8% ↑
Two or More Races 2.7%	31.9% ↑

STATE POPULATION BY HISPANIC OR LATINO ORIGIN
TEXAS: 2010

PERCENT OF POPULATION	CHANGE 2000-2010
Hispanic or Latino 37.6%	41.8% ↑
Not Hispanic or Latino 62.4%	10.6% ↑

1.5.2 Increasing Income

- In 2012, according to the U.S. Bureau of Economic Analysis, the total personal income (TPI) in Texas reached \$1.07 trillion dollars, which is an increase of 71% from 2002 of \$626.7 billion.

(Reference: The Business Journals, 10.17, 2012, <http://www.bizjournals.com/>)



1.5.3 Increasing Interest in Environment

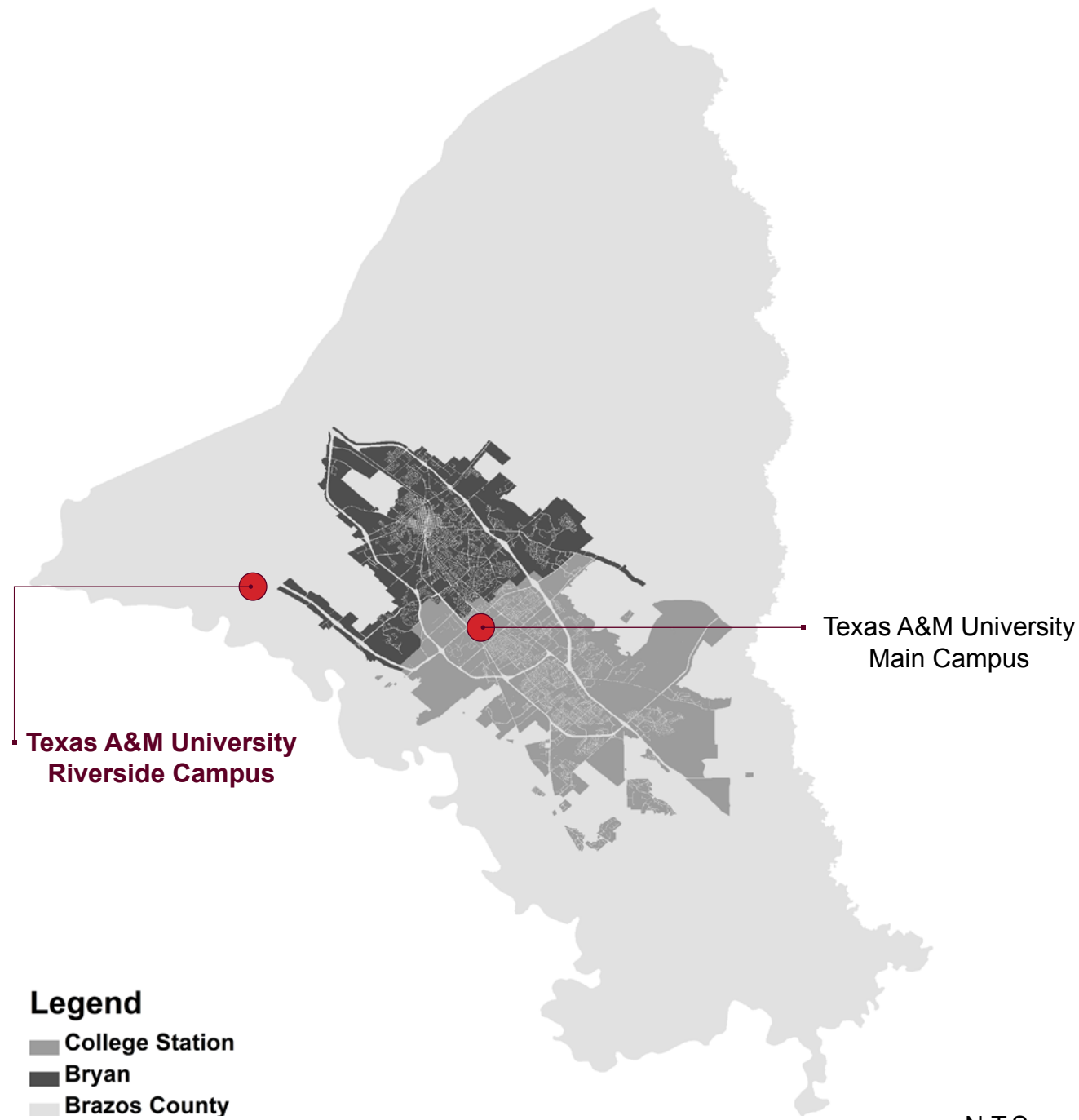
- As environmental issue gradually attracts more and more public concerns, the Environmental and Planning Program exactly catches up with this trend today, tending to grow up with the growing public concerns as well as the market.



Photo source: www.sustainablecitynetwork.com

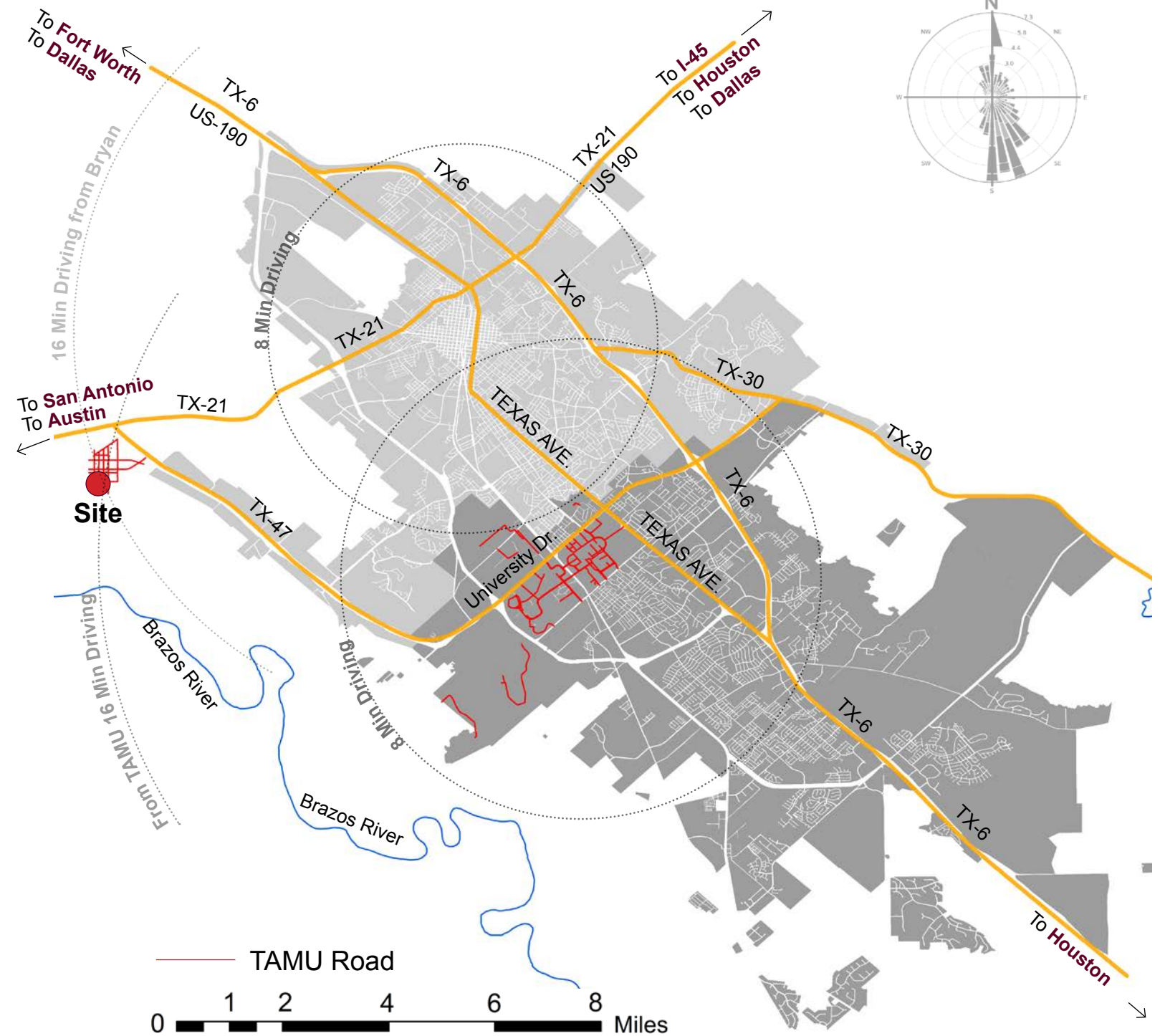
2. SITE ANALYSIS

2.1 Site Location



Location

The Sedimentation and Erosion Control Laboratory (SEC) is located in Texas A&M University Riverside Campus, which is to the northwest of Bryan, near the Brazos River.



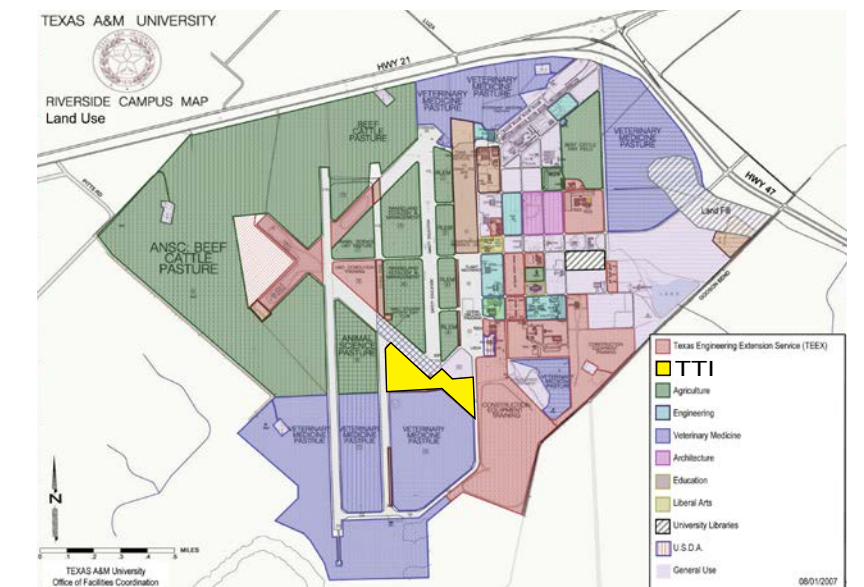
2.2 Site Boundary



Riverside Campus

The land of Riverside Campus is about 1,900 acres. The base was Bryan Air Force Base upon separation of the Air Force from the Army in 1947. Between 1949 and 1953, an estimated 5,500 men studied and lived at the Annex on the former Bryan Air Force Base, which was deactivated in May 1961. The land and buildings were deeded to Texas A&M University in 1962.

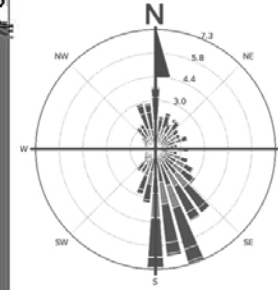
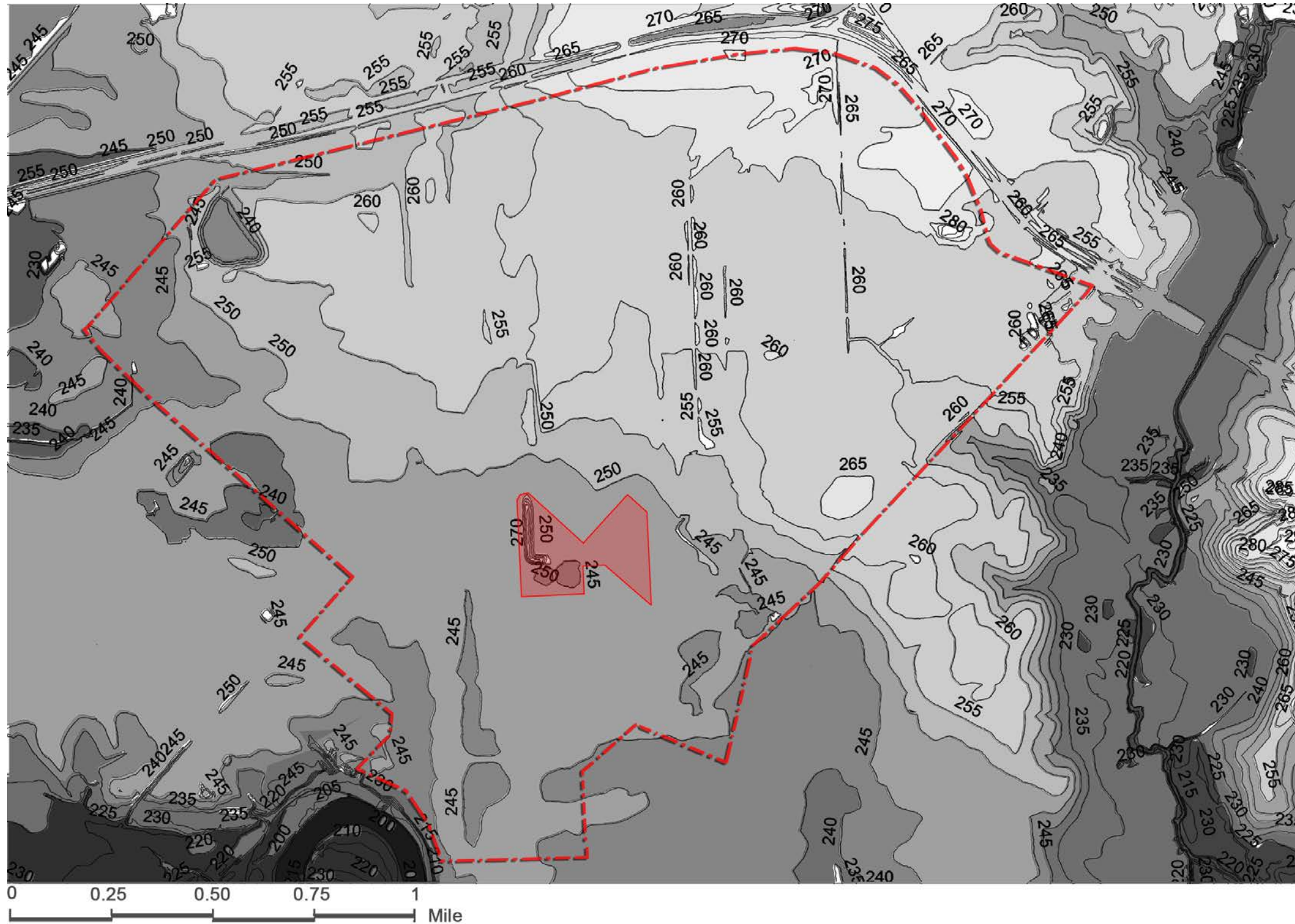
Reference from: <http://www.tshaonline.org/handbook/online/articles/qbb06>



Riverside Campus Land Use Map 2007

Map Source: <http://fcor-old.tamu.edu/downloads/Riverside%20Campus%20Use.2007.Land%20Use%20Map.pdf>

2.3 Topography

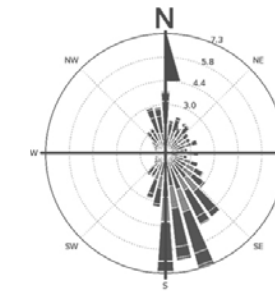
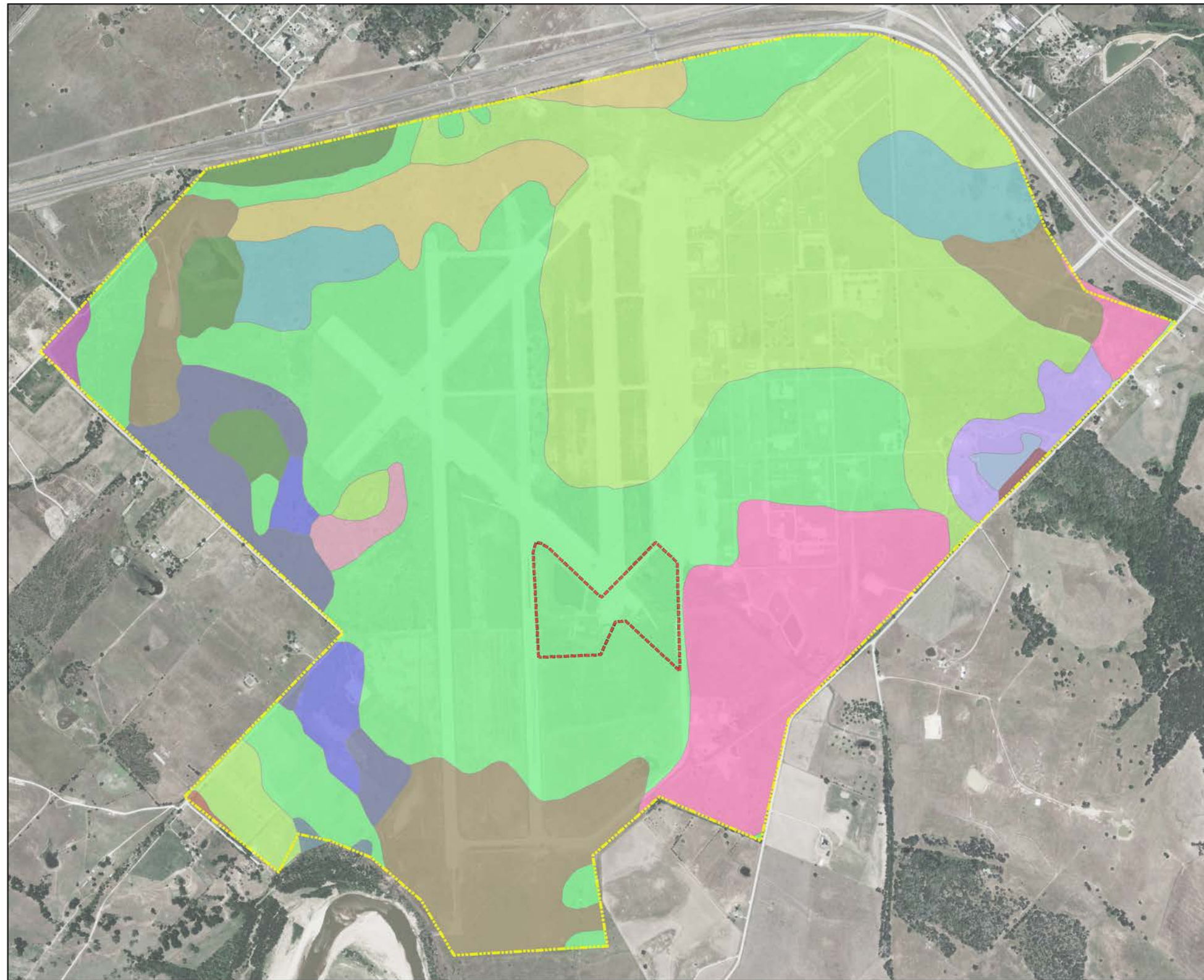


Legend

- SEC Lab
- Riverside Campus Boundary
- Contours

Topography Map of Riverside Campus

2.4 Soil Analysis



Legend

- SEC Lab Boundary
- Riverside Campus Boundary
- AxB
- BuA
- ChC
- CrB
- CrB2
- DfC
- EuB
- MaA
- RaB
- SkB
- SmC
- SmD
- TaA
- Us
- W
- Wy
- WzA

SEC Lab Site Soil

Burleson Clay

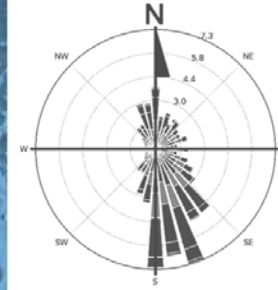
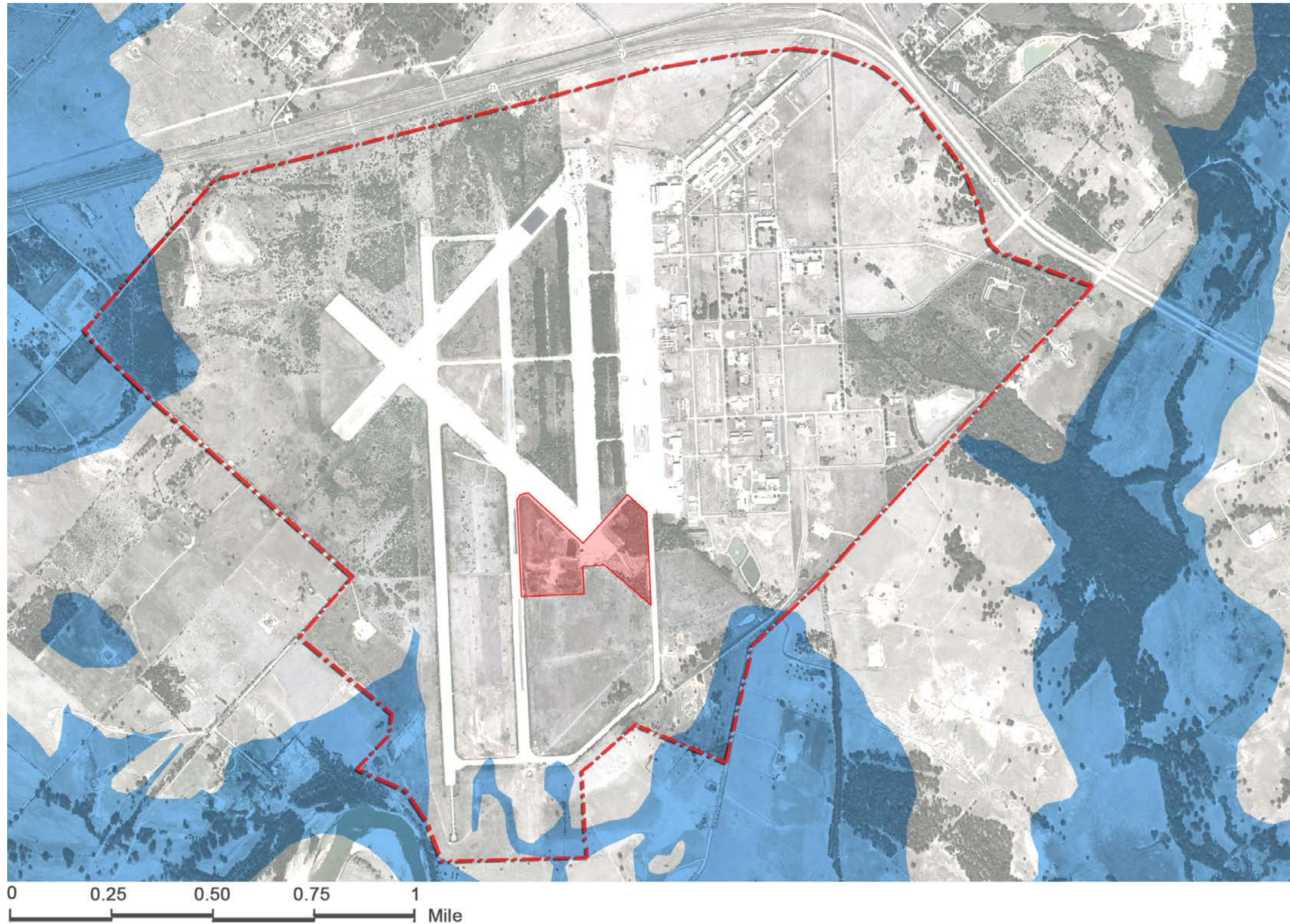
SOIL PROPERTIES

- Depth class:* Very deep
- Drainage:* Moderately well drained
- Depth to the water table:* >6 feet
- Flooding:* None
- Runoff:* Slow
- Permeability:* Very slow
- Available water capacity:* High
- Root zone:* Very deep
- Natural soil fertility:* High
- Shrink-swell potential:* Very high
- Hazard of water erosion:* Slight
- Land uses:* Cropland & pasture
- Other land use:* Rangeland



Soil Map of Riverside Campus

2.5 Flood Plain



- Legend**
- 100-year Flood Plain
 - SEC Lab
 - Riverside Campus Boundary

FEMA 100-year Flood Plain of Riverside Campus

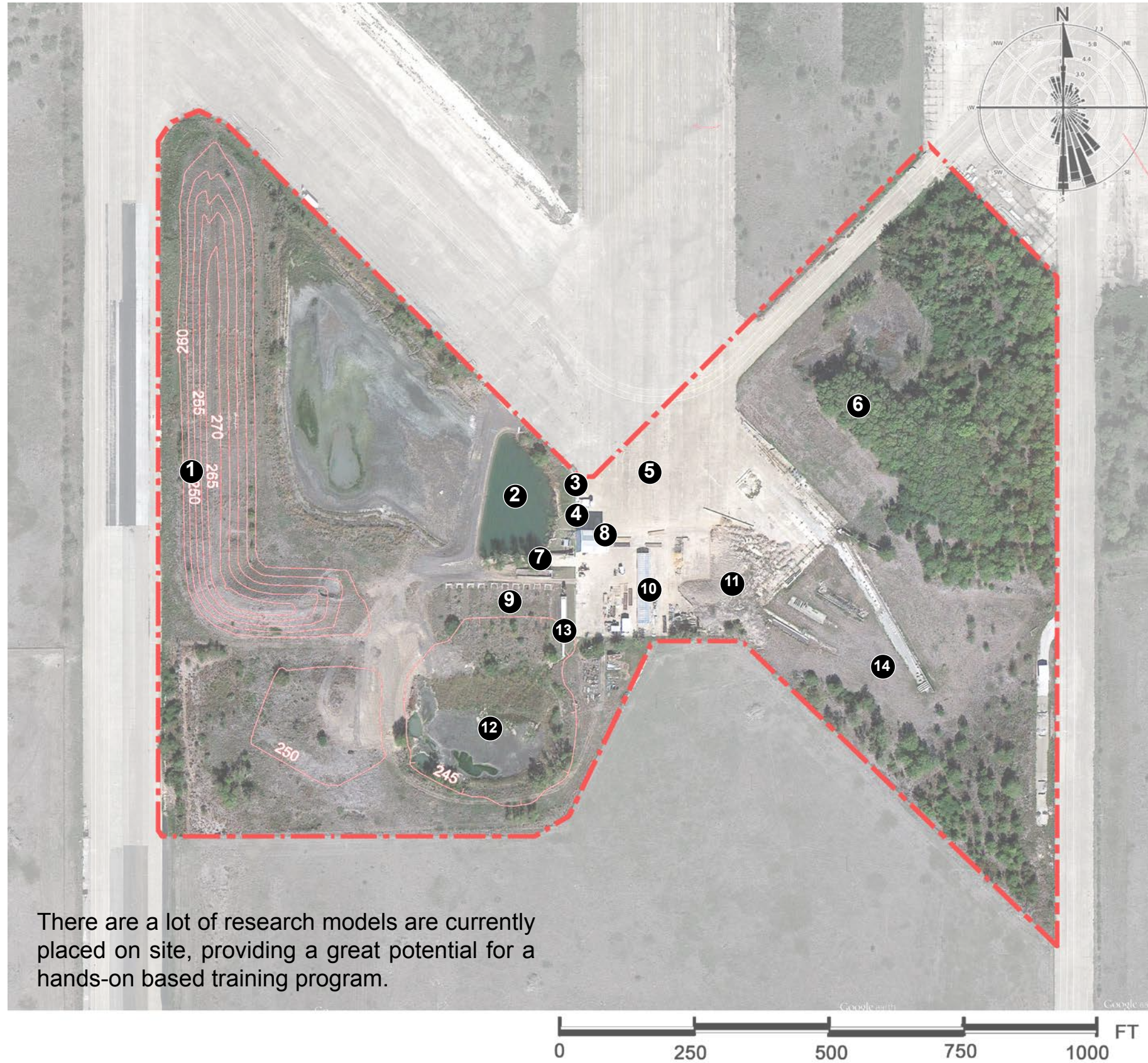
2.6 Site Base Map



Site

The SEC lab site covers 37-acre land in Riverside Campus of Texas A&M University. The site is at low area of the campus. Because the low elevation of the site, two lakes are located within the boundary.

2.7 Site Inventory



There are a lot of research models are currently placed on site, providing a great potential for a hands-on based training program.



3. SWOT-STRENGTH



- University based with excellent educational resources;
- Research related with validity;
- Experienced researchers and professionals assuring the quality;
- Systematically developed courses immediately available;
- A lot of research facilities providing the hands-on possibility;
- Large piece of land providing a great potential for development;
- Quiet environment with little disturbance;
- Good landscape base with water feature;
- Easy access by highway;
- Low elevation with little problem of available water;
- Different aspects related to the LID providing multiple choices;
- Large open space providing potential recreational function;

4. SWOT-WEAKNESS



- Location is a little far away from developed area;
- Lack of essential services, e.g. restaurant;
- No master plan developed before;
- All facilities are clustered in a small area;
- Lack of shaded area;
- Experimental site looks a little messy ;
- Facilities are not quite easy to access;
- Lack of staying spaces;
- No entrance identity;
- No clear circulation on site;
- Bank of ponds are not in good condition;
- Lack of demonstration for public;

5. SWOT-OPPORTUNITY



- Growing market of LID and Sediment & Erosion Control training;
- Good geologically relationship with Texas Triangle;
- Growing professionals related to LID and Sediment and Erosion Control;
- Growing population in Texas and public concern of environment;
- Texas fast growing personal income;
- Colleges with related major in Texas are located in 300-mile circle;
- Easy access to Houston, Austin, San Antonio and Dallas by highway;
- Approval of TTI;
- Registered professionals are required to earn CEUs every year;
- Availability of other topics which may attract larger market ;
- Only a few hands-on training courses are provide in the market;
- Only a few courses of LID are provided in Texas;

6. SWOT-THREAT



- Not quite near large cities;
- Hot weather in Texas for hands-on training;
- New development has already been carried on site;
- Lack of interdisciplinary involvement;
- Lack of funding for intensive development;
- Needs to be credited by authorized organization;
- No systematically developed marketing strategy;
- Online courses are at very low price and more convenient;

PART 4

Design Charrette



SOUTH REGION WEST UNIVERSITY TRANSPORTATION CENTER

1. Introduction
2. Pre-design Process
3. Preliminary Concept Design
4. Feedback for Preliminary Design
5. Final Presentation of LAND 602
6. Feedback of Final Presentation
7. Appendix - Design Charrette Product

SCHEDULE REVIEW

- The schedule (By Dr. Ming-Han Li)

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.
Task 1. Review training course.	█	█	█									
Task 2. ID strengths & weaknesses.	█	█	█									
Task 3. Design charrette.				█	█	█						
Task 4. Course modules.				█	█	█	█					
Task 5. Large-scale models.							█	█	█	█		
Task 6. Program brochures.										█		
Task 7. Master plan and final report.										█	█	█

DONE
March, 2013

- Following the schedule, the third task was finished in the middle of March, 2013, coming out with this part of report as a phasing product.

PURPOSE

- This part of the report is to introduce creative thinking into project, so that the maximum potential of the land could be explored. Through the communication of designers and researchers, we can determine and clarify the most feasible and favorable ideas, concluding a list of reasonable and creative programs.

1. INTRODUCTION

On January 21st of 2013, MLA students of TAMU in LAND 602 started their studio project, which is the SWUTC project. They are divided into 3 groups to develop three alternatives for the master plan of the SEC lab. The time period starts from January 21st (kick off) to March 4th (final presentation). The schedule consists of two parts:

- 1) Preliminary design due February 18th, 2013, and
- 2) Final design development due March 4th, 2013.

Design Team:

Instructor: Dr. Galen Newman

Team 1: Ruisi Guo, Zhihuang Li, Yue Yao, Jinglin Zhao

Team 2: Xiaotian Su, Yucheng Wang, Bitong Yang

Team 3: David Danielson, Siman Ning, Wonmin Sohn, Yixun Zhang

2. PRE-DESIGN PROCESS

2.1 Data Collection

During December, Dr. Ming-Han Li, Dr. Galen Newman, Jett McFalls, Beverly Storey and Pengzhi Li collected the necessary data for design preparation. Those data including:

- Base map in AutoCAD,
- Watershed data,
- GIS data of Bryan, College Station and Brazos County,
- Soil Survey,
- Water Discharge Regulation in Texas,
- Case Study of Current Training Courses in Market,
- and other related data.

2.2 Site Visit

Dr. Ming-Han Li organized a field trip to the SEC lab for LAND 602 class on January 25th, 2013.

2.3 Comprehensive Presentation

Beverly Storey gave the presentation for LAND 602 class about the basic information and research resource existing on site on January 23th, 2013



Site Visit on Jan.25th, 2013

3. PRELIMINARY CONCEPT DESIGN

3.1 Team 1 - Master Plan



3.2 Team 2 - Master Plan



3.3 Team 3 - Master Plan



- **Presentation Date:** March 18th, 2013
- **Location:** BLA Studio, Langford A
- **People Attended:** Dr. Ming-Han Li, Jett McFalls, Beverly Storey, Dr. Galen Newman, Pengzhi Li

4. FEEDBACK FOR PRELIMINARY DESIGN

Reviewing Team:

Dr. Ming-Han Li, Jett McFalls, Beverly Storey, Dr. Galen Newman

1. The different performance of BMPs and conventional methods of management practices should be demonstrated in the SEC Lab for educational purpose.
2. De-emphasize the recreational function on site, and re-categorize the facilities in a new list.
3. The lab may need a kitchen instead of a cafe.
4. The entrance position proposed by Team 3 is smart, the parking lot in the west of the entrance can be used as visitors parking, while the inside parking could be used as employee parking.
5. A lot of good ideas come out from the proposal of Team 1, but the feasibility is still not clear enough.
6. Sustainable planting could be considered on site.
7. The idea of applying floating islands on the lake is a good thinking of utilizing the lake, more ideas are encouraged to utilize the lake, e.g., bank stabilization.

5. FINAL PRESENTATION

DESIGN

Mid-term Progress Report
Final Presentation of TTI SEC Lab Master Plan

PROJECT TEAM

Ming-Han Li (Principal Investigator)
Jett McFalls (Co-PI)
Beverly Storey (Co-PI)
Galen Newman (Co-PI, Instructor of LAND602)
Pengzhi Li (Graduate Assistant)
LAND 602 MLA Students

GROUP 1
Ruisi Guo
Zhihuang Li
Yue Yao
Jinglin Zhao

GROUP 2
Xiaotian Su
Yucheng Wang
Bitong Yang

GROUP 3
David Danielson
Siman Ning
Wonmin Sohn
Yixun Zhang

2:00 p.m.
March 4th, 2013

Location:
Gilchrist Room 103

MASTER PLAN
SEDIMENT AND EROSION CONTROL LABORATORY

People Attended:

Joe Zietsman
Dock Burke
Jolanda Prozzi
Barb Lorenz
Duane Wagner
Ming-Han Li,
Jett McFalls,
Beverly Storey,
Kristi Holstead,
Galen Newman,
Pengzhi Li

Date:

March 4th, 2013
2:00 p.m. ~ 3:30 p.m.

Location:

Gilchrist Room 103

Clean-Collect-Convey 5

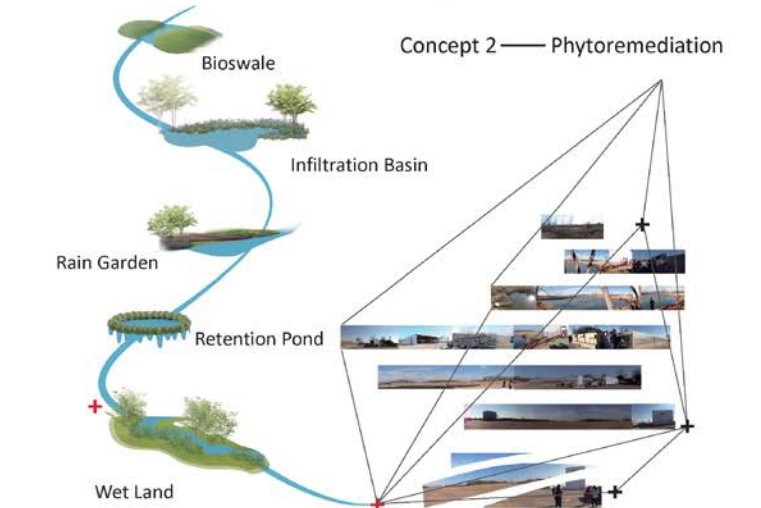
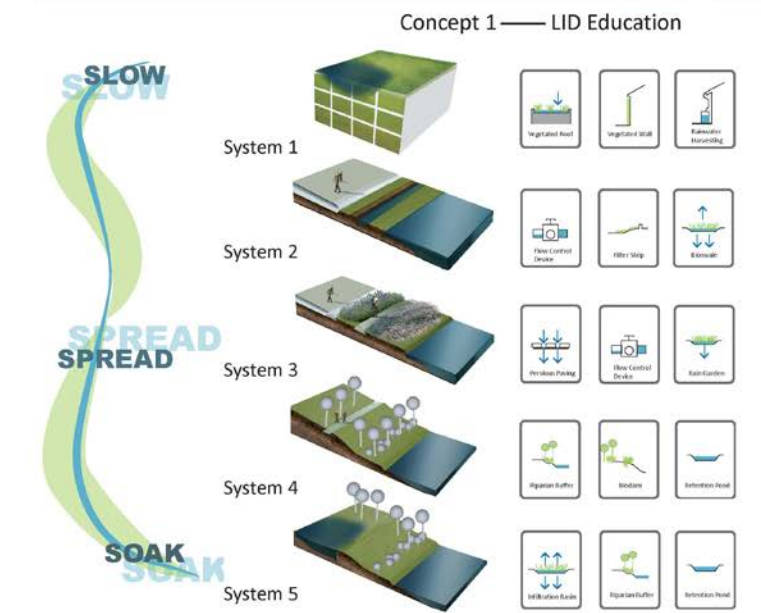
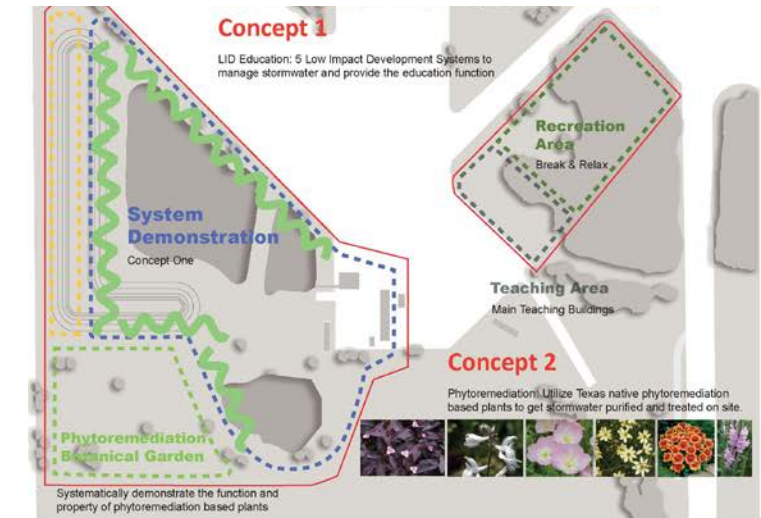
SEC Lab Hands On Training Course

5.1 Team 1-- Master Plan



LID training program

5.2 Team 2-- Master Plan





5.3 Team 3-- Master Plan



- 1. Erosion and Pavement Carpet
- 2. Willow Path
- 3. Viewing Platform
- 4. Waterfront Path
- 5. Retention Pond
- 6. Educational Building and Café with Living Wall
- 7. Archway
- 8. Material Fountain
- 9. Flower Tunnel
- 10. Pervious Parking
- 11. Conventional Parking
- 12. Sunken Plaza
- 13. Swale Garden
- 14. Rainfall Simulator with Green Roo
- 15. Floating Islands with Over-Water F
- 16. Green House
- 17. Pixilated Parking
- 18. Soil Storage
- 19. Botanic Garden
- 20. Detention Pond
- 21. Successional Plant Growth Re

6. FEEDBACK FOR FINAL PRESENTATION

Reviewing Team:

Joe Zietsman, Dock Burke, Jolanda Prozzi, Barb Lorenz, Duane Wagner, Ming-Han Li, Jett Mc-Falls, Beverly Storey, Kristi Holstead, Galen Newman

1. A final master plan is expected to be developed by merging the 3 plans presented;
2. Phasing plan is also important for the master plan to guide the lab development in future;
3. Entertainment combination thinking is good but need to be de-emphasized.
4. Course modules still need to be discussed further;
5. Make sure the class can accommodate 50~100 people participating;
6. If we propose the courses in summer, more shading trees or overhead structures for shading are preferred on site;

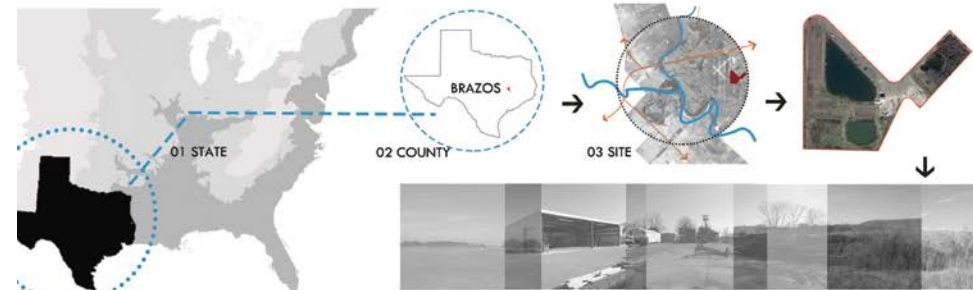
Overall, the master plan proposed by team 3 is feasible and suitable for embedding the training program into SEC Lab site. The team 1 proposal has a lot of inspiring ideas, but the feasibility could be a problem. Team 2 proposal has a good thinking on the combination of recreational function with the training program, but the budget is hard to control according to their proposal. Thus, team 3 proposal will become the base for the final master plan, combining with the valuable ideas developed by the rest 2 teams.

10. APPENDIX -- DESIGN CHARRETTE PRODUCT

Note: Specific design products are available in CDs attached with the report.

9.1 Team 1

1. SITE ANALYSIS



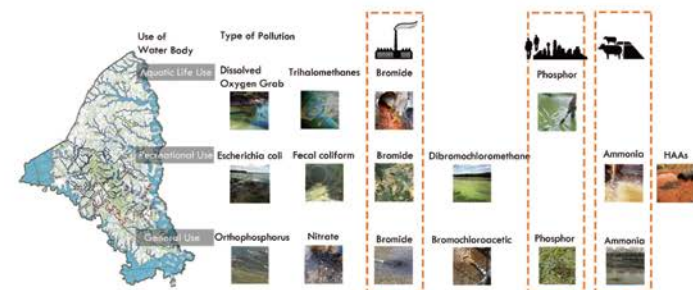
Clean-Collect-Convey 1

SEC Lab Hands On Training Course

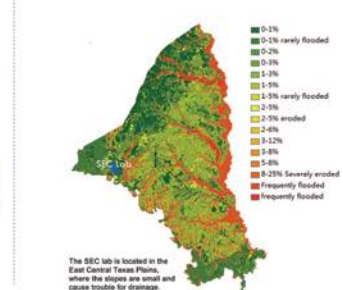
2. HYDROLOGY ANALYSIS



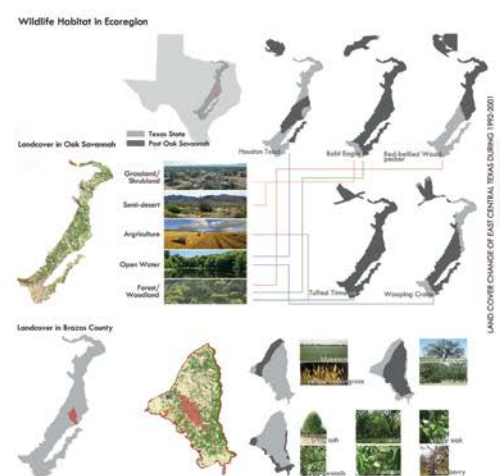
3. WATER POLLUTION SOURCE



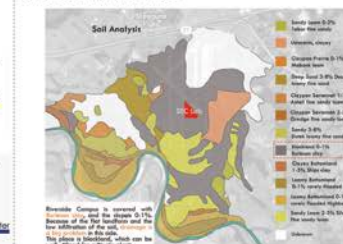
4. SLOPE ANALYSIS



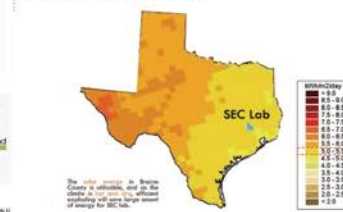
5. ECOREGION ANALYSIS



6. SOIL ANALYSIS



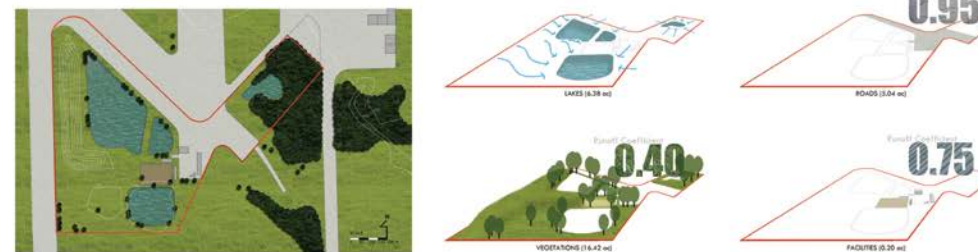
7. SOLAR ANALYSIS



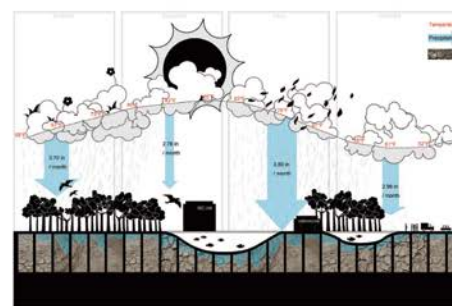
Clean-Collect-Convey 2

SEC Lab Hands On Training Course

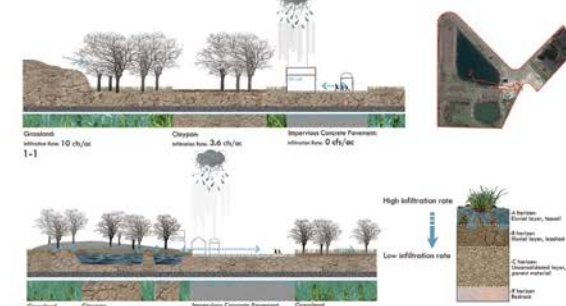
1. SITE ANALYSIS



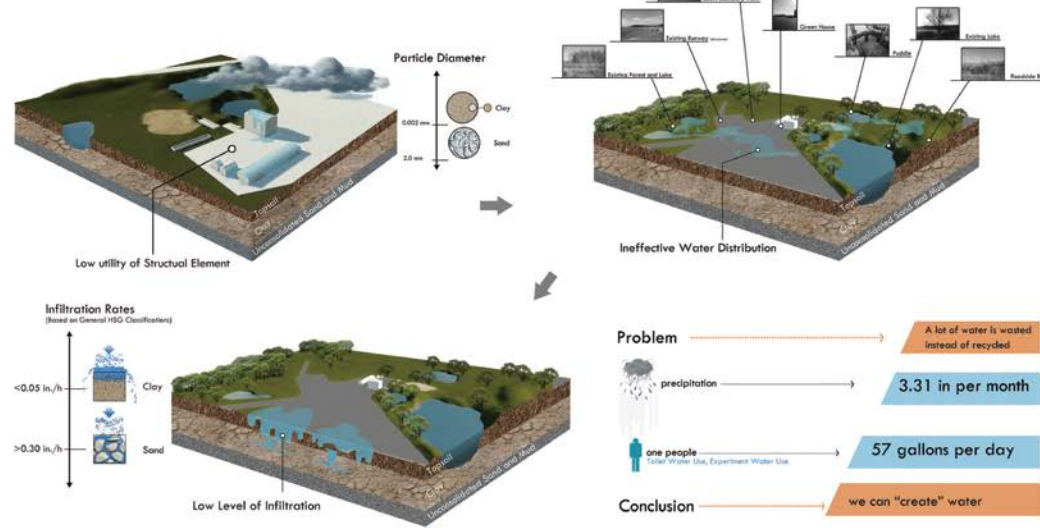
2. CLIMATE & PRECIPITATION



3. SECTION OF SITE



4. EXISTING PROBLEM



Note: Specific design products are available in CDs attached with the report.

9.1 Team 1

For the 1-day trip, the focus will be the existing soil testing, the slope protection facilities, and the newly built LID facilities, which introduce the main issues of SEC lab to the visitors.

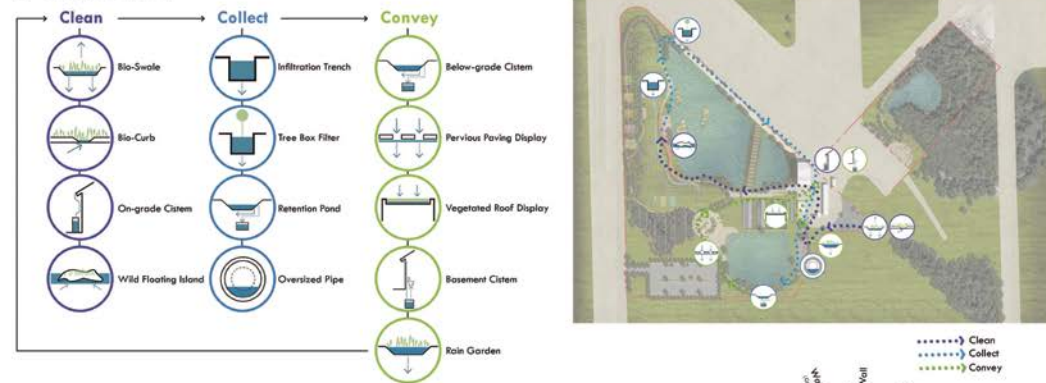
The 2-day trip adds some training and manipulative classes, such as to teach students the rainwater harvesting of the living wall modulators, and let them try by their own. The content will be more detailed and specialized, so that the participants will not only know the LID system, but also understand it.

The 3-day training will be even more systematic, which first introduce the basic theory of LID, then introduce the LID system with different function, then explain and show the connection and interaction between all the LID facilities.

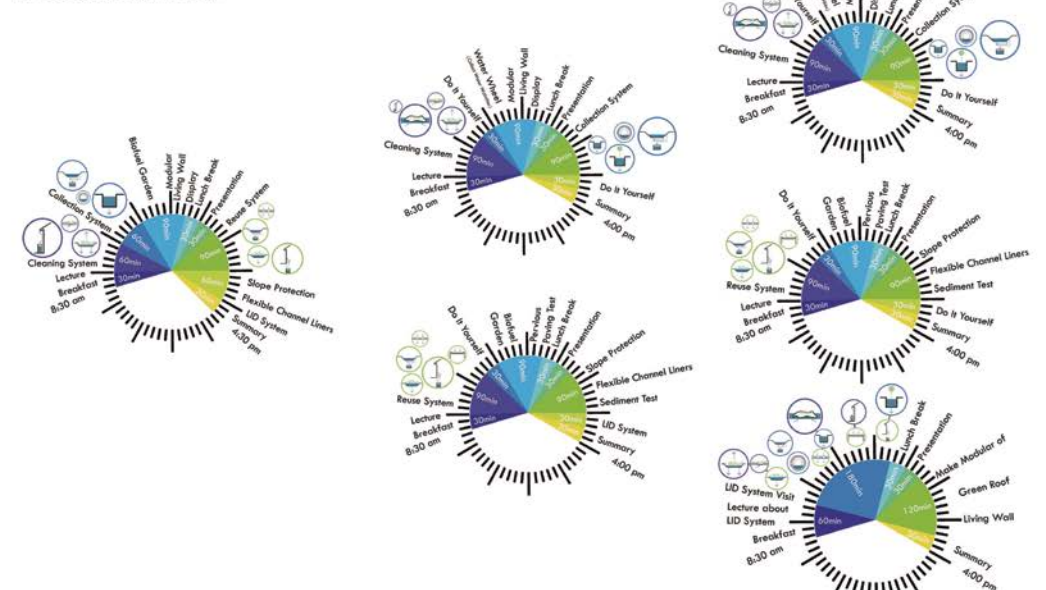
Clean-Collect-Convey 3 SEC Lab Hands On Training Course

LAND602 Ruli Guo, Jinglin Zhao, Zhihuang Li, Yue Yao

1. COURSE LOOP



2. COURSE TIMETABLE



Phase I -- Overview: the 1-day trip, \$250/person



Phase II -- Specialize: The 2-day trip, \$500/person



Phase III -- Expertise: The 3-day trip, \$750/person



1. MASTER PLAN



Clean-Collect-Convey 4 SEC Lab Hands On Training Course

LAND602 Ruli Guo, Jinglin Zhao, Zhihuang Li, Yue Yao

3. DESIGN FUNCTIONALITY



2. BEFORE & AFTER IN WATER FLOW

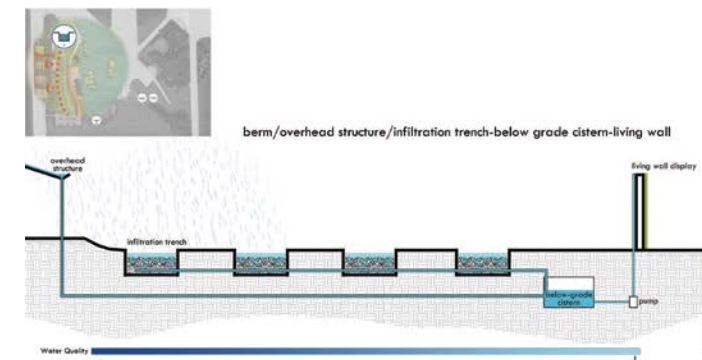
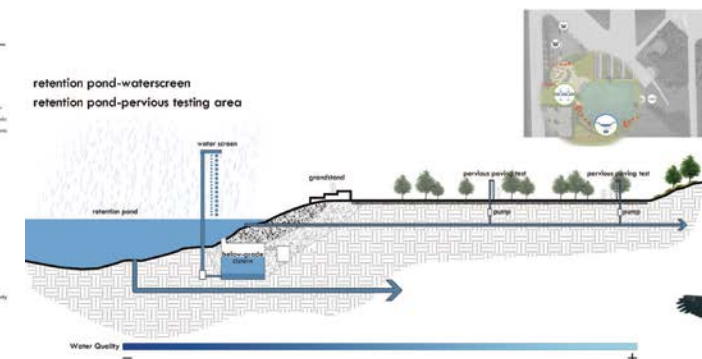
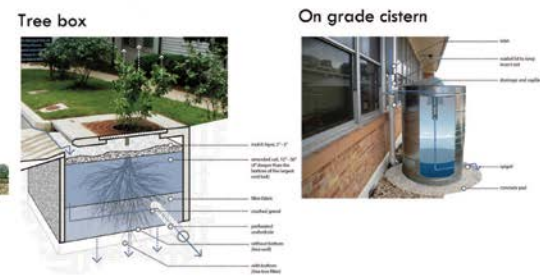
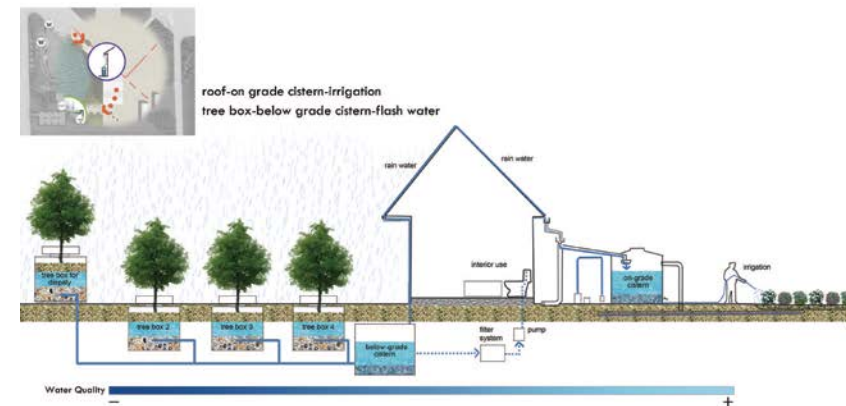
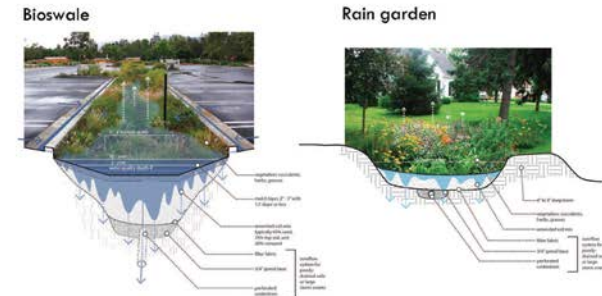
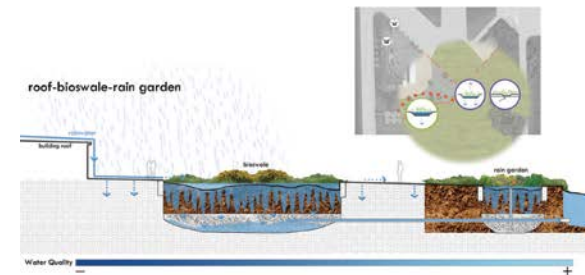


Note: Specific design products are available in CDs attached with the report.

9.1 Team 1

Clean-Collect-Convey 5 SEC Lab Hands On Training Course

LAND602 Ruisi Guo, Jinglin Zhao, Zhihuang Li, Yue Yao



Note: Specific design products are available in CDs attached with the report.

9.2 Team 2

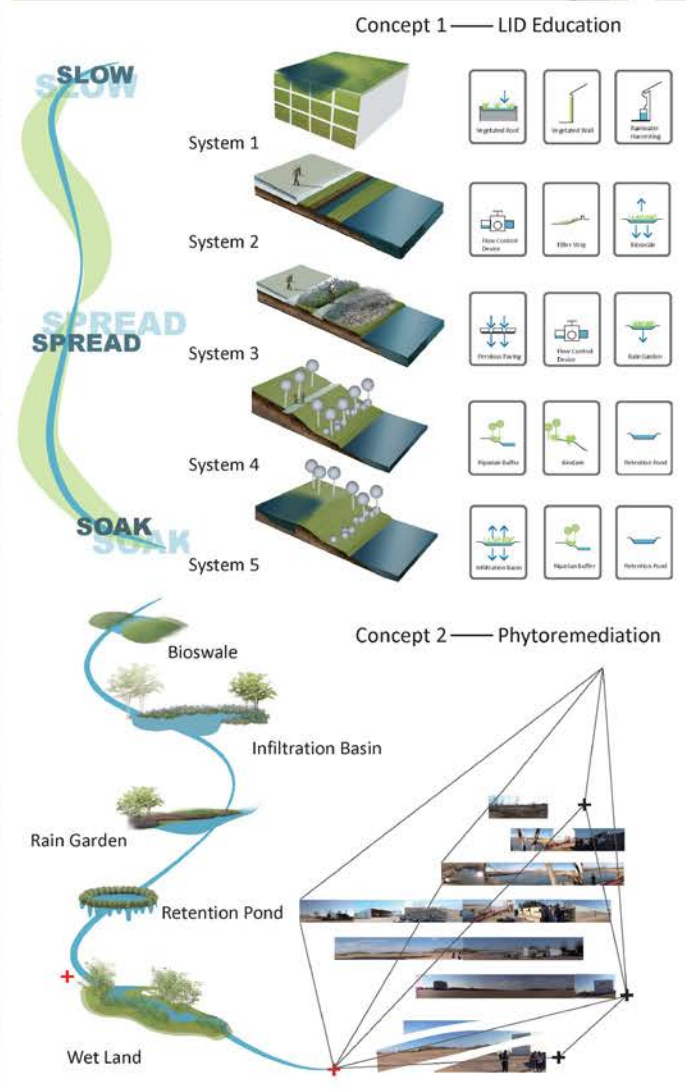
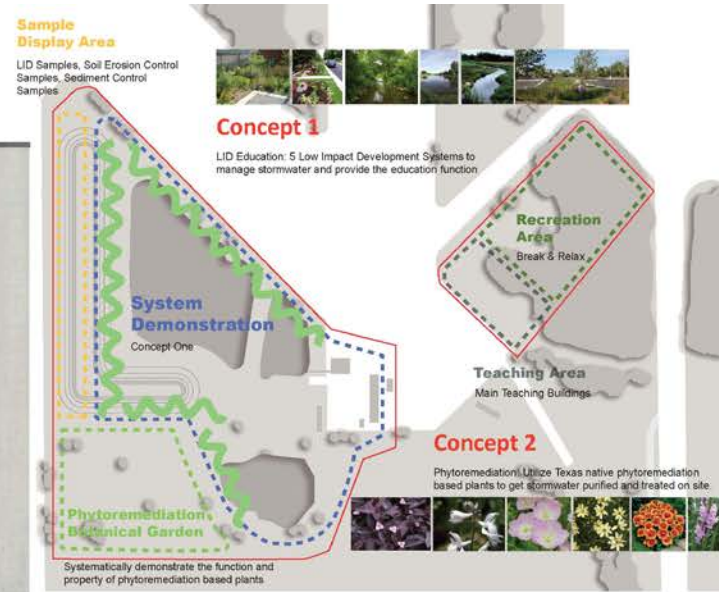
1

TAMU Riverside Campus Design Project — LID training program

Texas A&M University Department of Landscape Architecture and Urban Planning Group 2: Yucheng Wang, Xiaotian Su, Bitong Yang Instructor: Galen Newman



- | | | |
|----------------------------|-------------------------------|--|
| Recreation Area | System Demonstration | Phytoremediation Botanical Garden |
| 01 Flower terrace | 07 Parking garden | 18 Pergola |
| 02 Highline Trail | 08 Existing retention pond #1 | 19 Classified plant zone |
| 03 Existing Detention Pond | 09 Skywalk | Sample Display Area |
| Teaching Area | 10 Mitigating Islands | 20 LID samples (not applied on site) |
| 04 Outdoor cafe | 11 Platform with overhead | 21 Erosion control samples |
| 05 Main teaching building | 12 Outdoor teaching terrace | 22 Sediment control samples |
| 06 Educational parking lot | 13 Educational channels | 23 IWS samples |
| | 14 Demonstration terrace | 24 Pergola |
| | 15 Platform without overhead | |
| | 16 Existing retention pond #2 | |



Note: Specific design products are available in CDs attached with the report.

9.2 Team 2

2

TAMU Riverside Campus Design Project — LID training program

Texas A&M University Department of Landscape Architecture and Urban Planning Group 2: Yucheng Wang, Xiaotian Su, Bitong Yang Instructor: Galen Newman

System 3

Cut Curb
Slow
Flow control

Rain Garden
Spread + Soak
Filtration +
Infiltration
+treatment

System 4

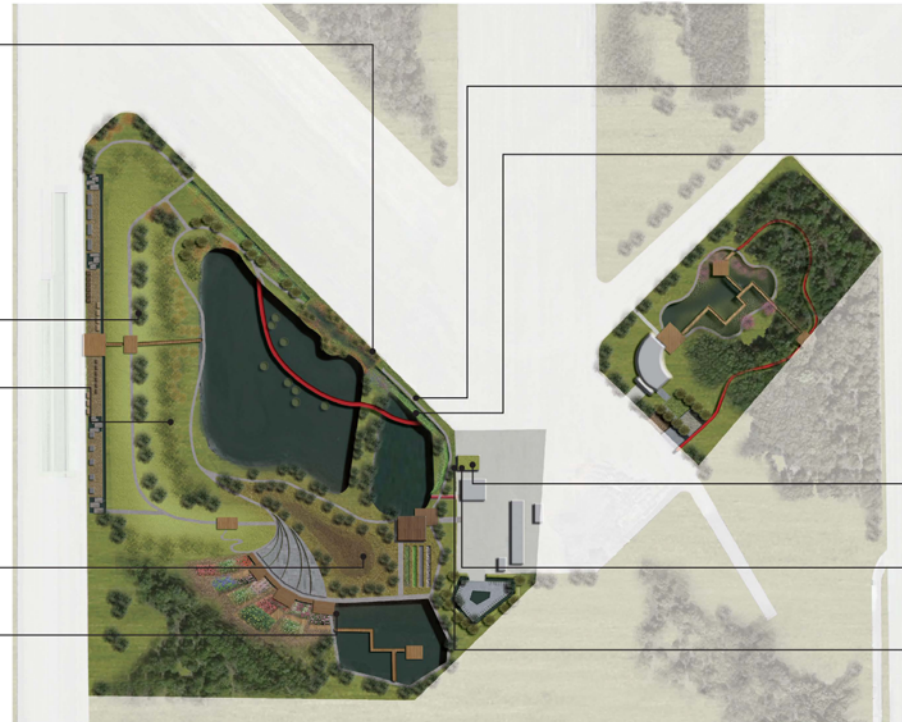
Biodam
Slow
Flow control

Riparian Buffer
Slow + Spread + Soak
Filtration + Infiltration +treatment

System 5

Infiltration
Spread + Soak
Flow control

Riparian Buffer
Slow + Spread + Soak
Filtration + Infiltration +treatment



System 2

Level Spreader
Slow
Flow control

Filter Strip
Spread
Filtration

Bioswale
Spread + Soak
Filtration + Infiltration +treatment

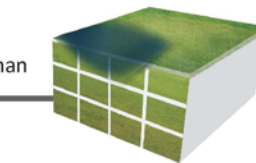
System 1

Vegetated Wall
Slow + Spread
Flow control + Filtration

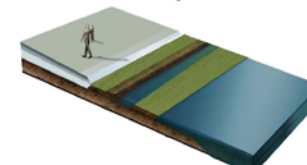
Vegetated Roof
Spread + Soak
Filtration + Treatment

Rain Barrel
Soak
Treatment

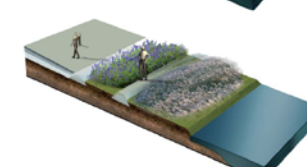
System 1



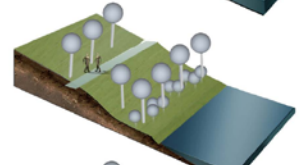
System 2



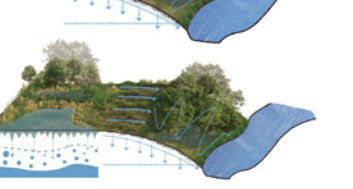
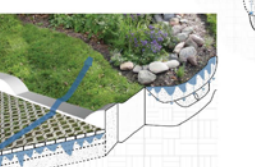
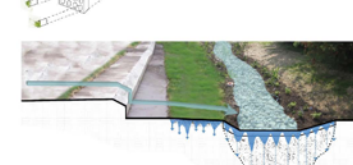
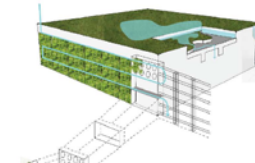
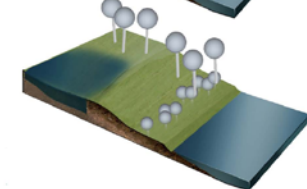
System 3



System 4



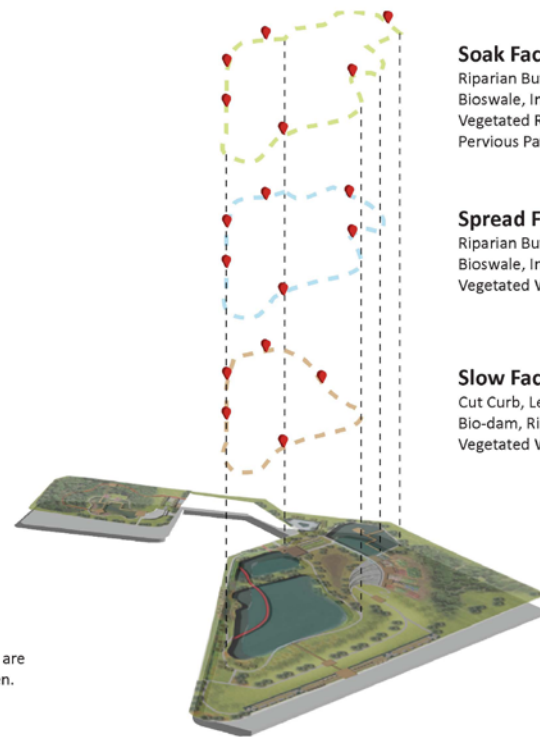
System 5



Curriculum Program

One-day Training

- 08:30-10:30 **LID Introduction-indoor lecture**
-Watershed, Theory, Phytoremediation
- 10:30-12:30 **System Components**
-**Slow:** Cut Curb, Level Spreader, Bio-dam, Riparian Buffer, Vegetated Wall
-**Spread:** Riparian Buffer, Rain Garden, Bioswale, Infiltration Basin, Vegetated Wall, Vegetated Roof
-**Soak:** Riparian Buffer, Rain Garden, Bioswale, Infiltration Basin, Vegetated Roof, Rain Barrel, Pervious Paving
- 12:30-13:30 **Lunch**
-Review knowledge learned
- 13:30-14:30 **System Interaction**
-Integrate system components together to function efficiently
- 14:30-15:00 **Sample Demonstration**
-LID facilities (not applied on site), Erosion Control facilities, Sediment Control facilities
- 15:00-16:00 **Phytoremediation System**
-All the plants distributed throughout the site are phytoremediation based plant. -All the plant types are collected in the Phytoremediation Botanical Garden.
- 16:00-17:00 **Course Conclusion-indoor lecture**
-Conclusion and Exam



Soak Facilities

Riparian Buffer, Rain Garden, Bioswale, Infiltration Basin, Vegetated Roof, Rain Barrel, Pervious Paving

Spread Facilities

Riparian Buffer, Rain Garden, Bioswale, Infiltration Basin, Vegetated Wall, Vegetated Roof

Slow Facilities

Cut Curb, Level Spreader, Bio-dam, Riparian Buffer, Vegetated Wall

Phasing

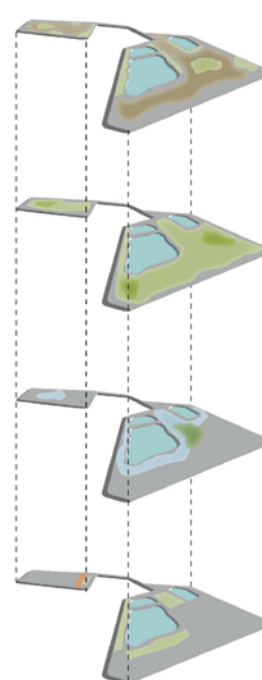
Drain Condition
Well Drained
Bad Drained

Vegetation
Lawn
Trees
Constructed Wetland

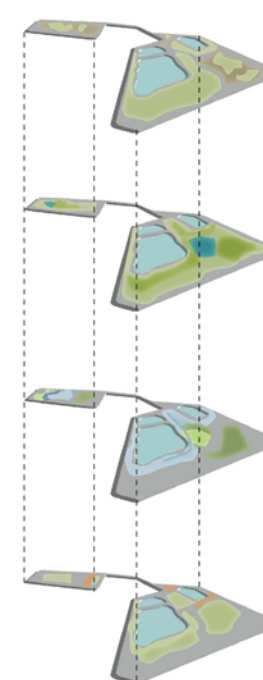
Water Infiltration
Catchment
Infiltration Basin
Wetland Purifying
Purified Water

Facilities
LID Facilities
Infrastructure

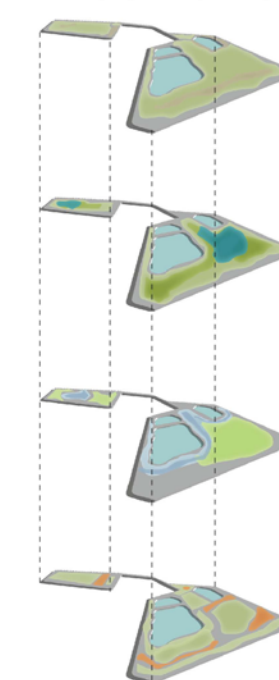
PHASING-I (5 year)
50 people 1-day training



PHASING-II (10 year)
75 people 2-day training



PHASING-III (20 year)
100 people 3-day training



Note: Specific design products are available in CDs attached with the report.

9.2 Team 2

3 TAMU Riverside Campus Design Project — LID training program

Texas A&M University Department of Landscape Architecture and Urban Planning Group 2: Yucheng Wang, Xiaotian Su, Bitong Yang Instructor: Galen Newman



Channels



Water Trail



Water Terrace



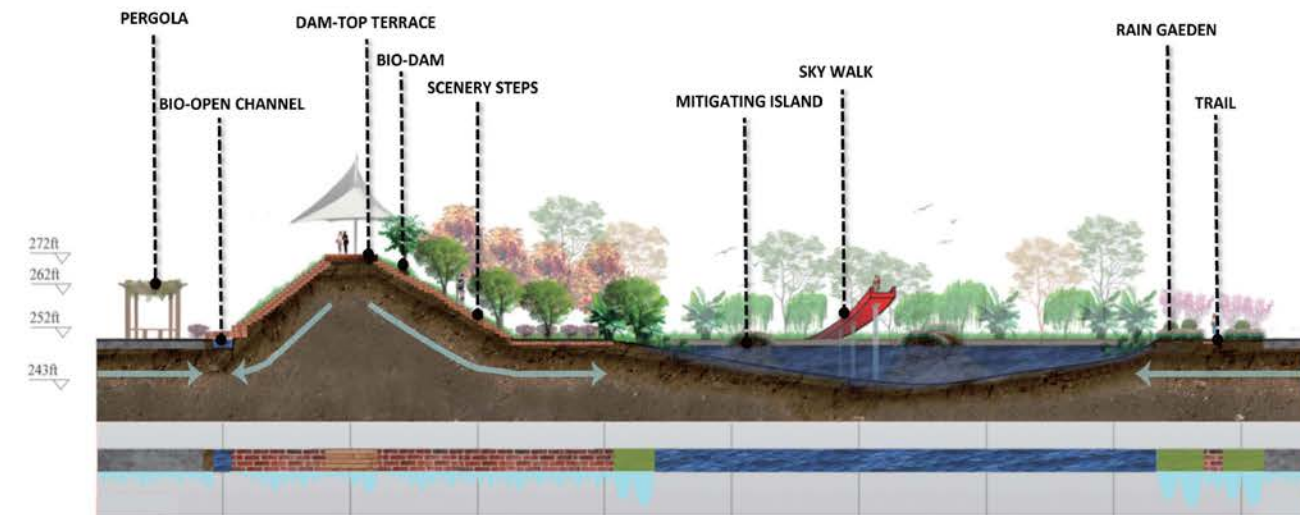
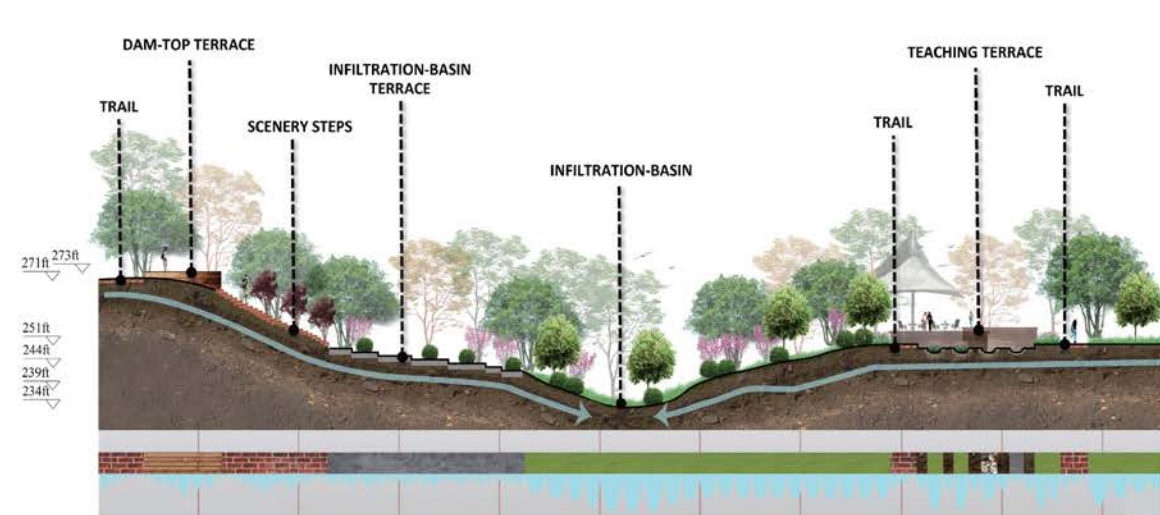
Sample Display Area



Phytoremediation Botanical Garden



Infiltration Basin



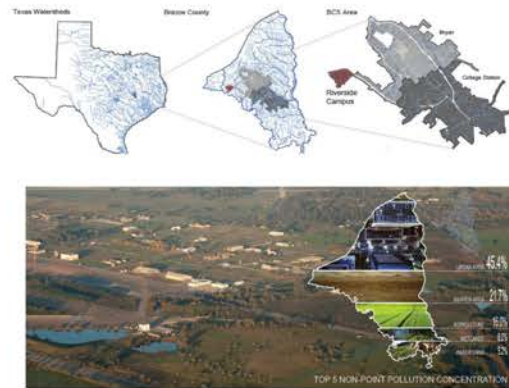
Note: Specific design products are available in CDs attached with the report.

9.3 Team 3



Texas A&M SEC Lab
Spring 2013, Professor Newman
David Danielson, Wonmin Sohn, Yixun Zhang, Siman Ning

Site Orientation



Runoff from urban development accounts for the majority of watershed pollution and degradation in Brazos County. This damage is best mitigated through proven low-impact development (LID) design strategies. The Texas A & M Sediment and Erosion Control Laboratory will serve as a real-world model for LID practices for students and professionals to emulate.

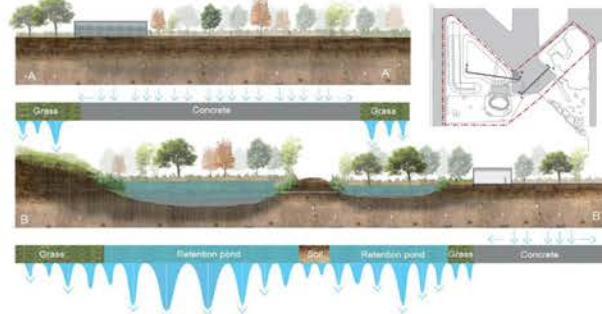


Diagram & Master Plan



- 1. Proposed Expansion Location
- 2. Existing Rainfall Simulator
- 3. Existing SRD Flume to be Moved
- 4. New SRD Flume Approximate Location
- 5. Existing Reservoir
- 6. Proposed Covered Soil Storage

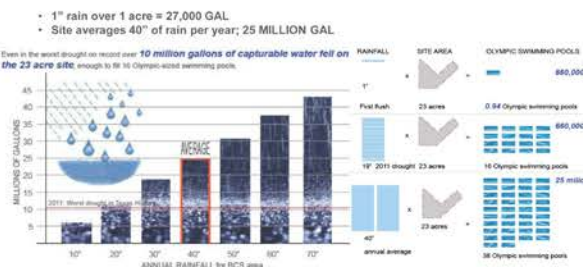
- 7. Archway
- 8. Material Fountain
- 9. Flower Tunnel
- 10. Pervious Parking
- 11. Conventional Parking
- 12. Sunken Plaza
- 13. Swale Garden
- 14. Rainfall Simulator with Green Roof
- 15. Floating Islands with Over-Water Pergola
- 16. Green House
- 17. Pixilated Parking
- 18. Soil Storage
- 19. Botanic Garden
- 20. Detention Pond
- 21. Successional Plant Growth Recording Wall

Analysis of Conditions

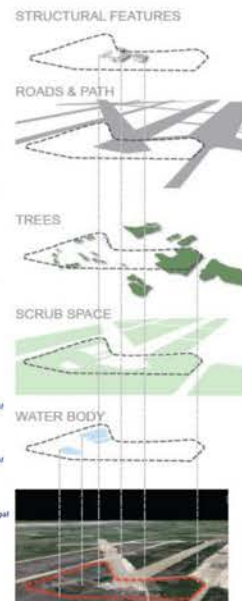
RAINFALL & FLOOD HAZARD In Brazos County



In a 25 year intensity storm the water level will rise approx. 9" in 24 hours.



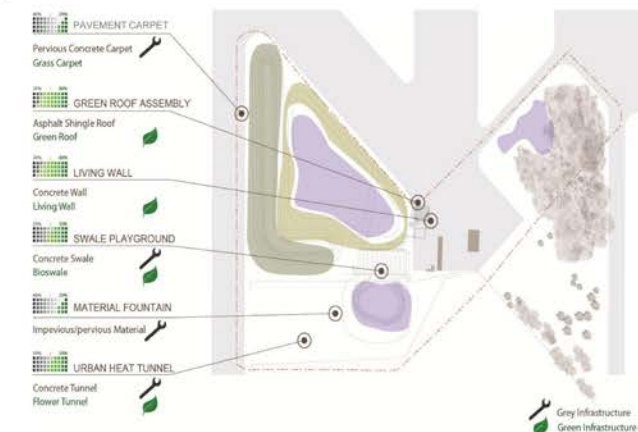
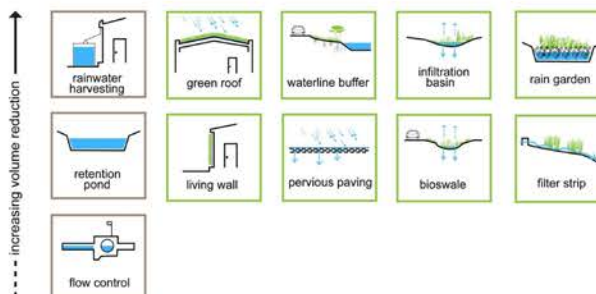
1" rain over 1 acre = 27,000 GAL
Site averages 40" of rain per year; 25 MILLION GAL



TEXTURE	RUNOFF COEFFICIENT
Impervious 0.4ac	0.75
Impervious 4.3ac	0.95
Permeable 4.3ac	0.40
Permeable 10ac	0.40
4.2ac	

TOTAL AREA 23.2 ac
COMPOSITE RUNOFF COEFFICIENT 0.62

LID Facilities



PHASE I	PHASE II	PHASE III
50 PARTICIPANTS	75 PARTICIPANTS	100 PARTICIPANTS
\$200 EACH; \$10,000 TOTAL	\$325 EACH; \$24,000 TOTAL	\$400 EACH; \$40,000 TOTAL
1-2 YEARS	5-6 YEARS	10-12 YEARS

Note: Specific design products are available in CDs attached with the report.

9.3 Team 3

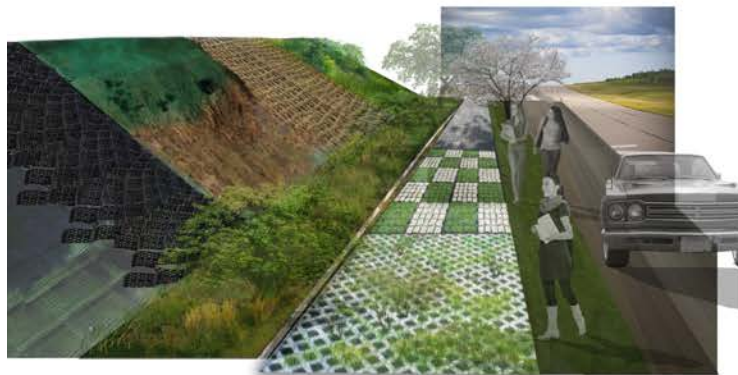


GREY TO GREEN
TEACHING LID THROUGH CONTRAST

Texas A&M SEC Lab
Spring 2013, Professor Newman
David Danielson, Wonmin Sohn, Yixun Zhang, Siman Ning

Design Concept and Perspective

Erosion and Pavement Carpet



Successional Plant Growth Recording Wall



3-Tiered Walkway



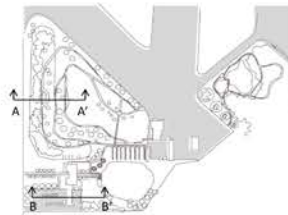
Willow path



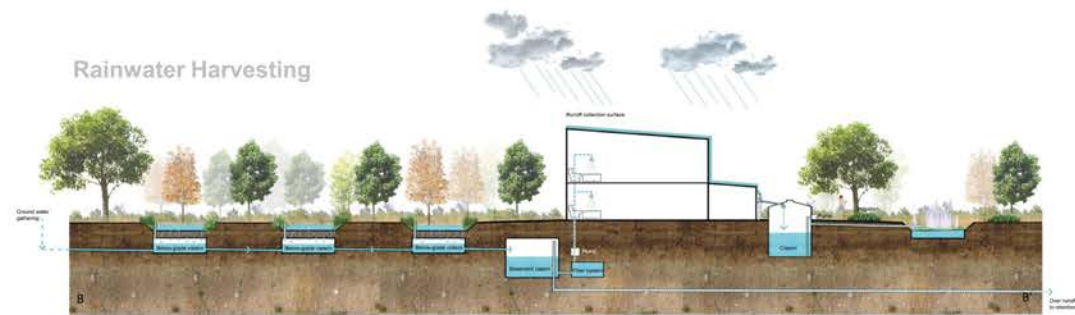
Viewing platform



Waterfront path



Rainwater Harvesting



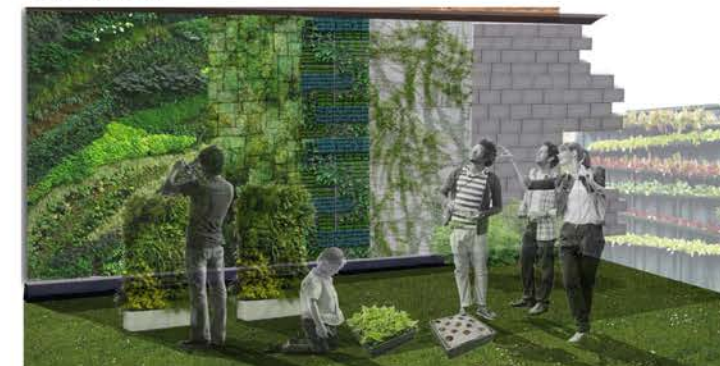
Main Entrance



Material Fountain



Living Wall



PART 5

Course Modules

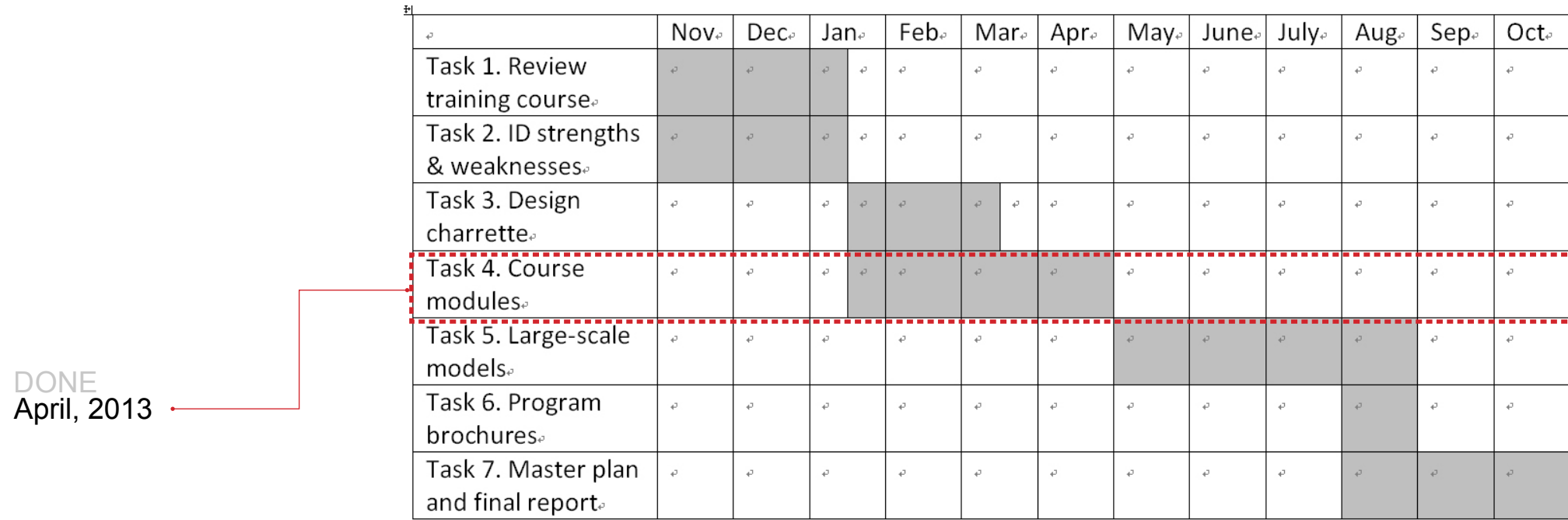


SOUTH WEST REGION
UNIVERSITY
TRANSPORTATION
CENTER

1. Course Topics
2. Course Structure
3. Courses Introduction

SCHEDULE REVIEW

- The schedule



- Following the schedule, the fourth task was finished by the end of April, 2013, coming out with this part of report as a phasing product.

PURPOSE

- This part of the report is to develop course modules for the training program. The course modules are based on the existing course materials which have already been presented in the public or classroom. By combining those courses and unifying them systematically, we can develop a set of uniformed courses fitting to different training schedules.

1. COURSE TOPICS

1.1 Focus

The courses developed is focused on Low Impact Development (LID). We basically have two levels of courses. Level one is targeted on the market of the public, students, and young professionals, who are interested in LID and want to expand their knowledge on the topic; while Level two is for the market of experienced professionals who want to further develop their professional skills.

1.2 Topics

Level 1:	Time Setting:
lv1.1 - LID Overview	1 Day
lv1.2 - Bioretention	50 minutes
lv1.3 - Porous Pavement	50 minutes
lv1.4 - Green Roof	50 minutes
lv1.5 - Rainwater Harvesting	50 minutes

Level 2:	Time Setting:
lv2.1 - LID Overview	1 Day
lv2.2 - Bioretention	1 Day
lv2.3 - Porous Pavement	1 Day
lv2.4 - Green Roof	1 Day
lv2.5 - Rainwater Harvesting	1 Day

2. COURSE STRUCTURE

In order to create a systematic course series, a consistent structure of courses is necessary. The courses follow the structure of outline below:

A. Learning Outcomes

This part should describe the expectation of learning outcomes on the specific topic, which will become the guideline of evaluation;

B. History

Introduction of the history of specific BMPs;

C. Rules & Regulation

Explain the latest rules and regulations related to the specific BMP;

D. Concept

Illustrate the concept of the BMP in terms of reducing the hydraulic impact caused by development;

E. Cases

Introduce the successful cases that have applied the BMP;

F. Design Example

Show the design details in terms of how to construct the BMP;

G. In-class Exercises

Practice the approach to the detailed design;

H. Hands-on Training

3. COURSES INTRODUCTION

- Course 1. Bioretention
- Course 2. Porous Pavement
- Course 3. Rainwater Harvesting
- Course 4. Green Roof

Instructors:

Ming-Han Li, Ph.D., P.E., P.L.A.

Associate Professor, Department of Landscape Architecture and Urban Planning,
Texas A&M University
Associate Research Engineer, Environment and Planning Program,
Texas Transportation Institute

Beverly J. Storey, P.L.A.

Associate Research Scientist, Environment and Planning Program,
Texas A&M Transportation Institute

Jett A. McFalls, P.L.A.

Assistant Research Scientist , Environment and Planning Program,
Texas A&M Transportation Institute

Bruce Dvorak, P.L.A.

Assistant Professor,
Texas A&M University

Sample course modules could be found in the CDs with this document.

PART 6

Large Scale Model



SOUTH REGION WEST UNIVERSITY TRANSPORTATION CENTER

1. Method
2. Section Design
3. Digital Modeling
4. Physical Model Construction

SCHEDULE REVIEW

- The schedule

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.
Task 1. Review training course.	█	█	█									
Task 2. ID strengths & weaknesses.	█	█	█									
Task 3. Design charrette.				█	█	█						
Task 4. Course modules.				█	█	█	█					
Task 5. Large-scale models.								█	█	█	█	
Task 6. Program brochures.										█		
Task 7. Master plan and final report.										█	█	█

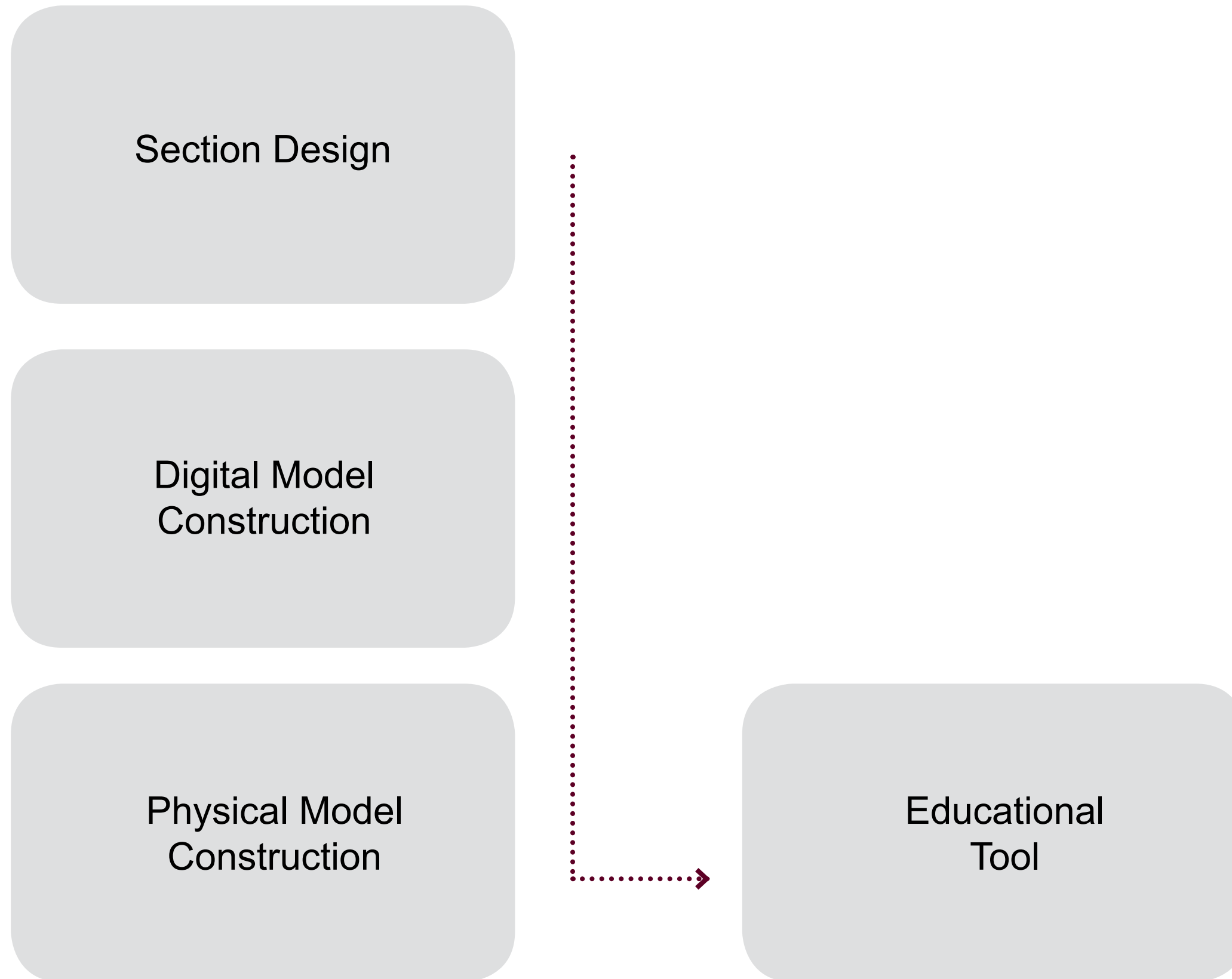
DONE August, 2013

- Following the schedule, the fifth task was finished by the end of August, 2013, coming out with this part of report as a phasing product.

PURPOSE

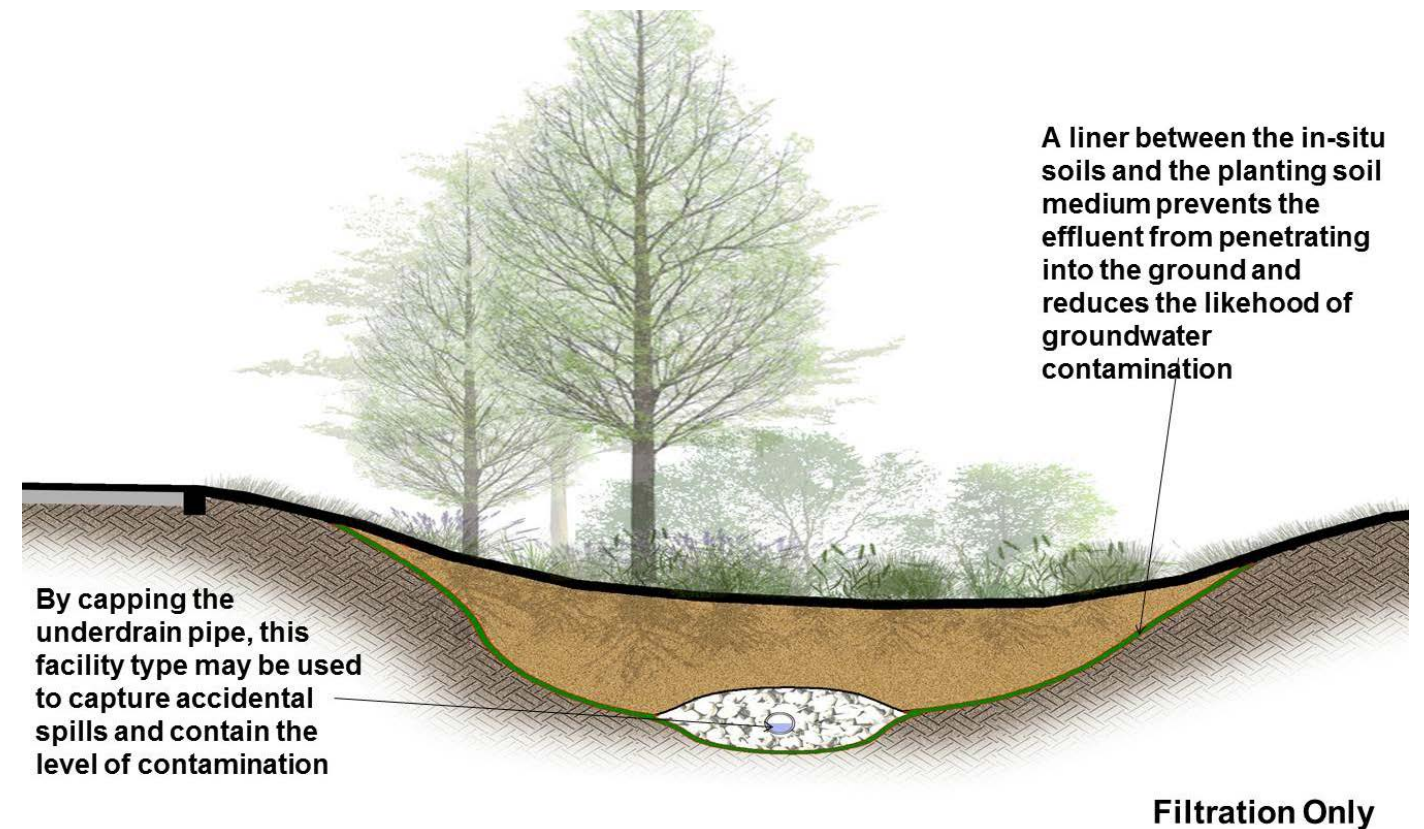
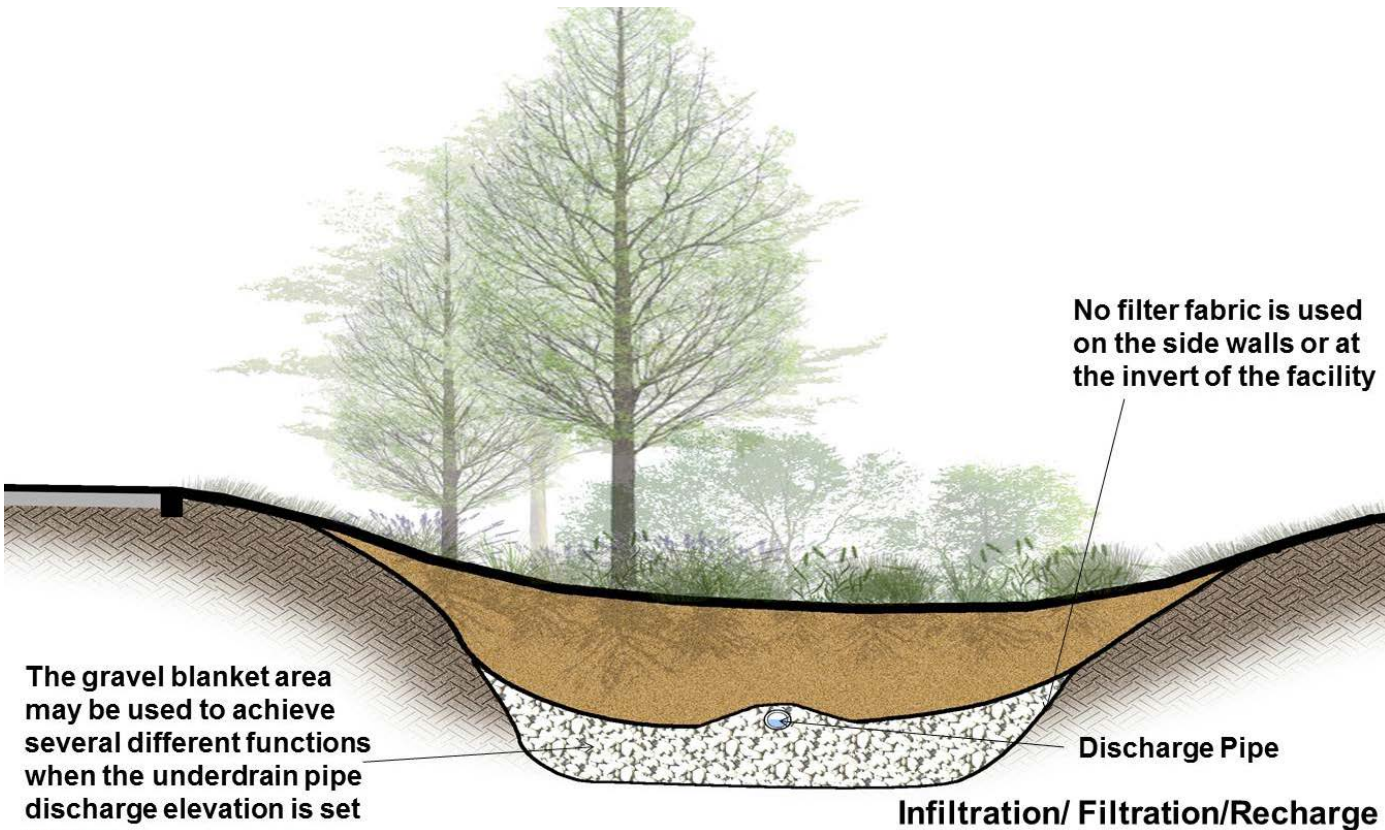
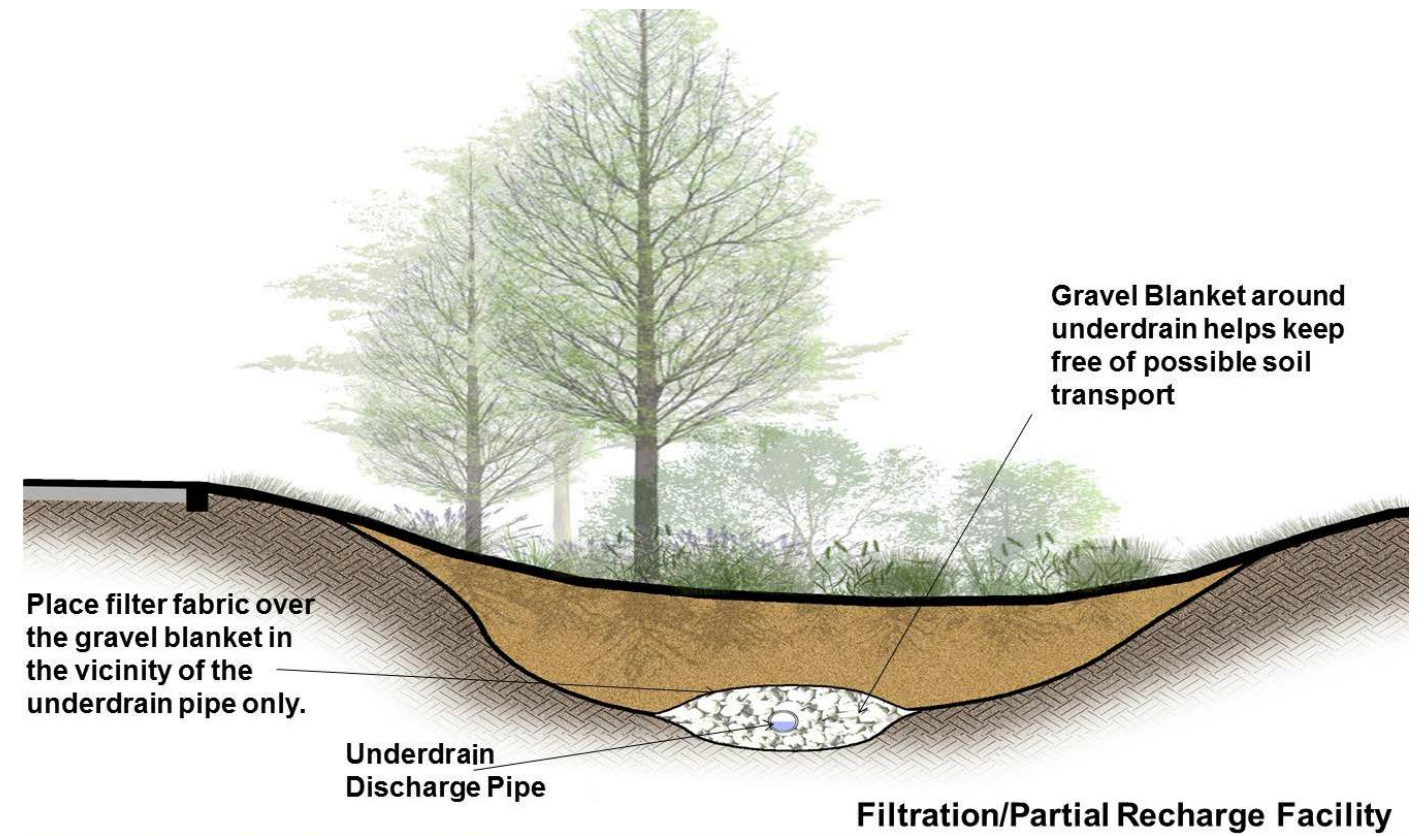
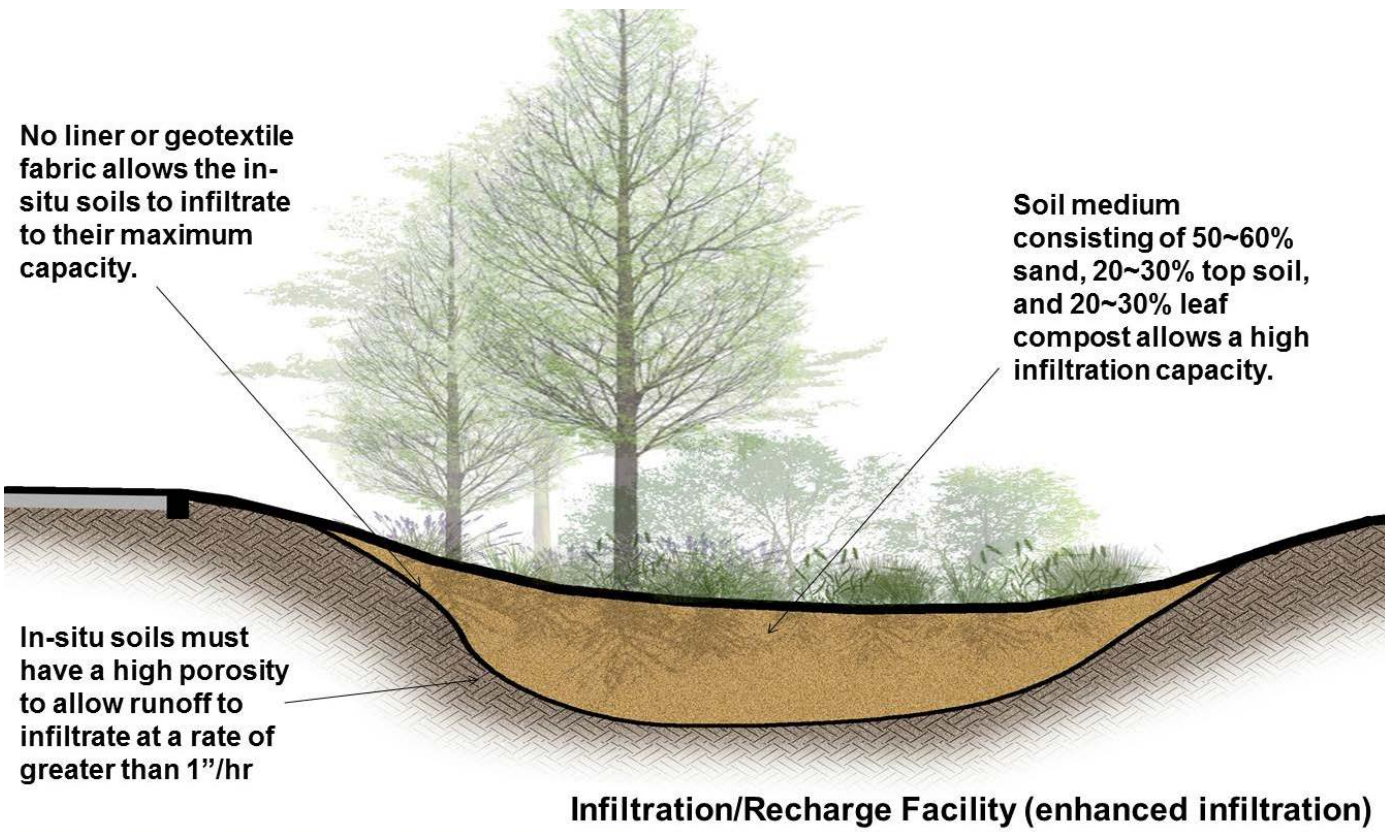
- This part of the report is to document the process of the large scale model construction. The large scale model is an important tool related to hands-on training. With the large scale model, we can clearly show the BMPs in front of attendees, and also effectively help audience to understand the design method as well as the construction detail.

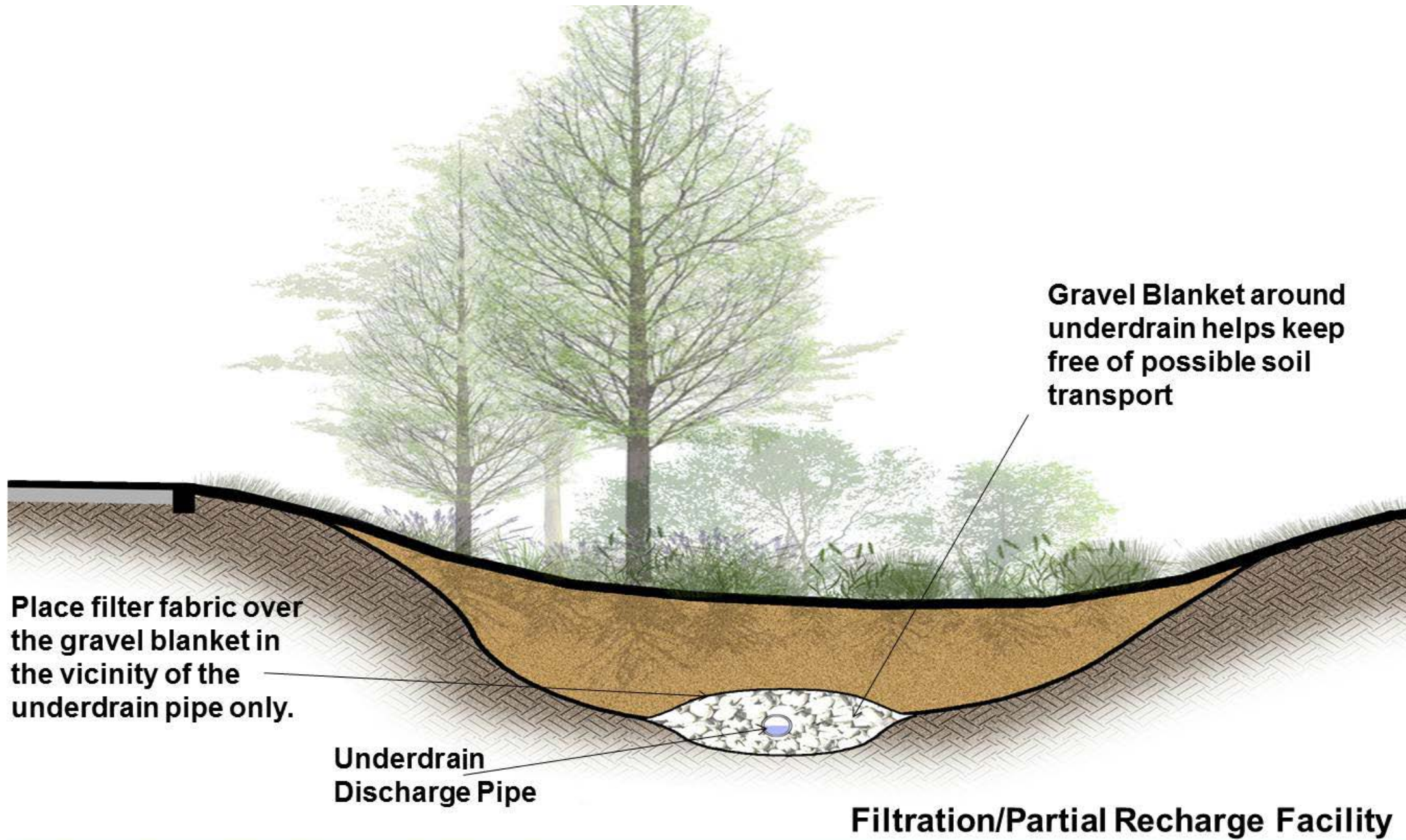
1. METHOD



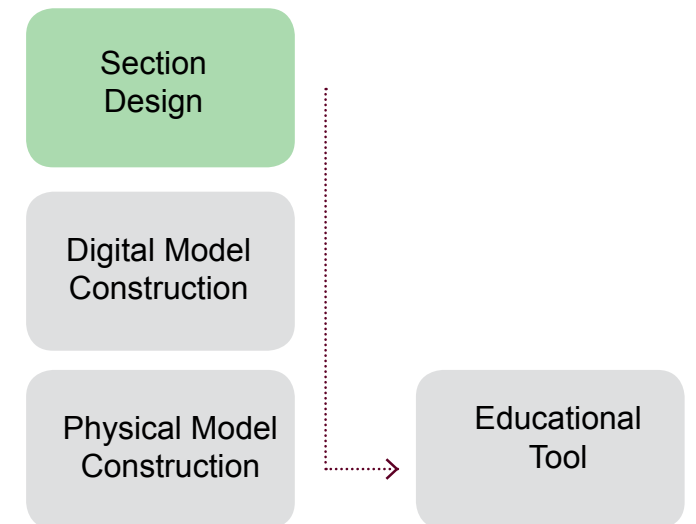
In this phase, we developed a large scale model of bioretention. As the program grows, we may construct more in the future.

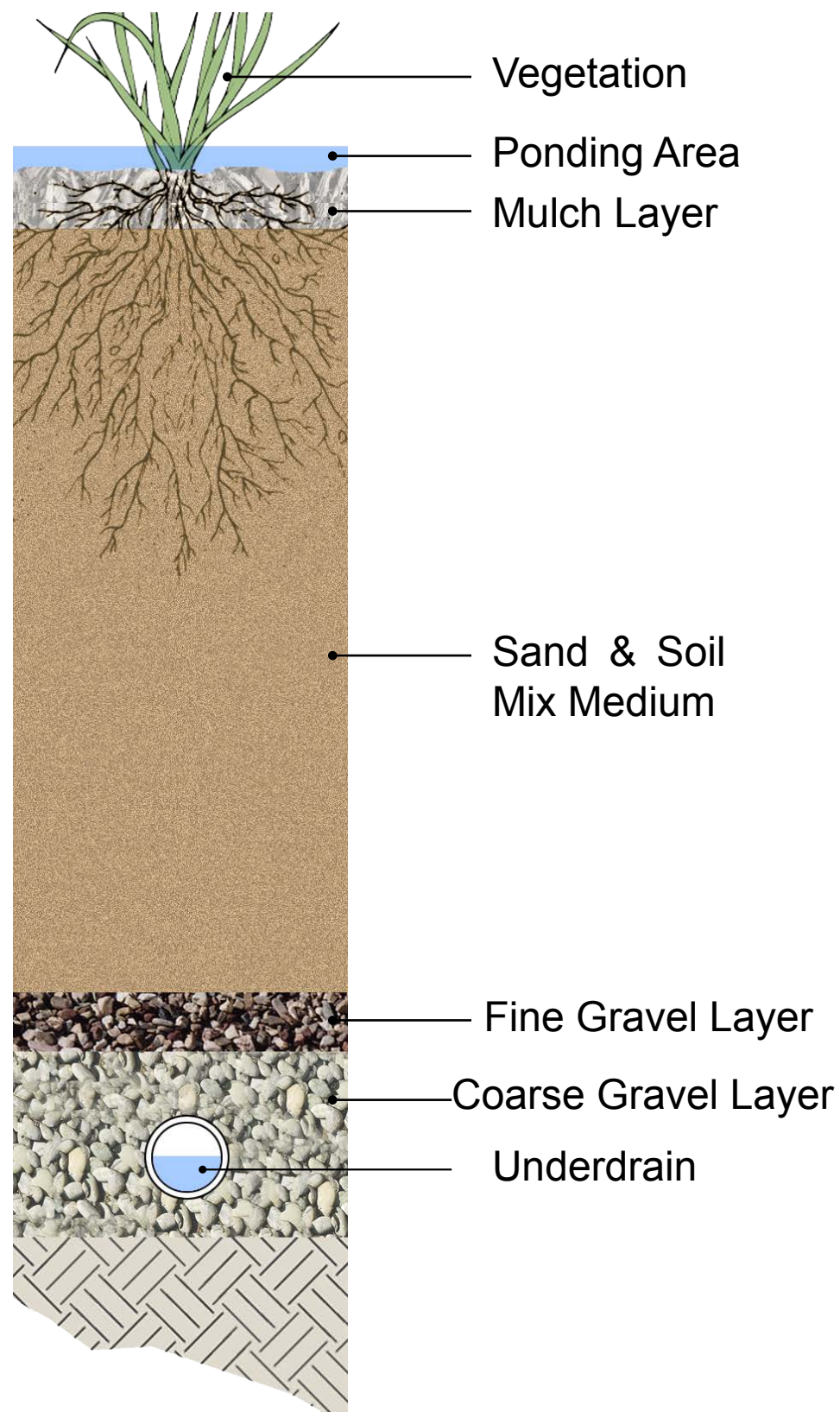
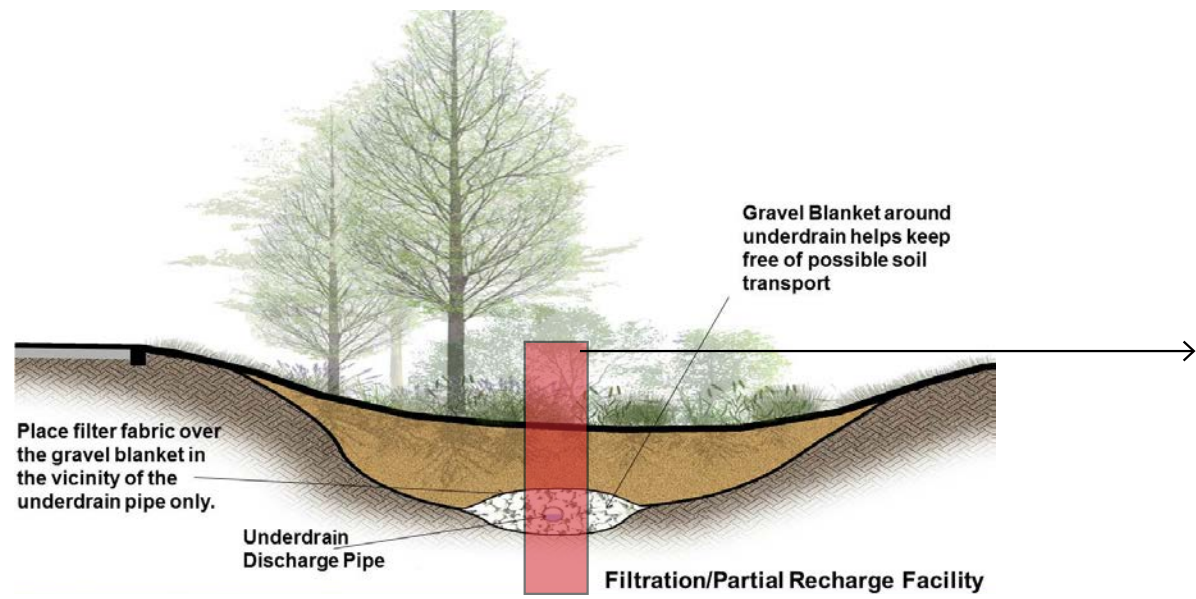
2. SECTION DESIGN



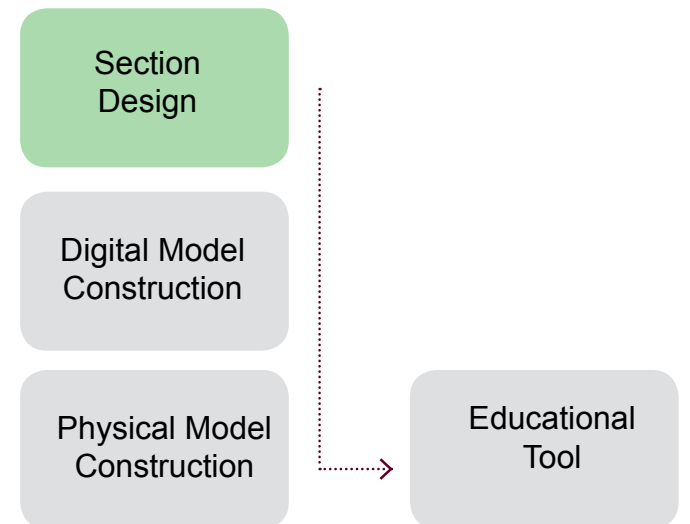


Among these four variations of bioretention design, we select the *Filtration/Partial Recharge Facility* as a widely applied practice to build an educational model.



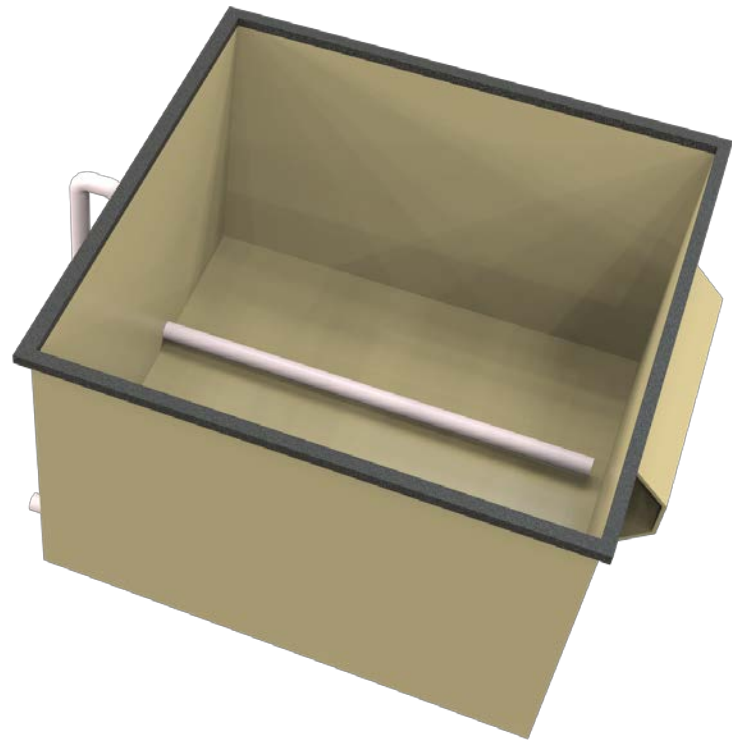


Specifically, we need a more detailed section design to construct the model.

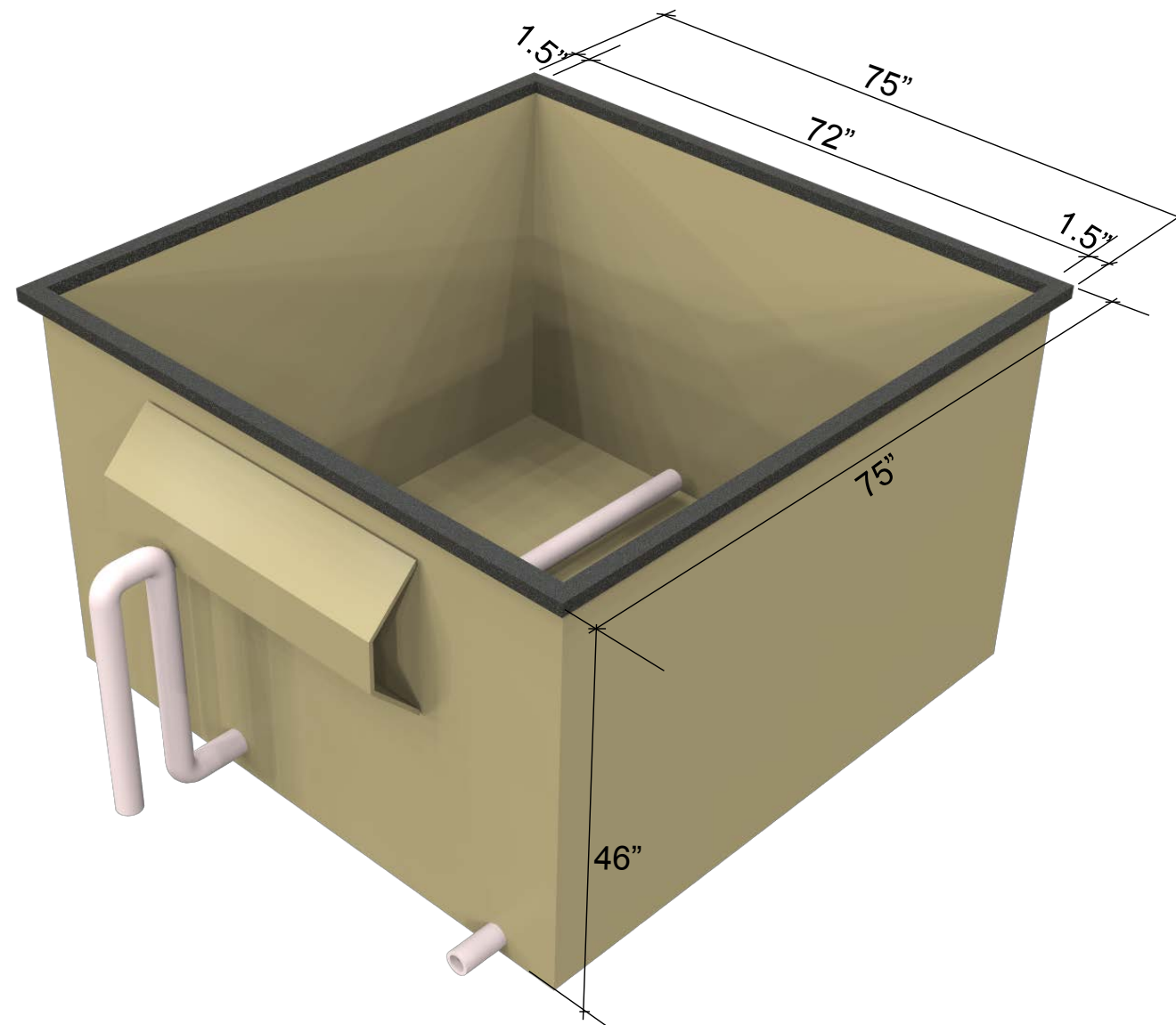


2. DIGITAL WORKING

Step 01: Empty the dumpster

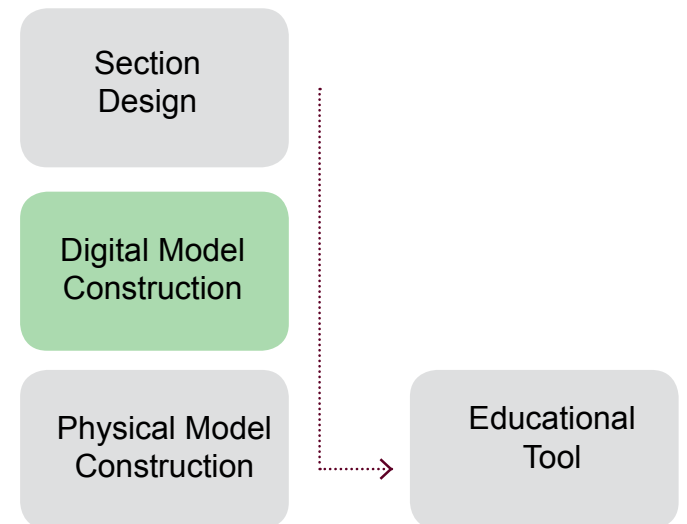


Original Base Model View 01



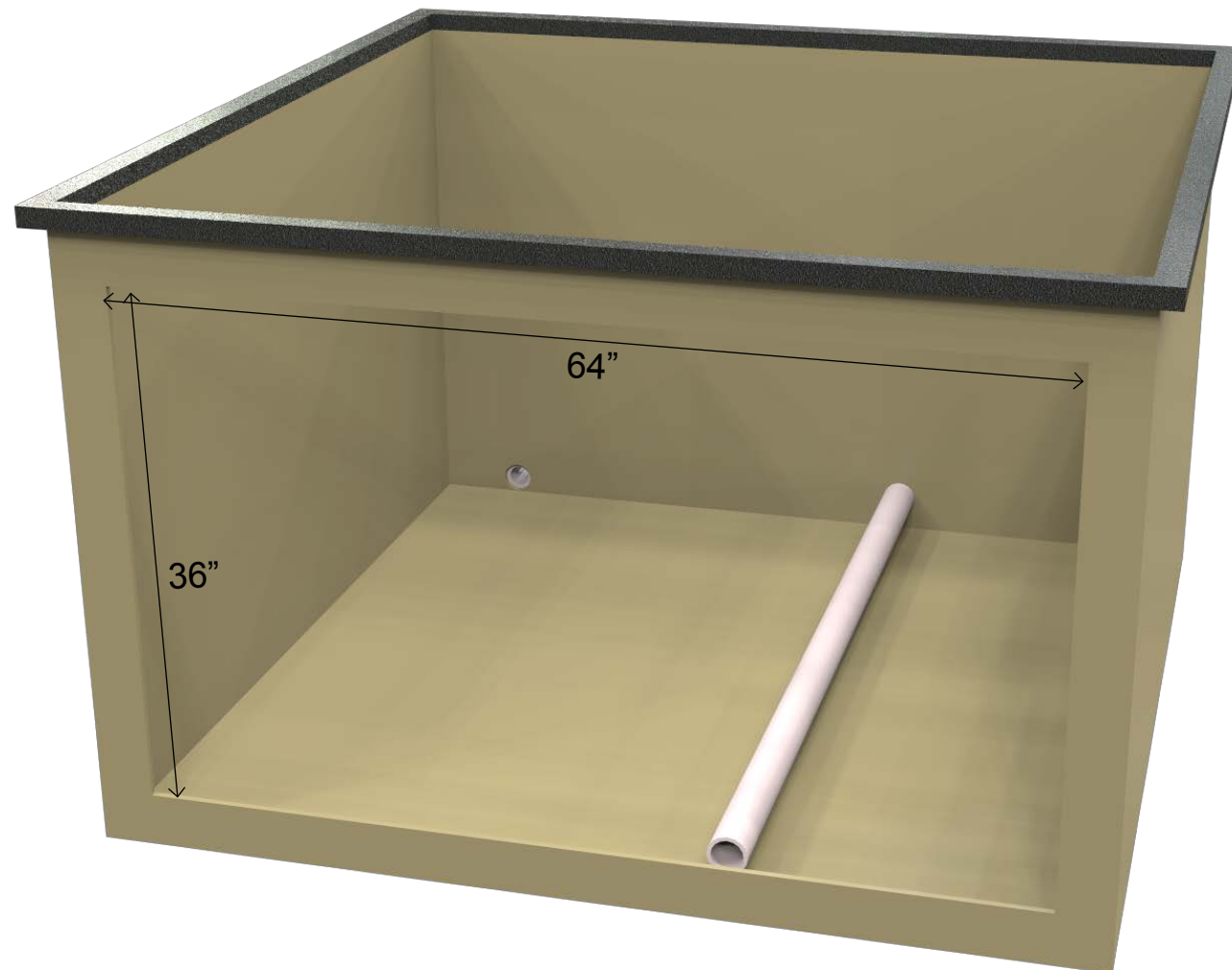
Original Base Model View 02

To apply the section design into a model, we started from a dumpster. This is the existing models in SEC Lab. We emptied one and used it as a base frame for a new educational model.

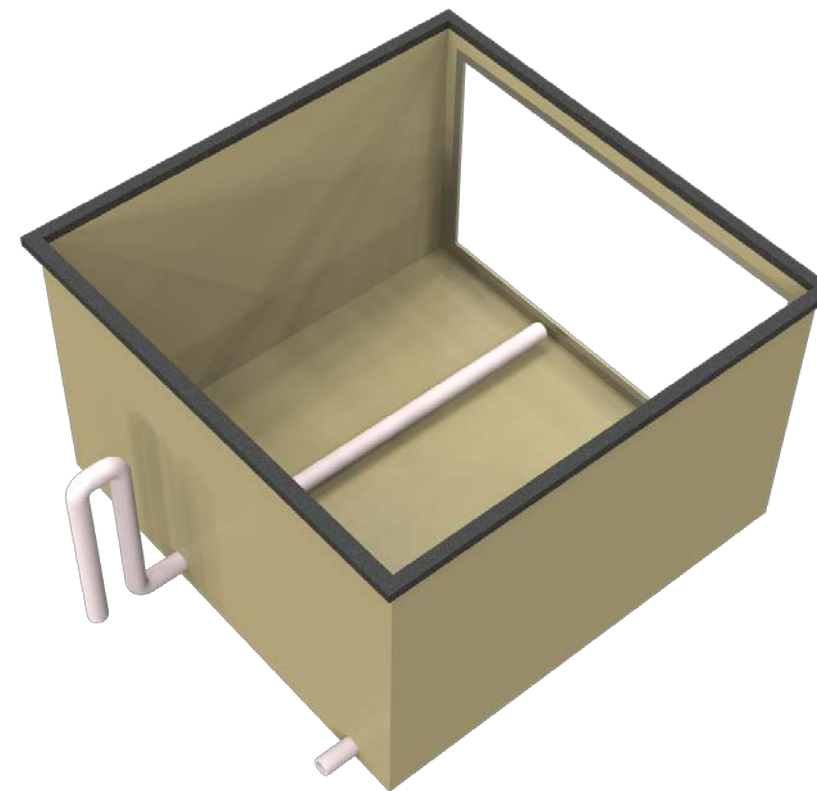


Step 02: Create a hole in the front of the dumpster

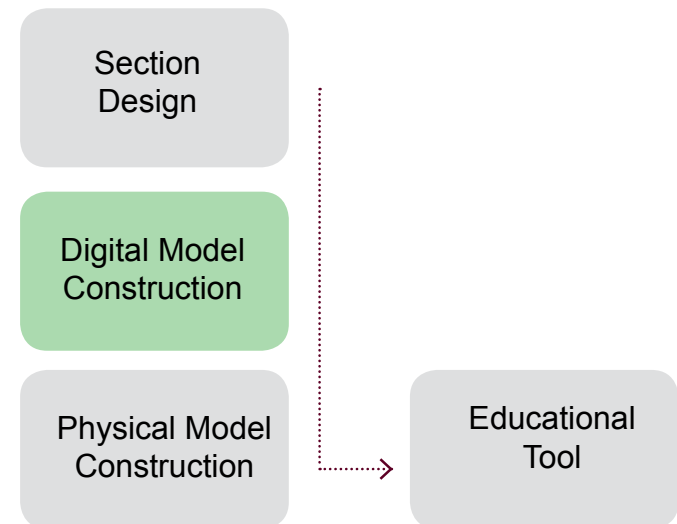
A hole in front of the dumpster will be a showcase window for educational use.



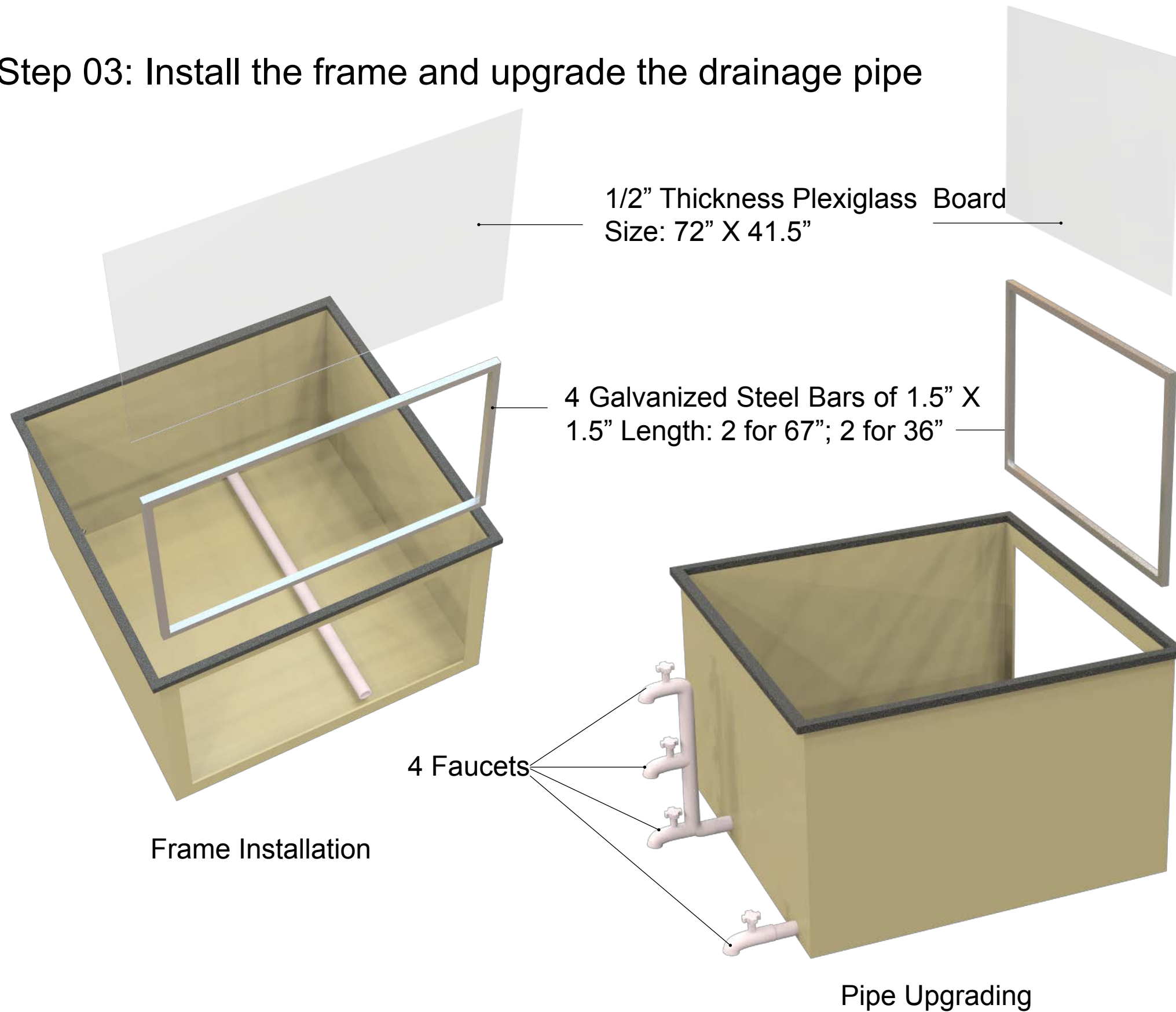
Cut Model View 01
Hole Size: 36" X 64"



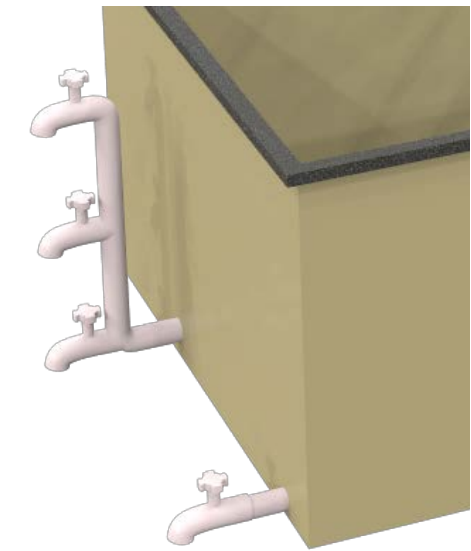
Cut Model View 02



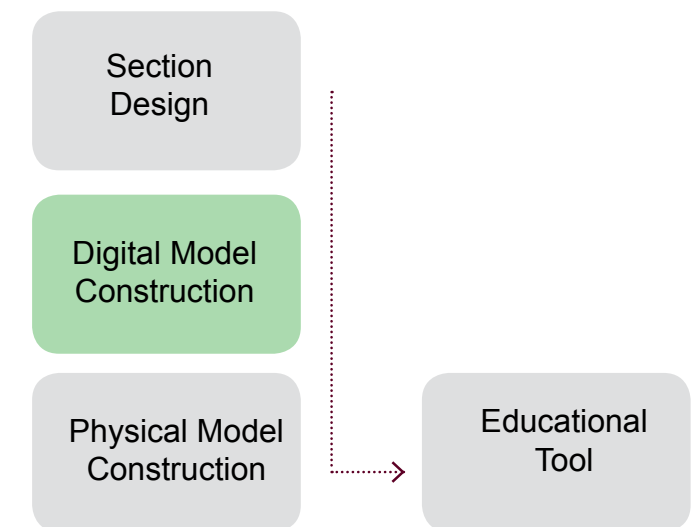
Step 03: Install the frame and upgrade the drainage pipe



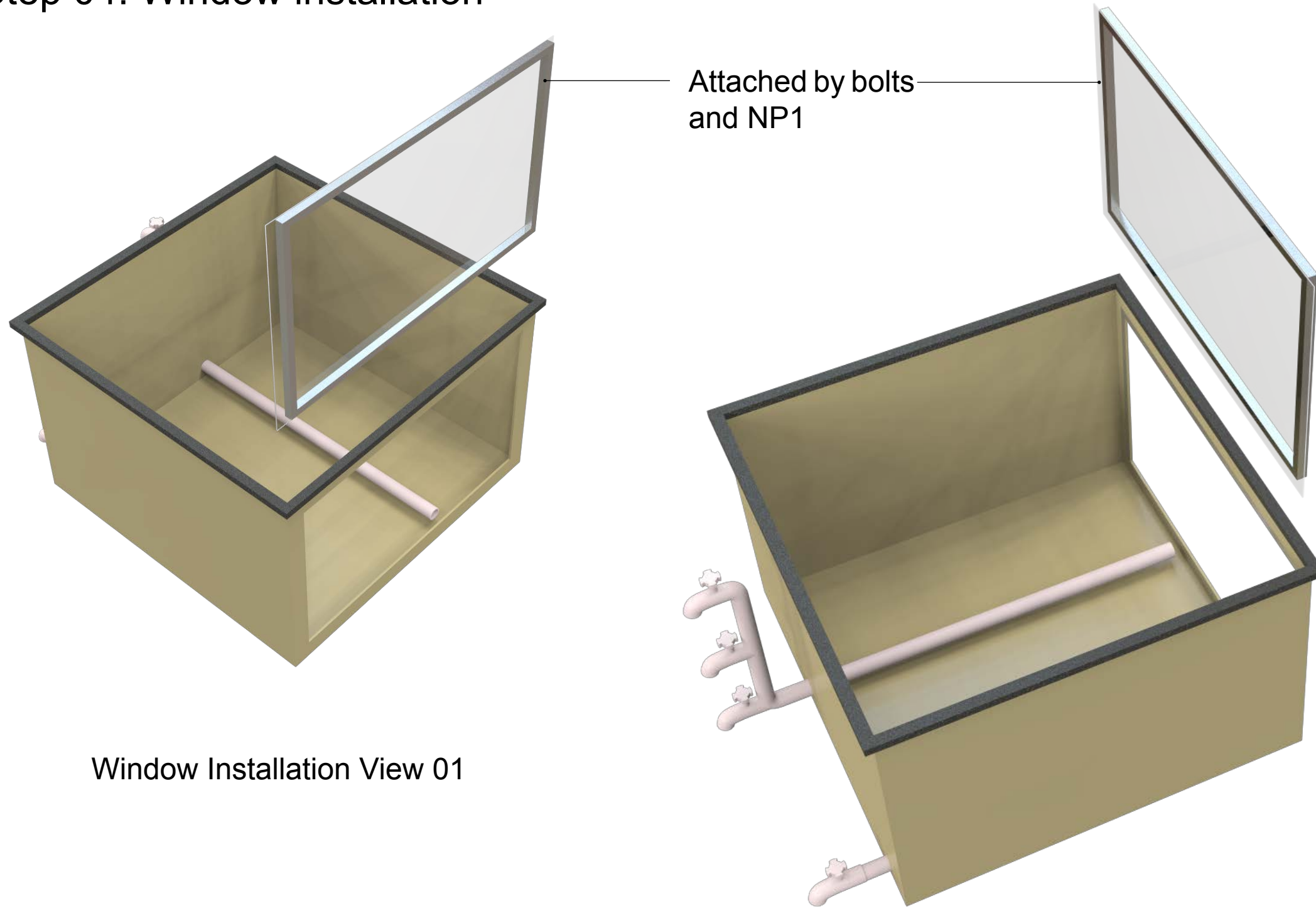
A smooth material is applied to frame the window so that the transparent material can be easily attached.



The pipes at backside are upgraded and transformed into a controllable system.



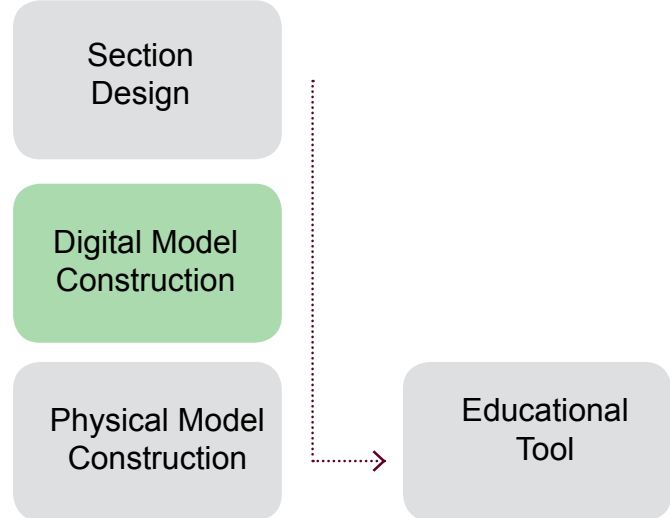
Step 04: Window installation



Attached by bolts and NP1

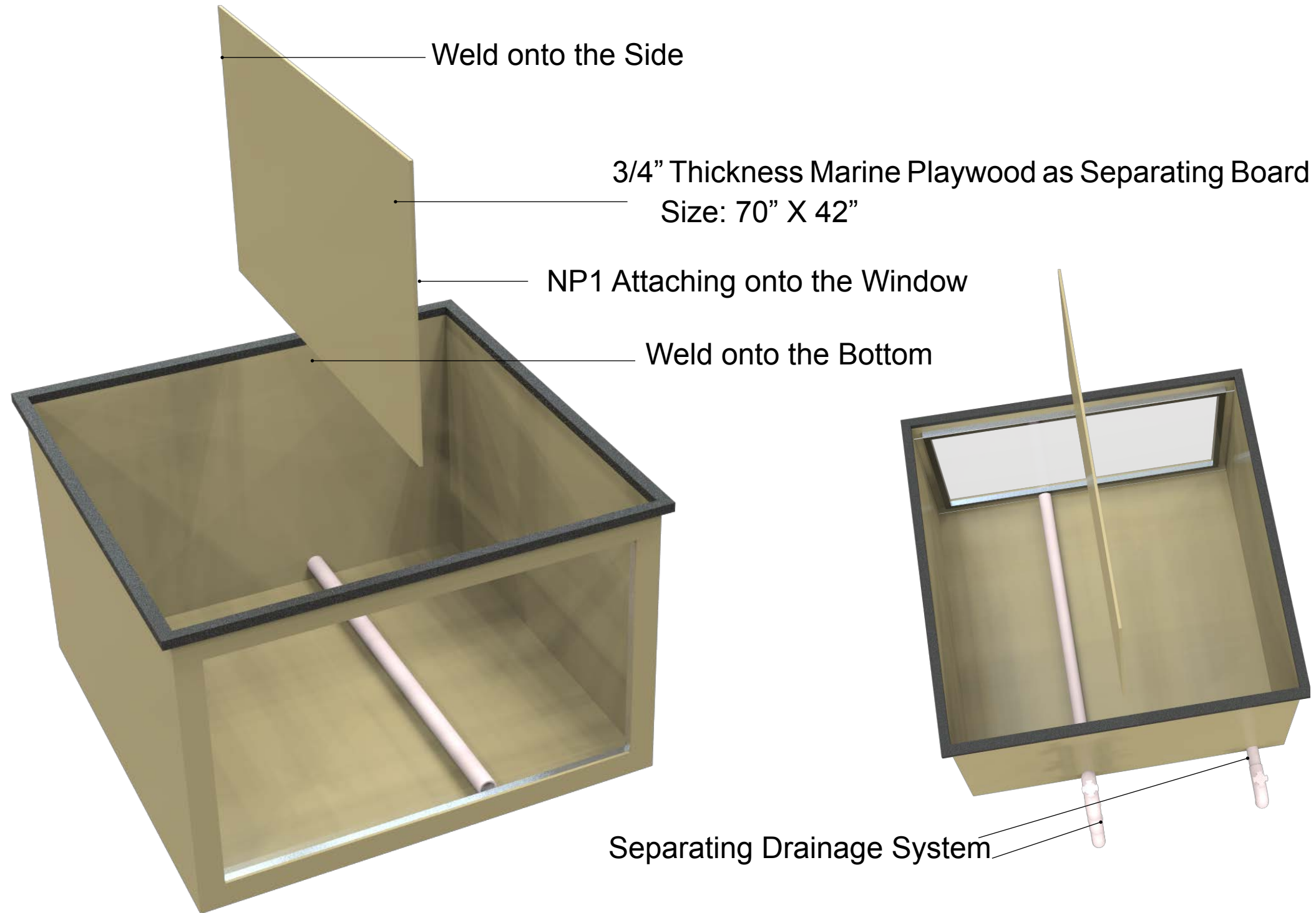
Window Installation View 01

Window Installation View 02



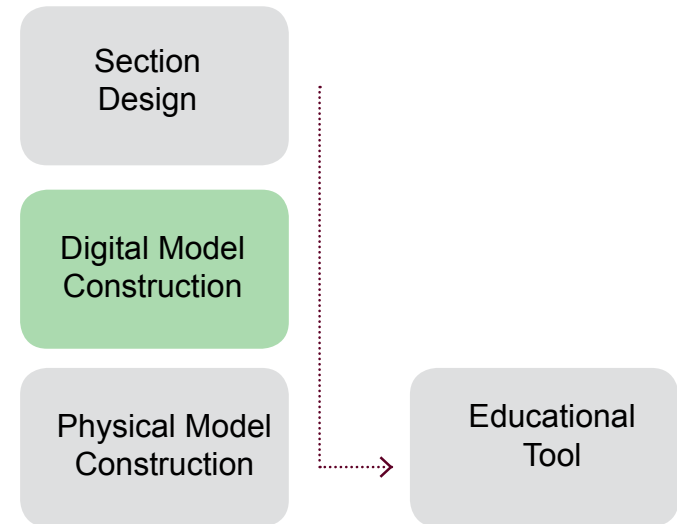
Step 05: Separating board installation

The separating board will provide a clear view of the comparison between traditional detention and bioretention.



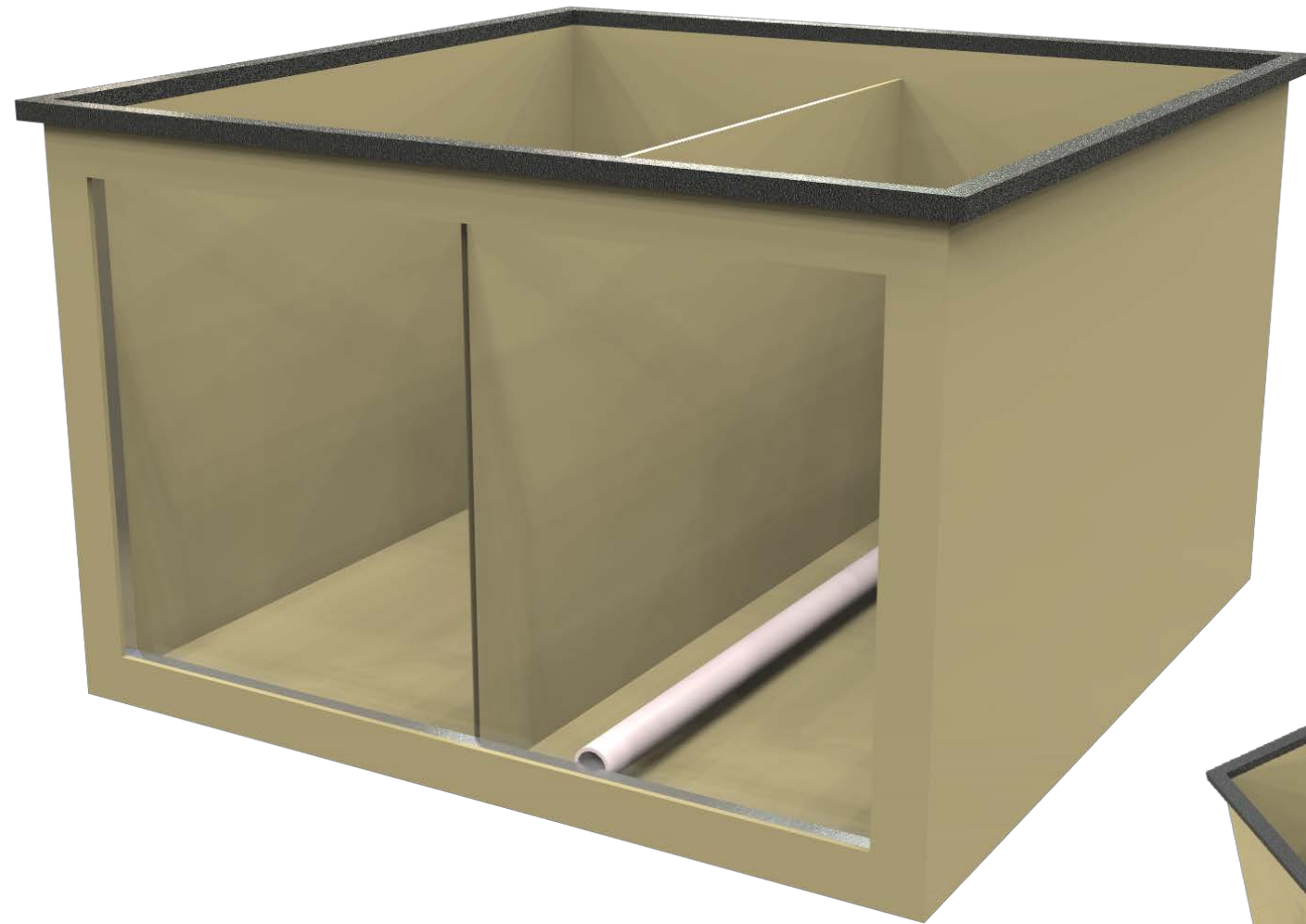
Separating Board Installation View 01

Separating Board Installation View 02

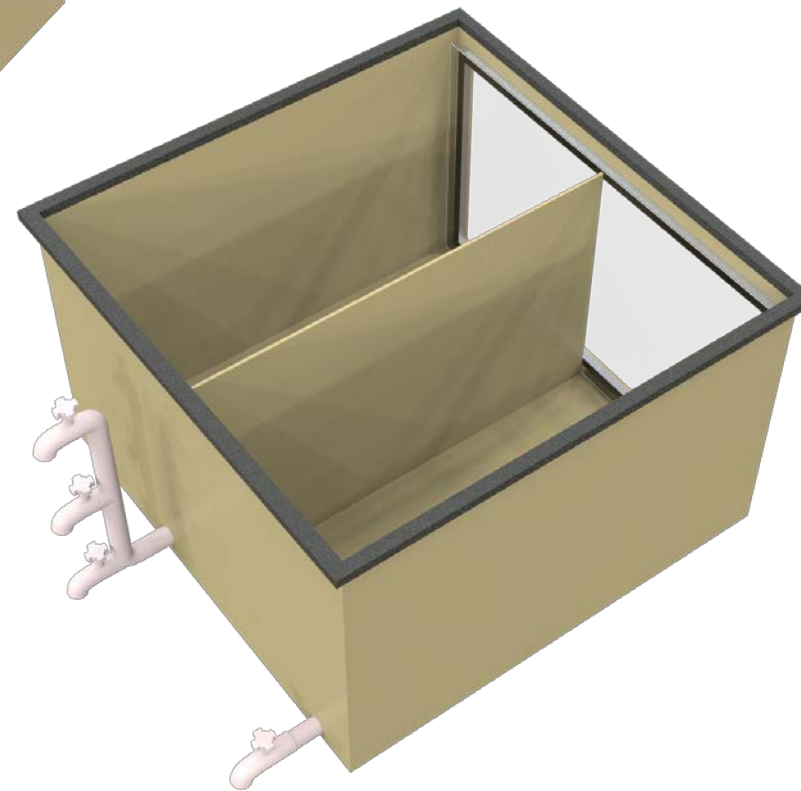


Step 06: Water proofing testing

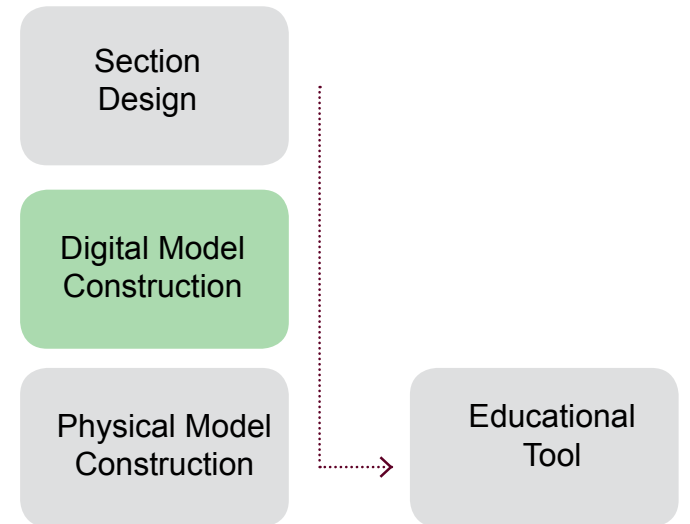
Water proofing testing is necessary at this phase.



Prepared Container for Testing View 01

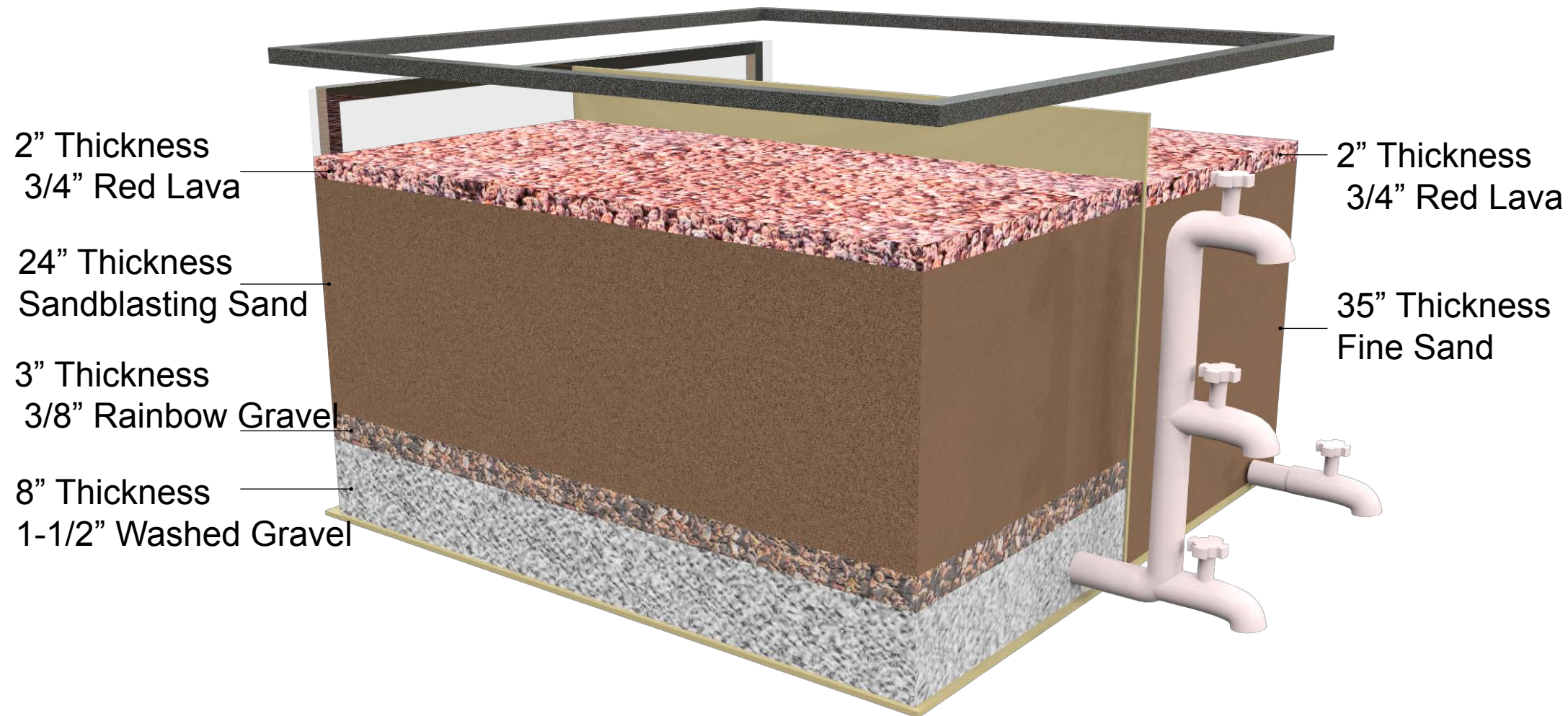


Prepared Container for Testing View 02

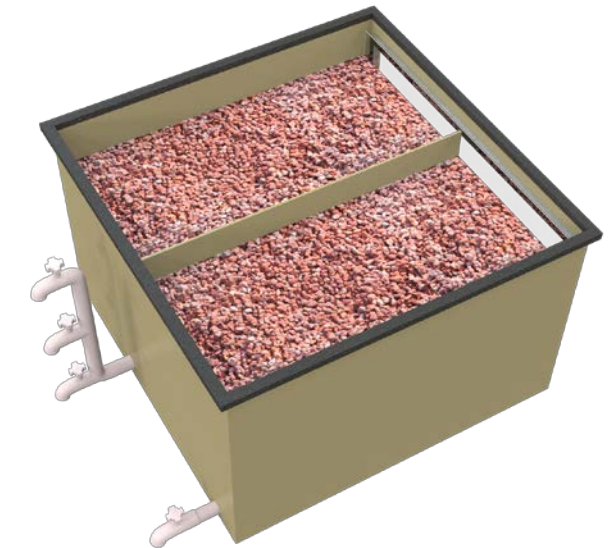


Step 07: Fill-in materials installation

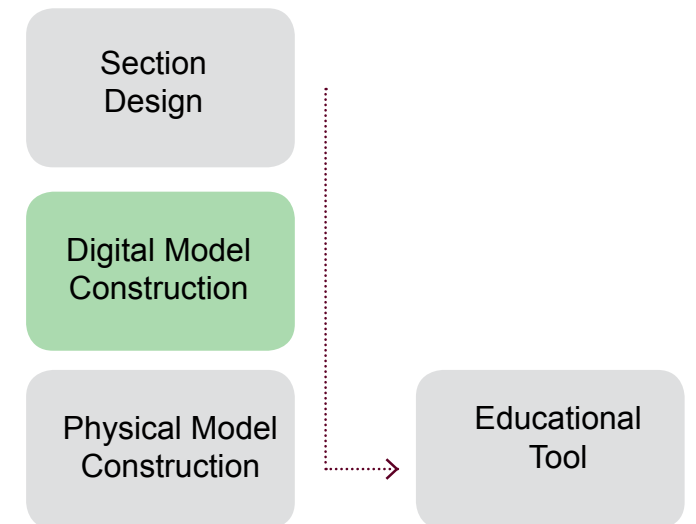
Fill-in material will be installed at this phase.



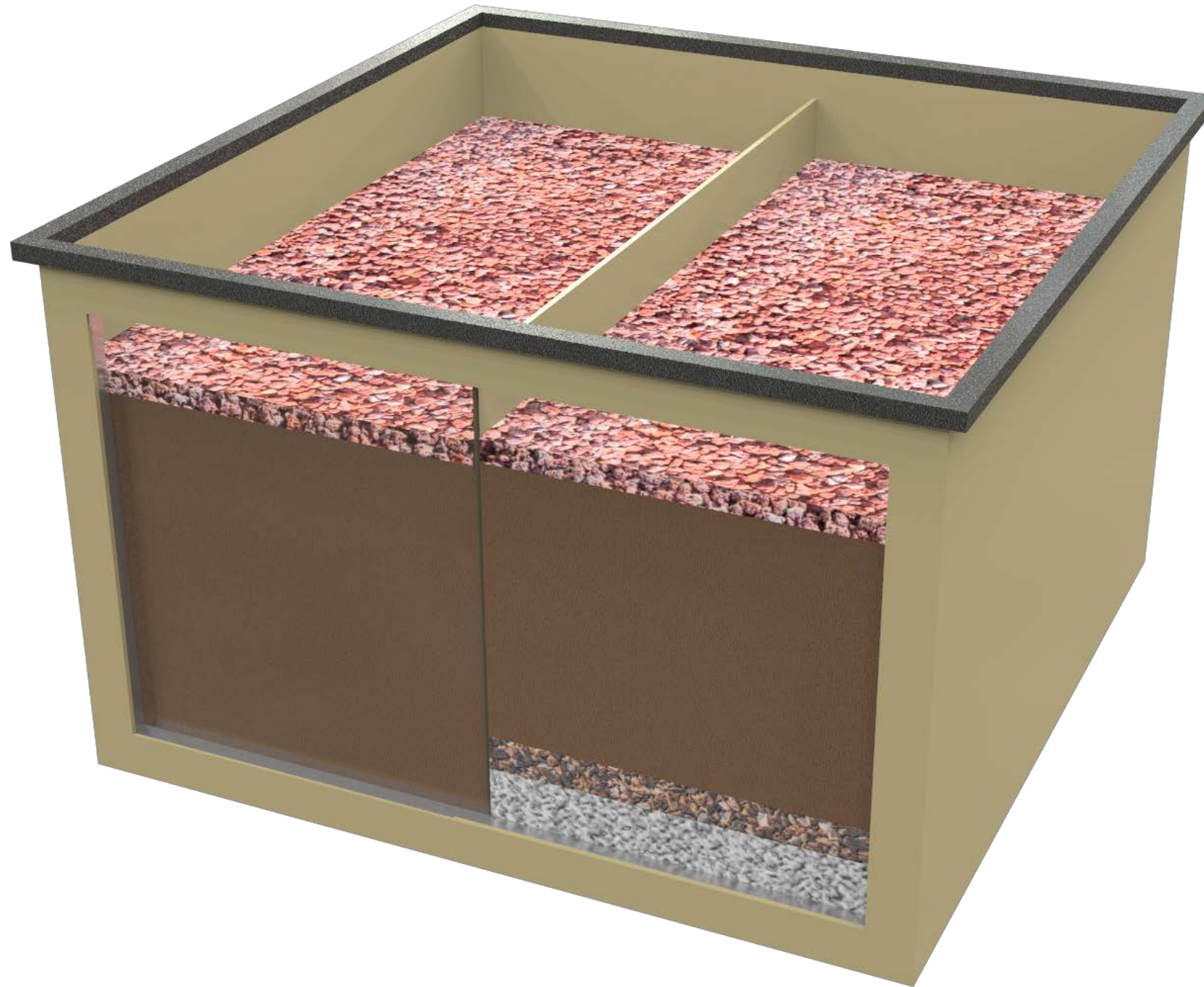
Fill-in Material Layers



Fill-in Materials Installation

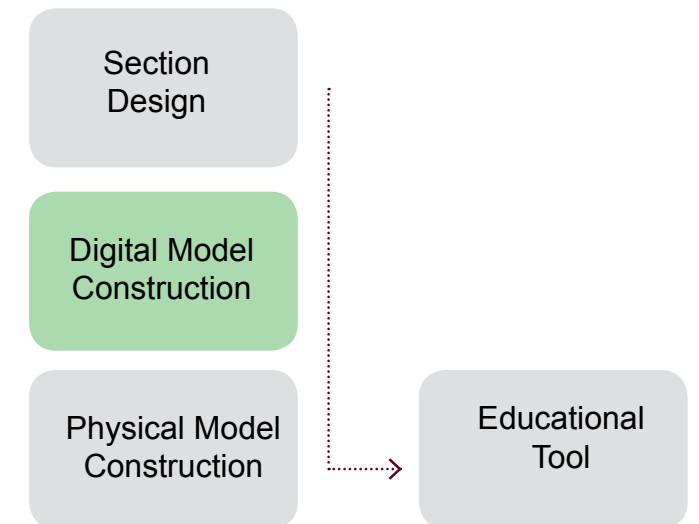


Step 08: Final Installation



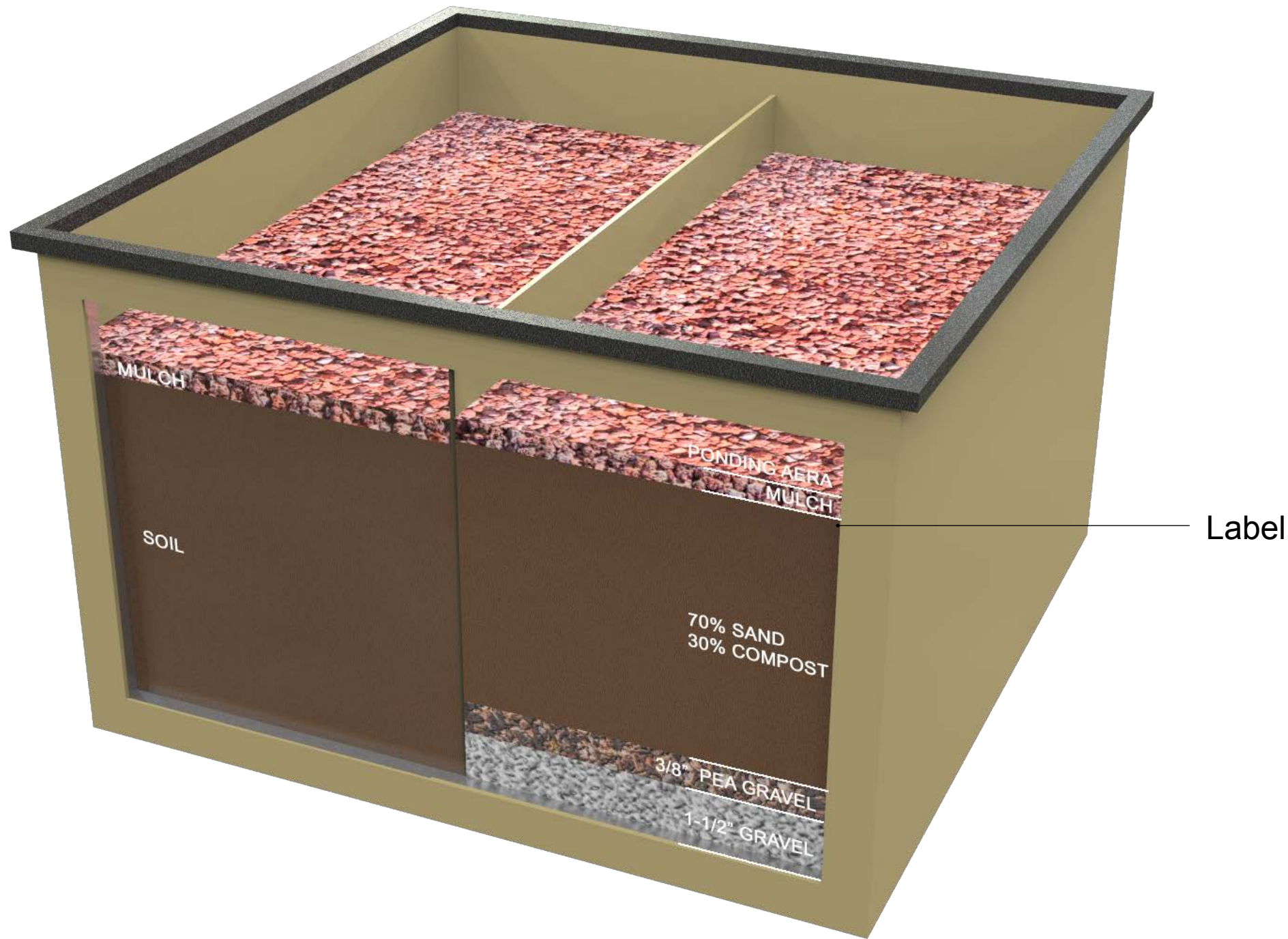
Final Installation

The aggregates filled the dumpster layer by layer, and were washed layer by layer, forming this clean model here.

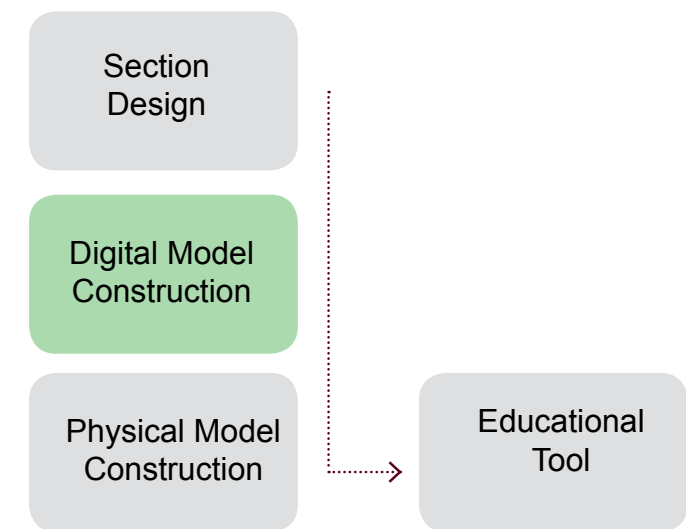


Step 09: Educational tool enhancement

Some marks and labels were applied to create a more comprehensive model for educational use.



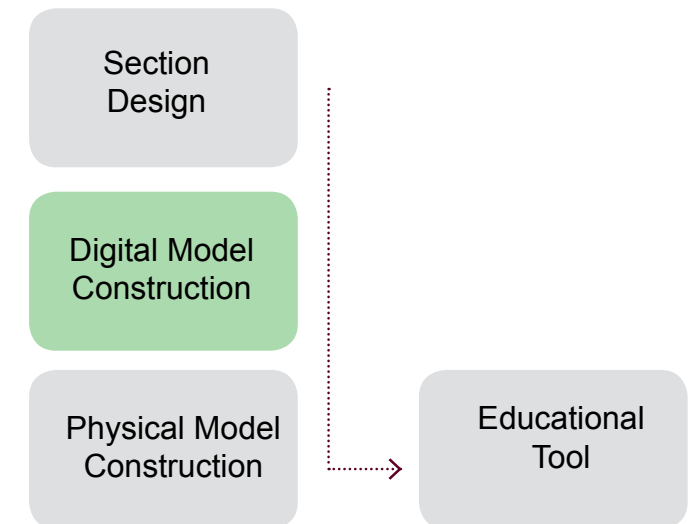
Final Model



Material List:

Material	Size	Amount	Provider
Container Material			
Rust Primer	12 oz	1	Walmart
Painting	1 Gallon	1	The Woodsons
Galvanized Steel Bars	1.5"X1.5"X67"	4	(already on site)
Galvanized Steel Bars	1.5"X1.5"X36"	6	
1/2" Plexiglass Board	72"X41.5"	2	Acme Glass
Faucets		4	Valley Valve
2-way Valve		1	
3-way Valve		3	
NP1		5	The Woodsons
3/4" Marine Plywood	70" X 42"	2	The Woodsons
Filling Material (amount unit: Cubic Yard)			
Washed Gravel	1.5" size	1	NEI Construction
Sandblasting Sand		2	
Rainbow Gravel	3/8" size	1	
Red Lava	3/4" size	2 bags	
Washed Sand		2	
Geotextile		1	(already on site)

Based on the digital design, we created a list of materials to be purchased.

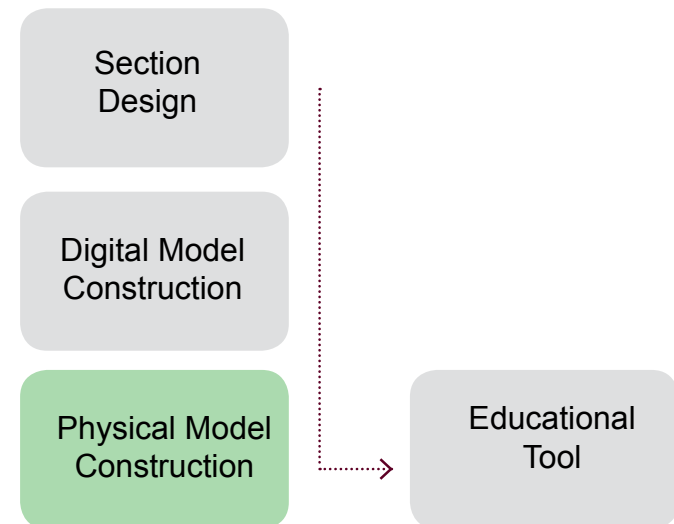


3. PHYSICAL MODEL CONSTRUCTION



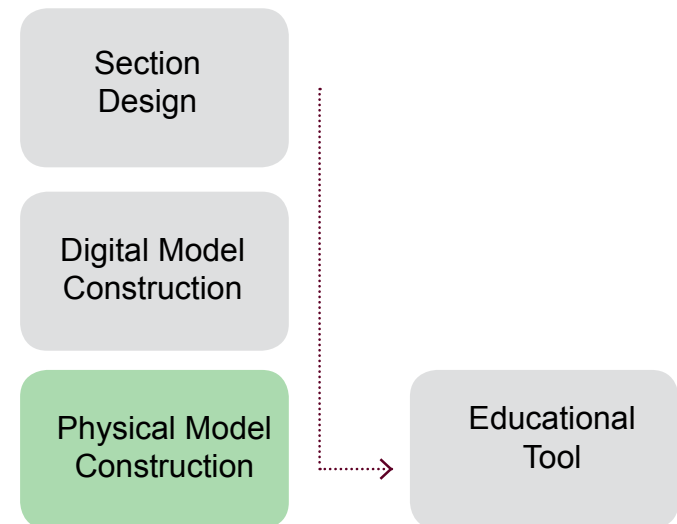
The first step is to empty the original model.

Then cutting to create the hole for the window in front of the dumpster is the second step.



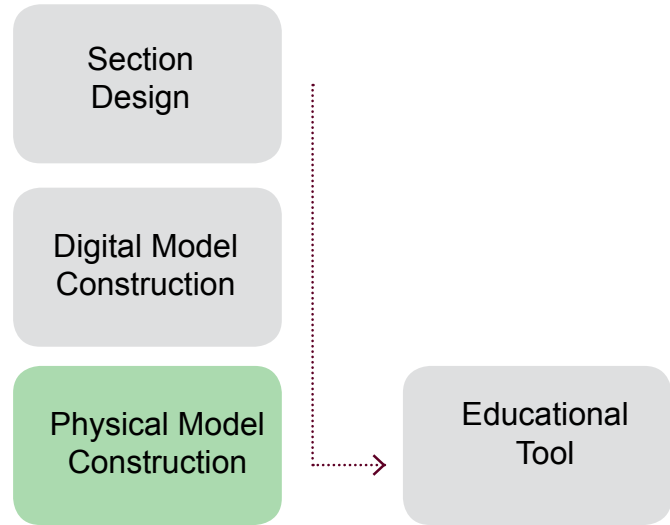


The window hole in the front of the box.



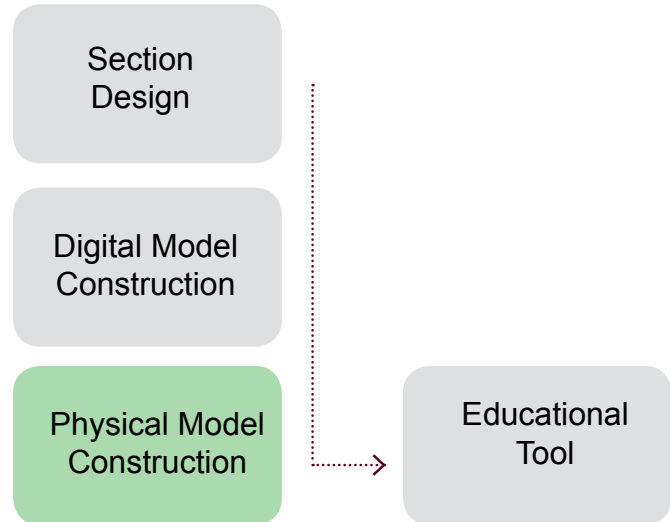


Framing the window by galvanized tubes.



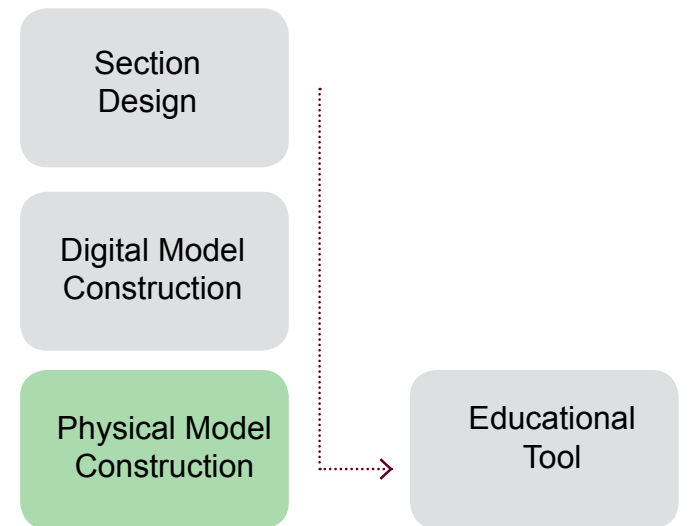


The framed dumpster should be painted to be a clean box for future use.



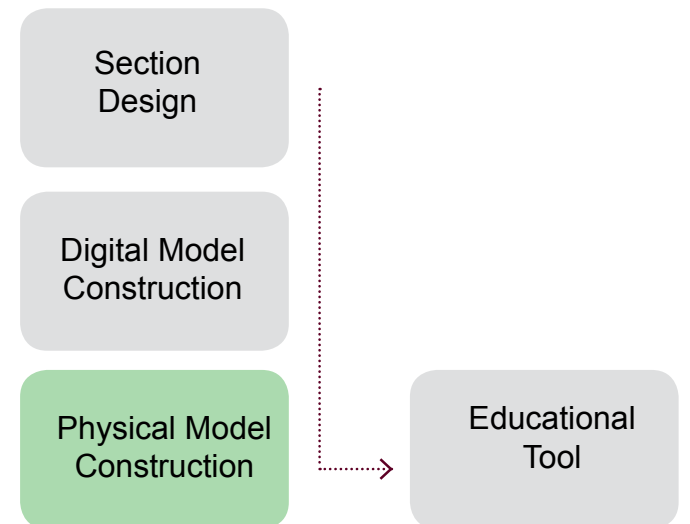


The plexiglass and marine plywood were cut on site and then attached onto the model.



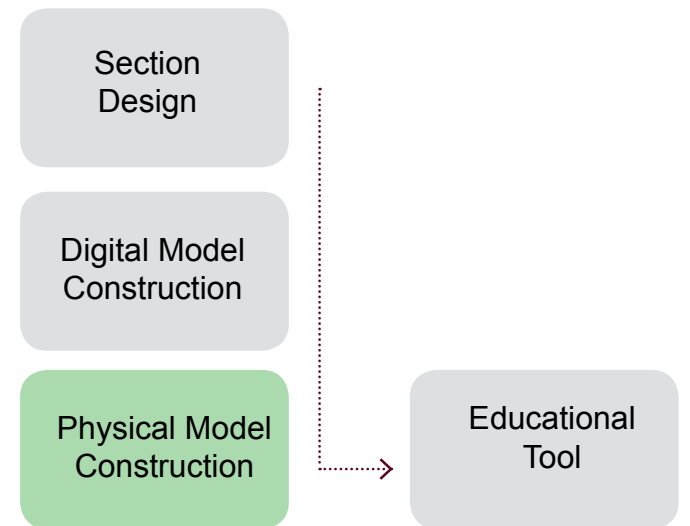


The model with attached boards was finished.



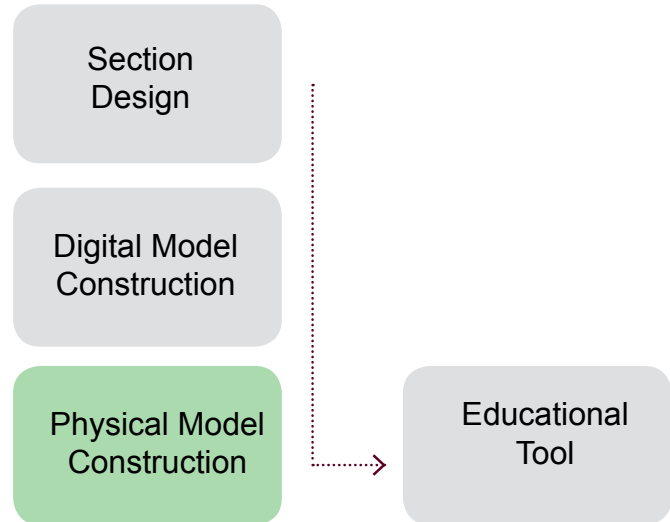
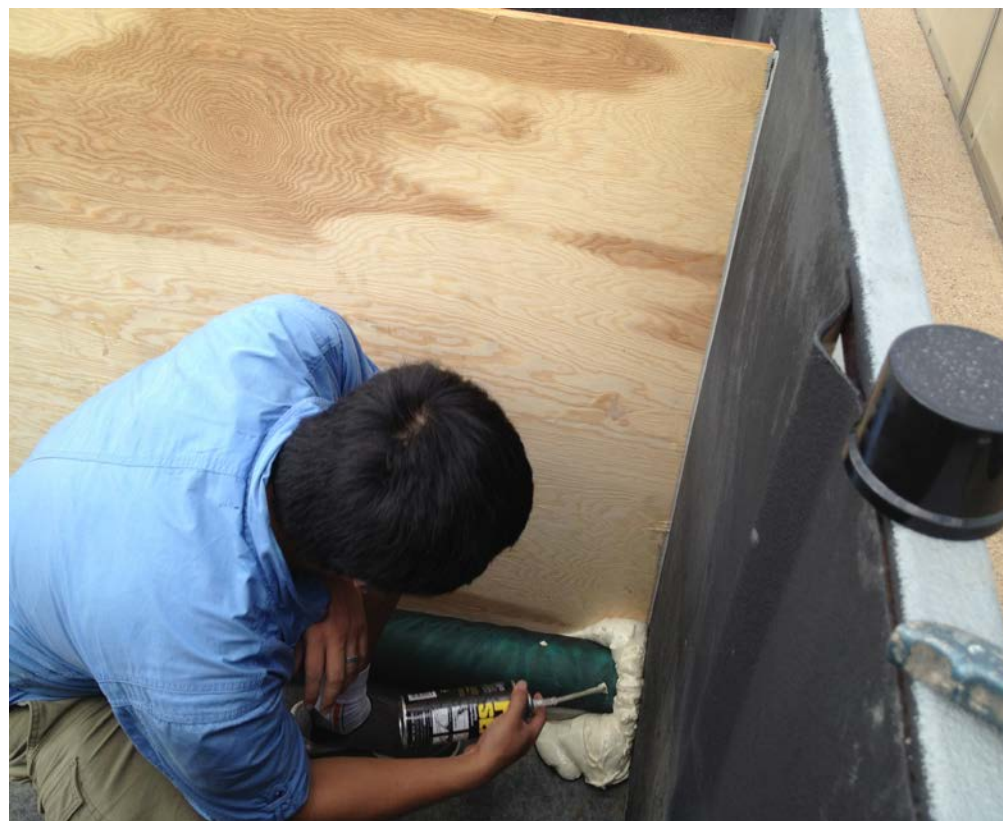
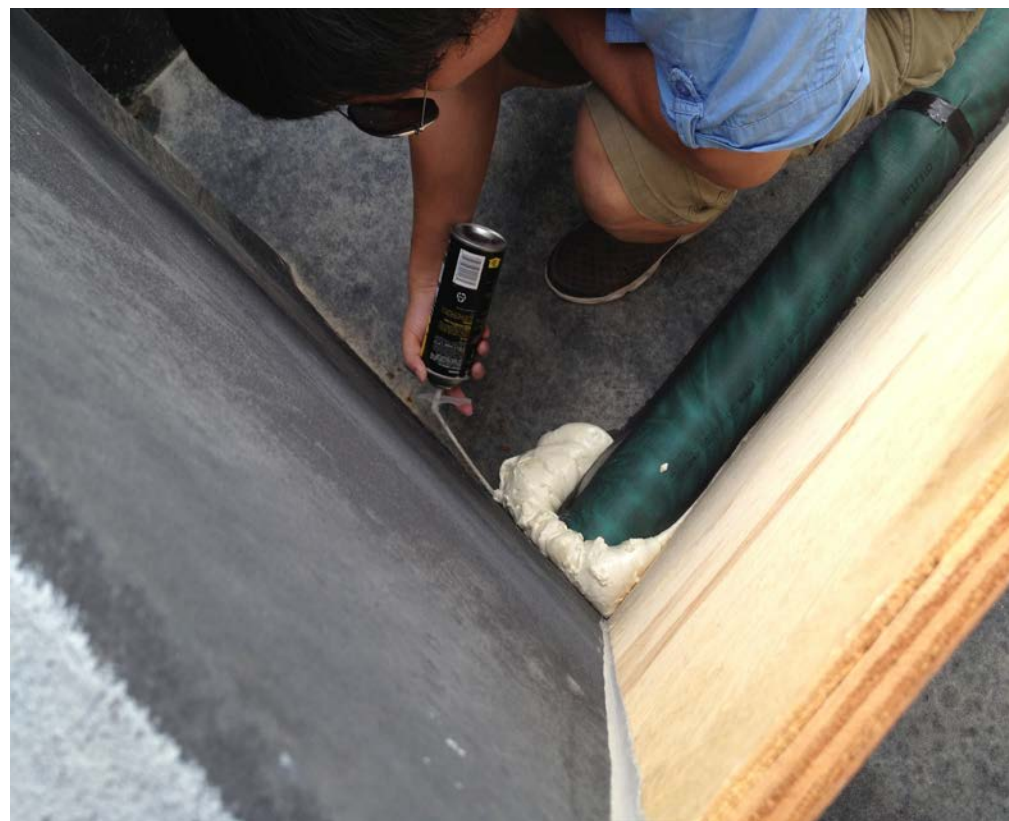


The models were washed.



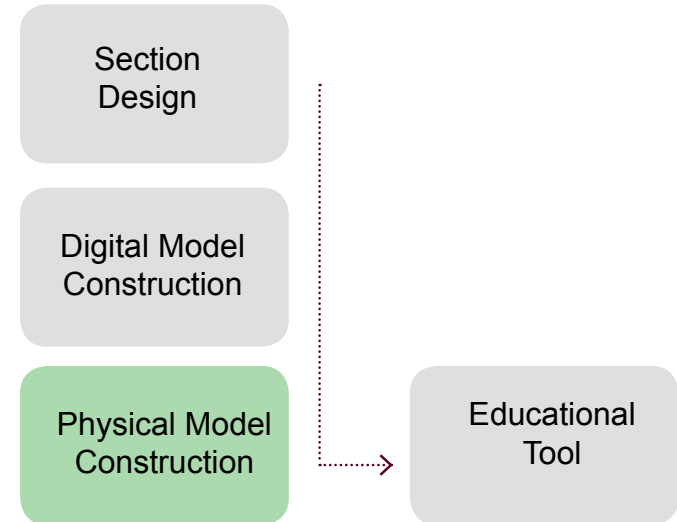


All the potential leakage were fixed by NP1 and Expandable Foam.



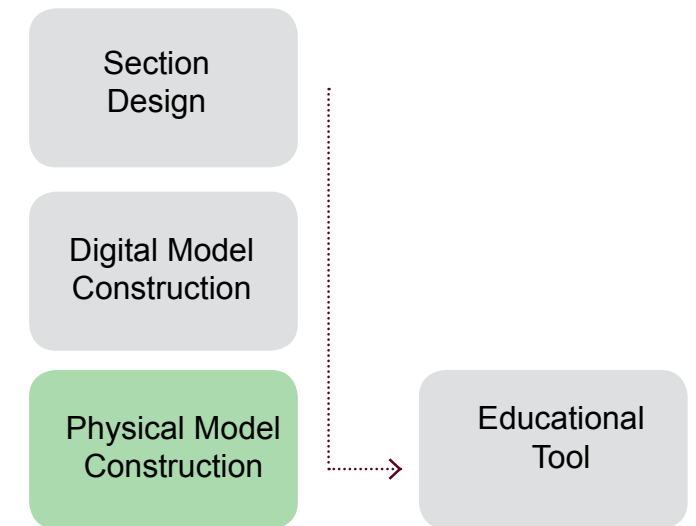


The filling materials were picked up from NEI.



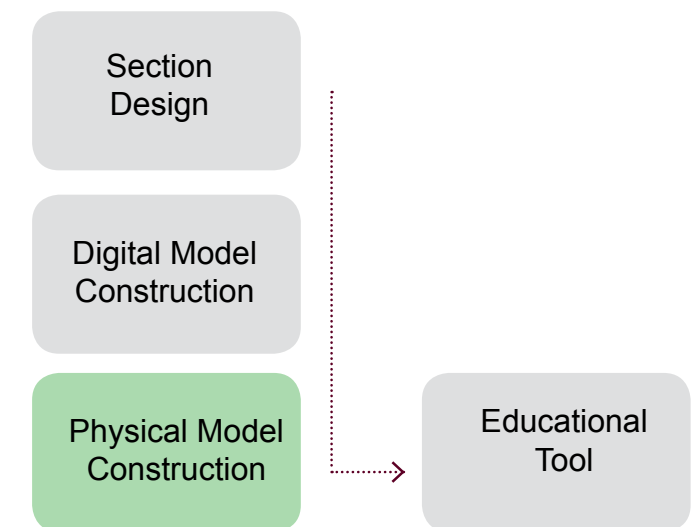


Filling sands and gravels layer by layer separated by geotextile.



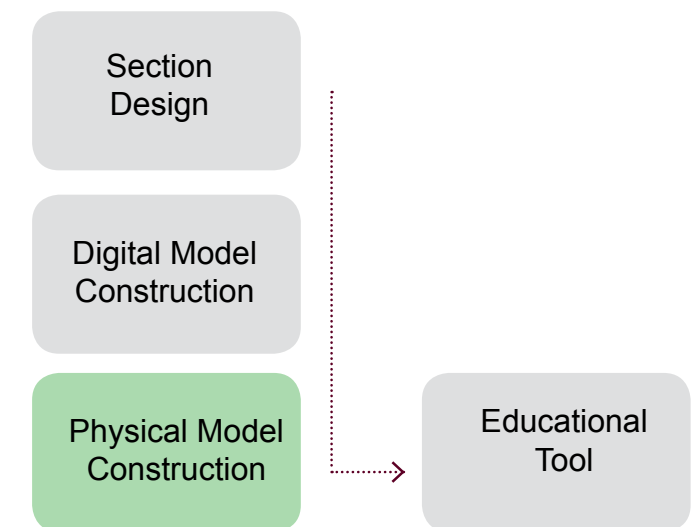


The materials were filled into model.





The red lava rock was filled as mulch.



PART 7

Program Brochures

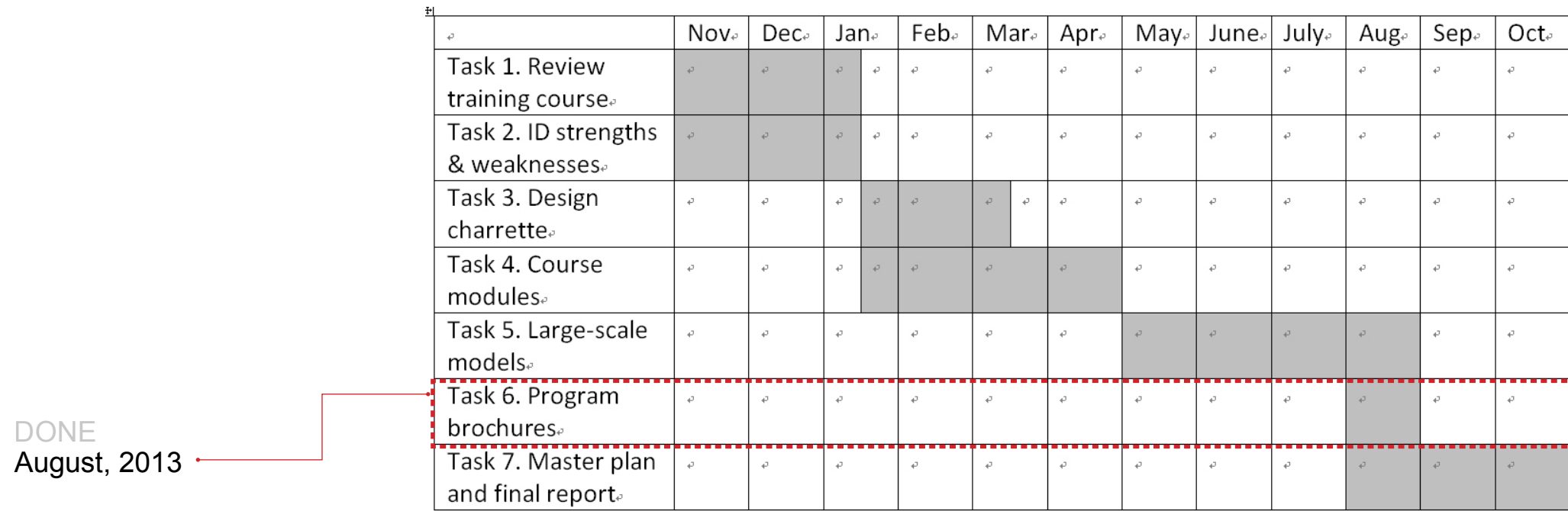


SOUTH REGION WEST UNIVERSITY TRANSPORTATION CENTER

1. Method
2. Section Design
3. Digital Modeling
4. Physical Model Construction

SCHEDULE REVIEW

- The schedule



- Following the schedule, the sixth task was finished by the end of August, 2013, coming out with this part of report as a phasing product.

PURPOSE

- This part of the report is to establish a framework and template for information sharing and dissemination.

1. INTRODUCTION

Brochures distribution will follow the arrangement of course modules as well as the course schedule.

COURSE CONTENTS REVIEW

1. LID Overview
2. BMPs - Bioretention
3. BMPs - Porous Pavement
4. BMPs - Green Roof

2. BROCHURE



The Sediment and Erosion Control Lab (SEC) has an established reputation as a renowned soil erosion research facility in the United States since its inception in 1990. The SEC began performance evaluation for erosion control products, materials and techniques in the early 1990s. During the past two decades, the lab has expanded its original performance evaluation task to cutting-edge stormwater research, as well as professional training development.



Low Impact Development (LID) A Hands-on Based Workshop

November, 2013



Nonprofit
Organization
U.S. Postage
PAID
College Station,
TX

Texas A&M Transportation Institute
Riverside Campus
3100 State Highway 47
Bryan, TX 77807

TEXAS A&M TRANSPORTATION INSTITUTE
Southwest Region University Transportation Center

<http://tti.tamu.edu/>

To:

LID series courses will benefit a wide variety of professionals. They are suitable for these professionals:

Who Should Attend?

- Landscape Architects
- Architects
- Transportation Professionals
- Urban Planners
- Professional Engineers

WORKSHOP



Low Impact Development (LID)

A Hands-on Based Workshop

Friday, November 8th, 2013



2. BROCHURE



Instructors

Ming-Han Li, Ph.D., P.E., P.L.A.

Associate Professor,
Department of Landscape Architecture and Urban Planning,
Texas A&M University;
Associate Research Engineer,
Environment and Planning Program,
Texas Transportation Institute

Beverly Storey, P.L.A.

Associate Research Scientist,
Environment and Planning Program,
Texas A&M Transportation Institute

Jett McFalls, P.L.A.

Assistant Research Scientist,
Environment and Planning Program,
Texas A&M Transportation Institute

Bruce Dvorak, P.L.A.

Assistant Professor,
Department of Landscape Architecture and Urban Planning,
Texas A&M University

Registration Information



Landscape Architecture
Continuing Education System™

This program is registered with the American Society of
Landscape Architects for continuing education credit.

How to Register

Online:

Phone:

Mail:

Registration Time:

Registration Fee: \$200 for early birds,
\$250 for regular.
(Lunch included)

Location:

Texas A&M Transportation Institute
Riverside Campus
3100 State Highway 47
Bryan, TX 77807

Agenda

Registration & Sign in

Lecture: BMPs--Bioretention

- Bioretention Concept
- Bioretention Benefit
- Bioretention Limitation
- Bioretention Design Criteria
- Bioretention Design & Variations

Lecture: BMPs--Green Roof

- Green Roof Concept
- Green Roof History
- Green Roof Benefits
- Green Roof Criteria
- Green Roof Design

Break

Lecture: BMPs--Porous Pavement

- Porous Pavement Concept
- Porous Pavement History
- Porous Pavement Benefits
- Porous Pavement Criteria
- Porous Pavement Design

Lunch

Hands-on Course of Bioretention

- Bioretention Model Tour and Installation Guide

Hands-on Course of Green Roof

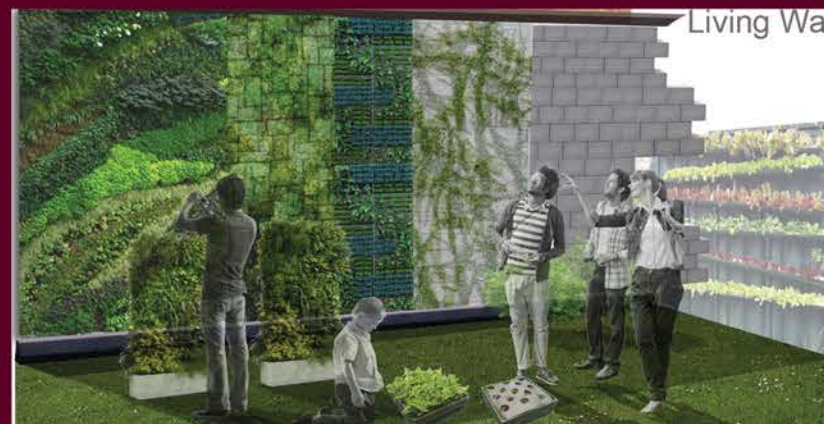
- Green Roof Design Exercise and Installation Guide

Break

Hands-on Course of Porous Pavement

- Porous Pavement Design Exercise and Installation Guide

Evaluation Session



PART 8

Master Plan



SOUTH WEST REGION UNIVERSITY TRANSPORTATION CENTER

1. Project Programming
2. Users Analysis
3. Preferred Elements
4. Merged Master Plan
5. Facilities Design
6. Cost Analysis

SCHEDULE REVIEW

- The schedule

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.
Task 1. Review training course.	█	█	█									
Task 2. ID strengths & weaknesses.	█	█	█									
Task 3. Design charrette.				█	█	█						
Task 4. Course modules.				█	█	█	█					
Task 5. Large-scale models.							█	█	█	█		
Task 6. Program brochures.										█		
Task 7. Master plan and final report.										█	█	█

DONE
October, 2013.

- Following the schedule, the seventh task was finished by the end of October, 2013, coming out with this part of report as a phasing product.

PURPOSE

- This part of the report is to finalize the previous ideas developed in the design charrette and produce a final mater plan to guide future construction activity.

1. PROJECT PROGRAMMING

7.1 Mission Statement

Utilizing the research resources which has already been established in the SEC lab to generate educational product to serve the public, meanwhile constructing a framework and paradigm for a continuing education program that can grow up with future research activities.

7.2 Goals and Objectives

GOAL 1. Shape the site to be a place that can accommodate LID training activities

Objectives: 1.1. Design classroom for training courses
 1.2. Provide lunch area and gathering space
 1.3. Provide parking and entrance for SEC lab as an educational center
 1.4. Locate restrooms
 1.5. Providing shade for outdoor activities in hot season

GOAL 2. Merge the research resources with educational products

Objectives: 2.1. Group and locate the existing research models systematically
 2.2. Promote more potential training opportunities related to LID
 2.3. Modify the research models to be more comprehensive showcase for people

GOAL 3. Create hands-on opportunities for the training courses

Objectives: 3.1. Design hands-on training route through the site
 3.2. Develop comprehensive models for attendees
 3.3. Provide comparable models for BMPs training courses
 3.4. Organize field tour efficiently in terms of course contents and trip comfortability

GOAL 4. Attract local people for recreational purpose

Objectives: 4.1. Provide recreational facilities on site
 4.2. Design attractive features
 4.3. Provide outdoor learning opportunity for local kids

GOAL 5. Achieve sustainable development

Objectives: 5.1. Apply LID practices on site development
 5.2. Make the courses to be updatable according to future research
 5.3. Try to provide opportunity for other courses beyond LID to join into the program framework

2. USER ANALYSIS

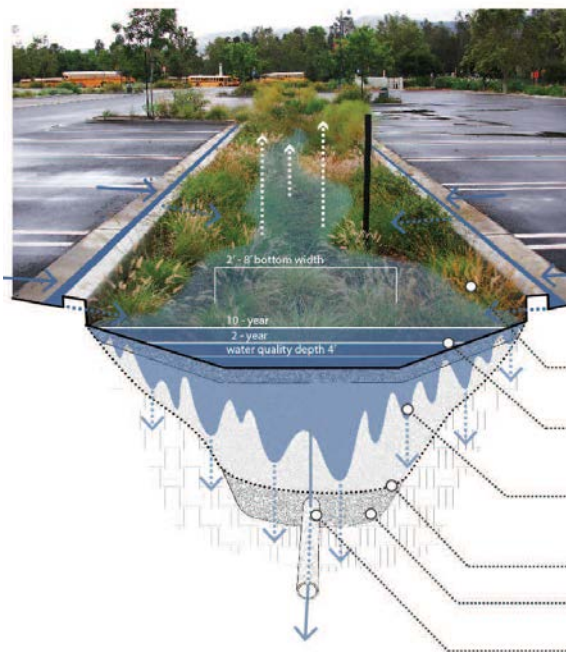
USERS	ACTIVITIES	ELEMENTS	EXPECTATION
Researchers	Research Communication Experiment	Parking Lot Experiment Lab Place for Sitting Office	Safe Accessible Less Disturbance
Instructors	Lecture Communication Rest	Classroom Outdoor Classroom Office Parking Lot	Safe Accessible Easy Communication
Staff	Maintenance Rest Recreation Communication Assisting Experiment	Office Tools Room Parking Lot Maintenance Trail	Safe Accessible Comfortable Environment
Professionals / College Students	Professional Learning Communication Recreation Rest Having Lunch	Classroom Outdoor Classroom Hands-on Facility Lunch Place Walking Trails Touring Route	Safe Accessible Comprehensive Learning Deeply Learning Easily Discussing
School Children	Recreation Easy Learning	Beautiful Plants Playing Facility Outdoor classroom	Safe Accessible Happily Playing Knowledge Expanding
Family	Recreation Easy Learning Having Fun	Beautiful Plants High Visual Quality Playing Facility Picnic Area	Safe Accessible Relaxing Healthy Learning Benefit

3. ELEMENTS PREFERRED

LID Educational Facility:

Note: The elements marked by yellow squares are preferred ones.

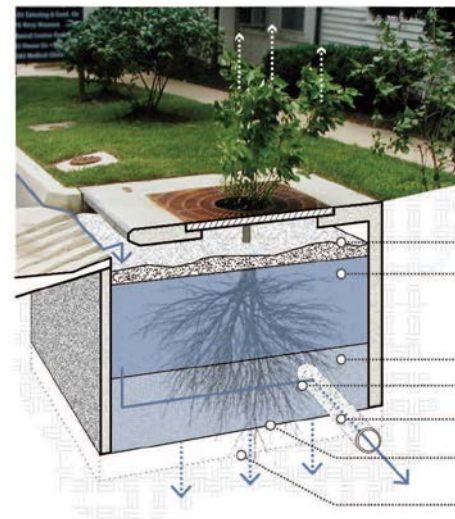
Bioswale



Rain Garden



Tree Box



On-grade Cistern



Wild Floating Island



Green Wall 01



Channels



Infiltration Basin



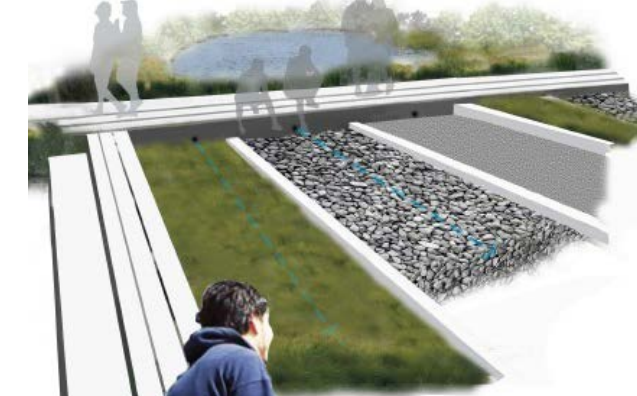
Water Screen



Biofuel Garden



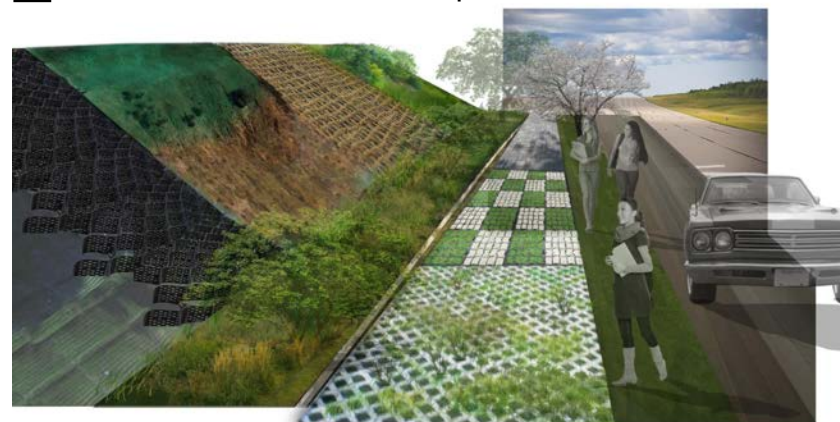
Sediment Test



3. ELEMENTS PREFERRED

LID Educational Facility:

Erosion and Pavement Carpet



Successional Plant Growth Recording Wall



Swale Garden



Material Fountain



Living Wall 2



Main Entrance



Green Roof Sample



Note: The elements marked by yellow squares are preferred ones.

3. ELEMENTS PREFERRED

Recreational Facility:

Note: The elements marked by yellow squares are preferred ones.

Lake Side Overhead Structure



Land Trail



Phytoremediation Botanical Garden



Water Terrace



Board Walk



Living Wall Garden

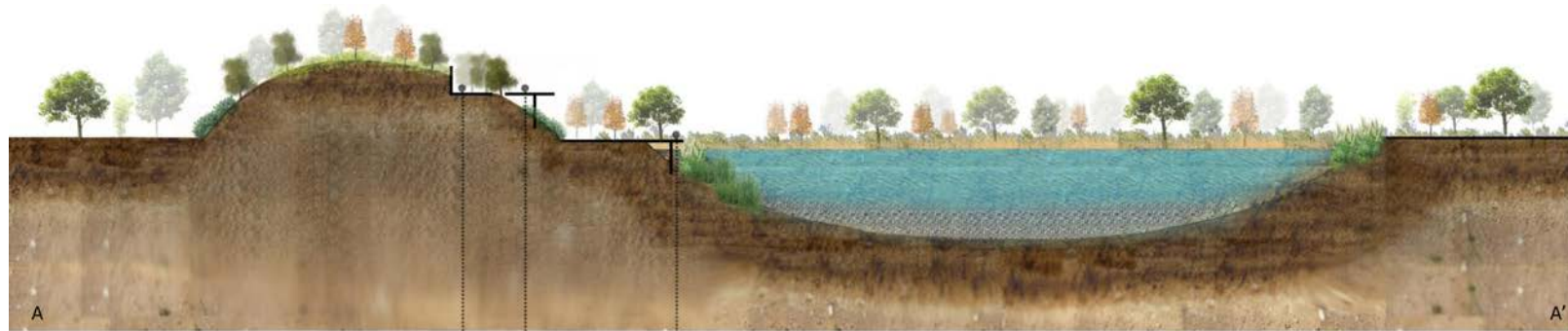


3. ELEMENTS PREFERRED

Note: The elements marked by yellow squares are preferred ones.

Recreational Facility:

3-Tiered Walkway



Willow path



Viewing platform



Waterfront path



Coffee and Lunch Area



Water Pergola



Picnic Area

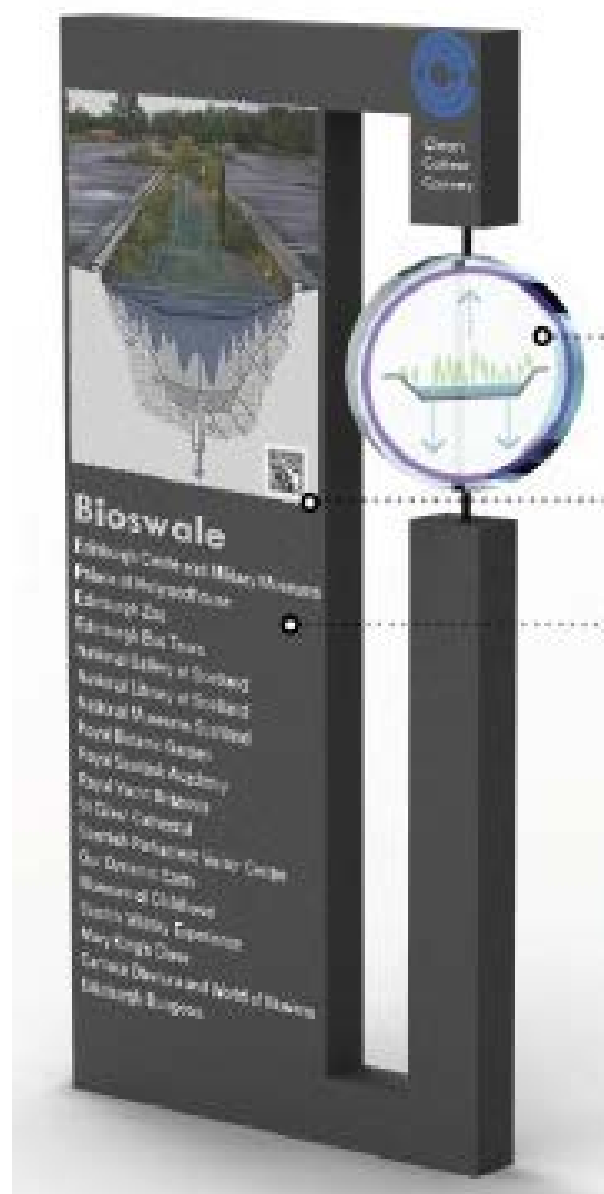


3. ELEMENTS PREFERRED

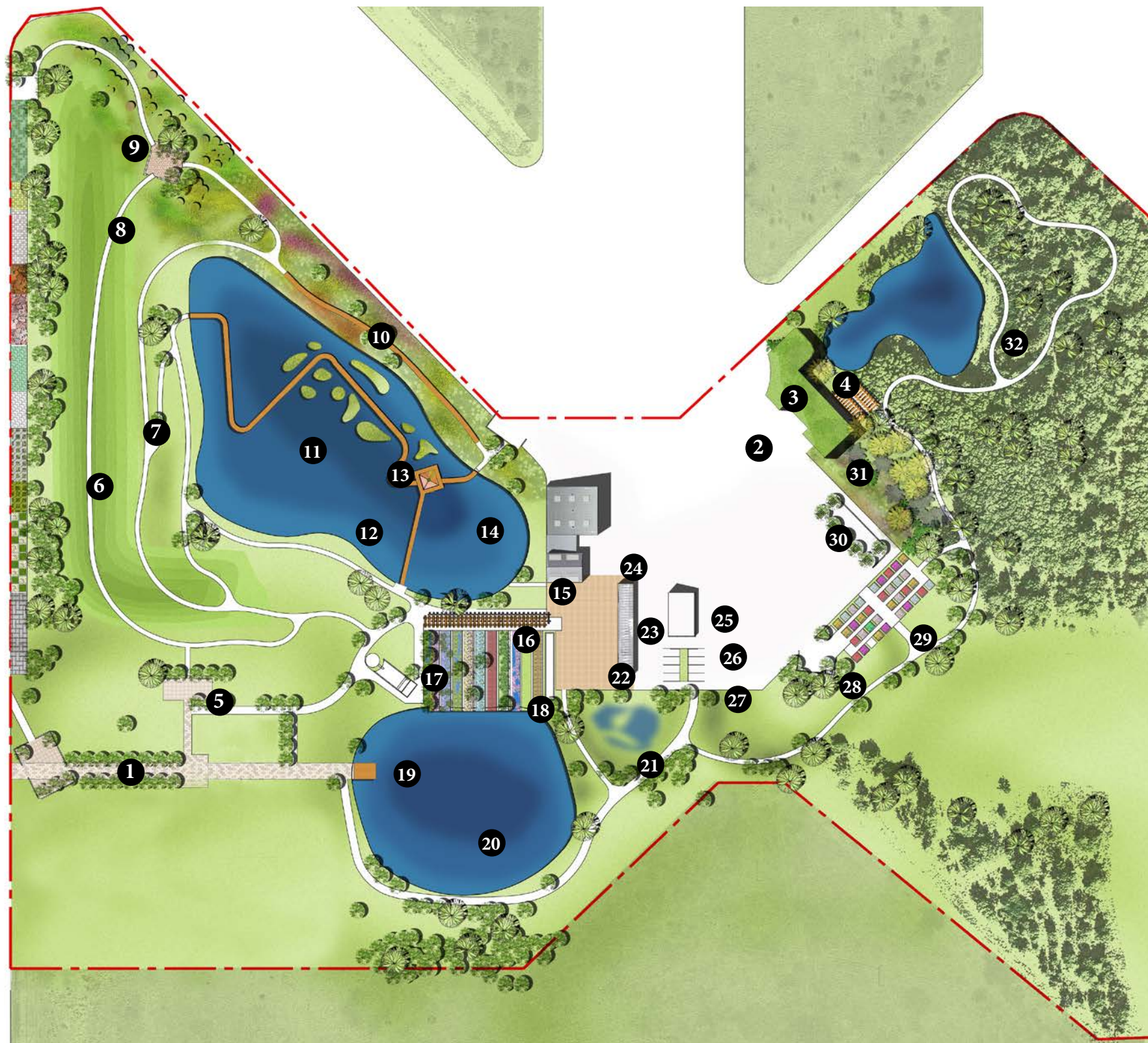
Note: The elements marked by yellow squares are preferred ones.

Some Other Facility:

■ Signage

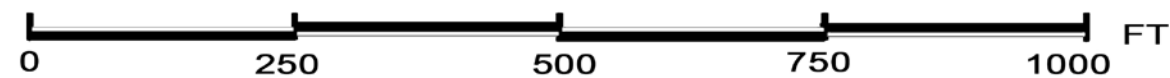
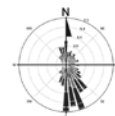


4. MERGED MASTER PLAN

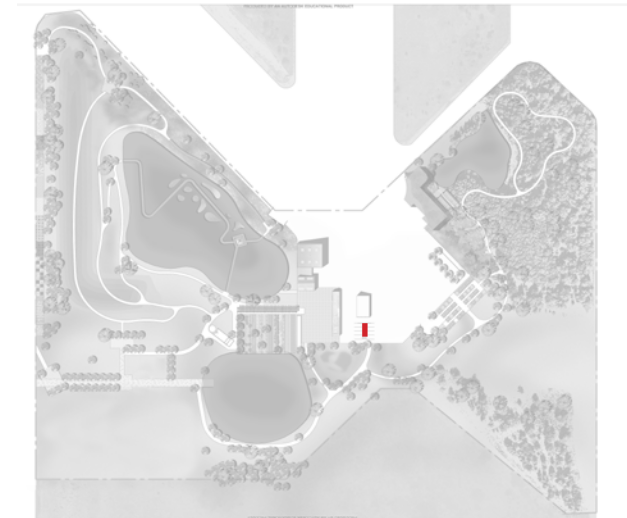
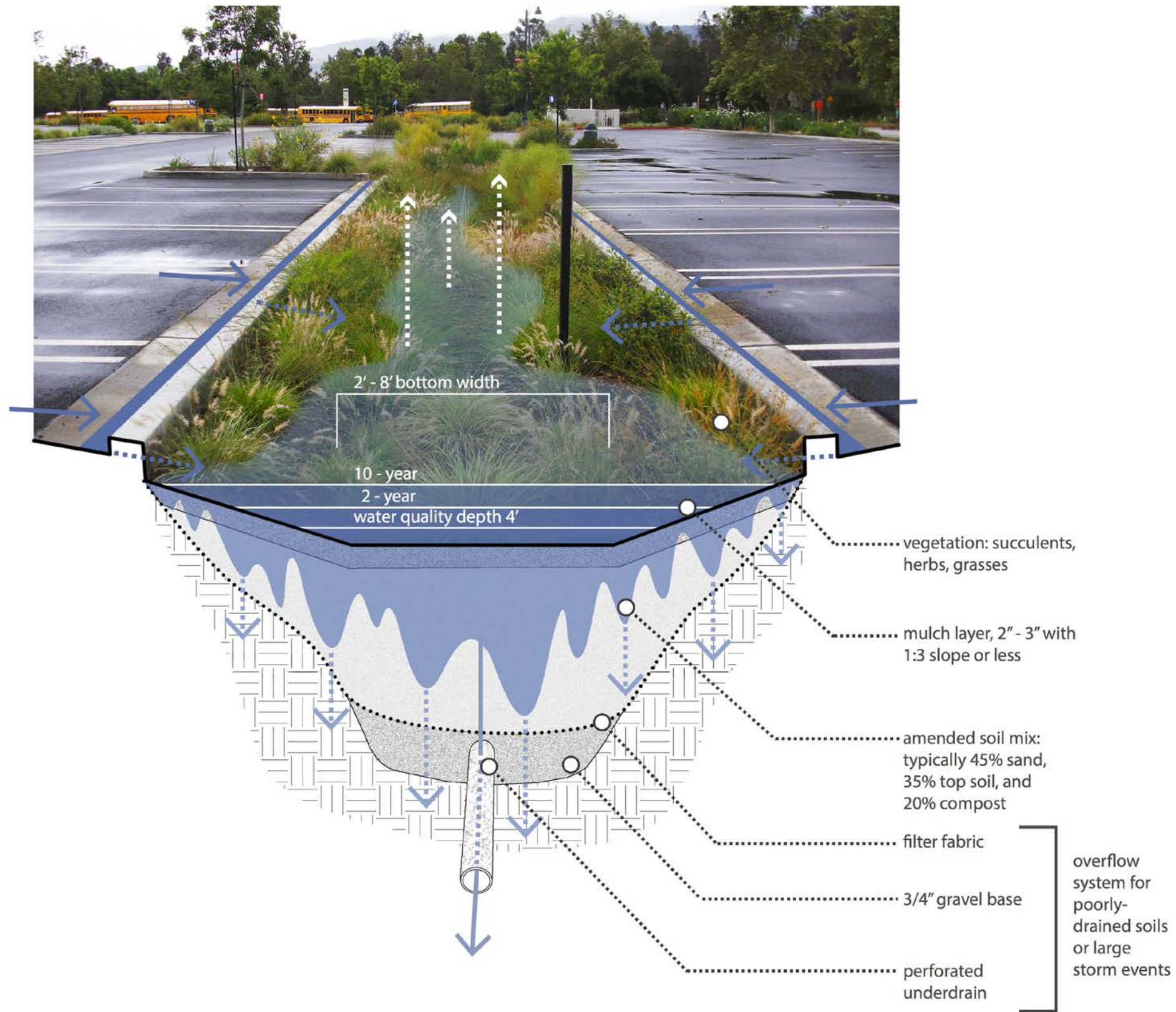


- 1** Porous Pavement Station
- 2** Parking Lot (107 Units including 14 Staff parking)
- 3** Education Center (Classrooms and Offices)
- 4** Covered Dining Area
- 5** Erosion Control Station
- 6** Porous Pavement Demonstration
- 7** Erosion Control Demonstration
- 8** Xeriscape & Mesic Native Species Station
- 9** Xeriscape and Invasive Species Demonstration
- 10** Mesic and Invasive Species Demonstration
- 11** Board Walk
- 12** Upper Lake
- 13** Floating Islands (Wetland Demonstration)
- 14** Wetland Station
- 15** Rainwater Harvesting Demonstration
- 16** Bioswale & Rainwater Harvesting Station
- 17** Model - Sediment Control
- 18** Bioswale Garden (Bioswale Demonstration)
- 19** Porous Pavement Sculpture
- 20** Lower Lake
- 21** Bio-infiltration Basin
- 22** Gathering Plaza
- 23** Green House (Existing)
- 24** SEC Lab (Existing)
- 25** Storage Building (Existing)
- 26** Living Wall Demonstration
- 27** Parking for Researchers
- 28** Living Wall & Green Roof Station
- 29** Green Roof Demonstration
- 30** Succession Station
- 31** Succession Demonstration
- 32** Nature Trail

- Legend:
- N**Common Feature
 - N**Outdoor Classroom
 - N**Demonstration

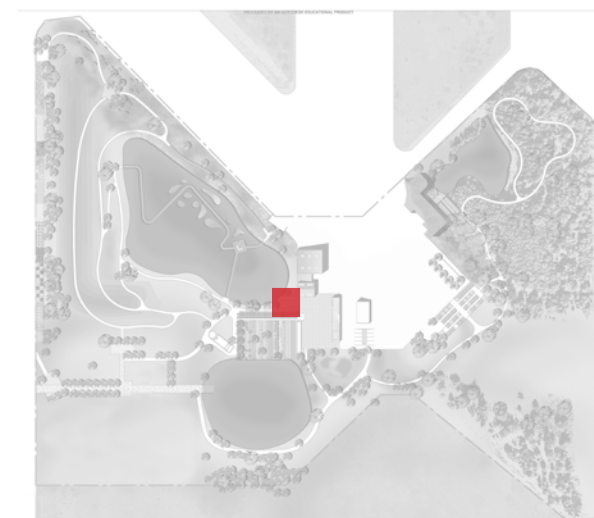
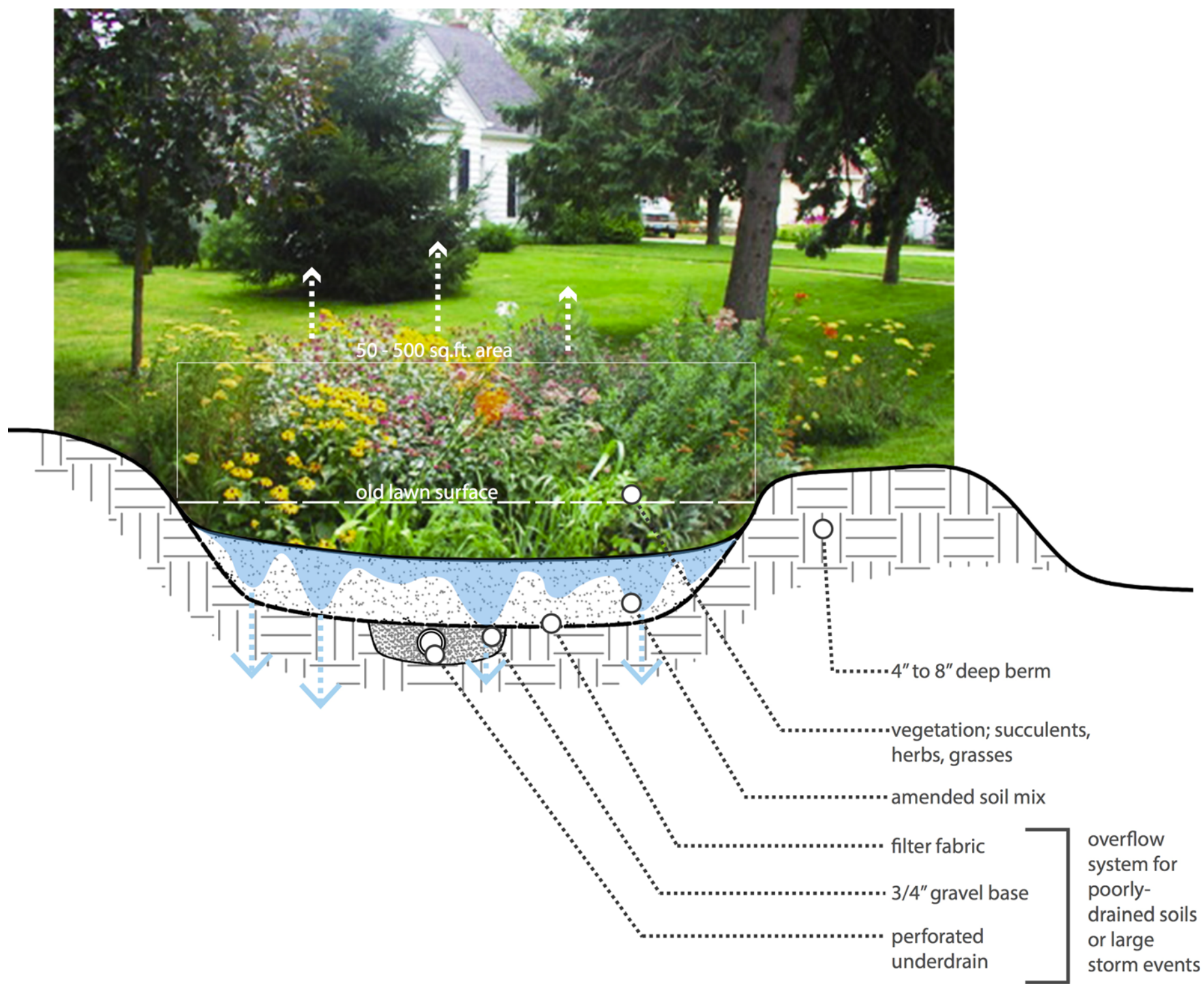


4. FACILITIES DESIGN-- BIOSWALE



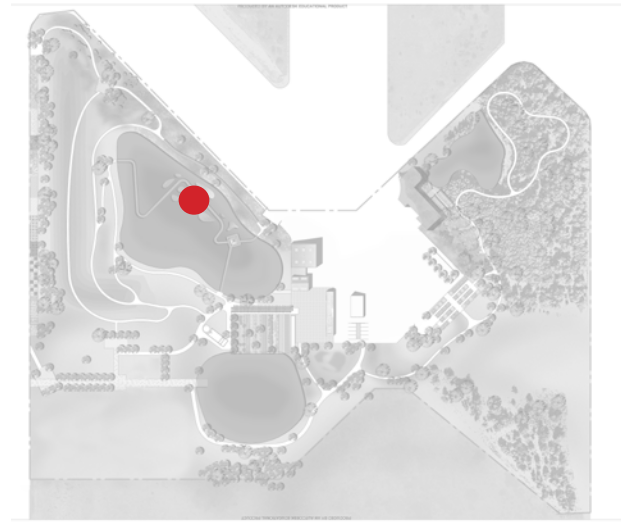
Index Map

4. FACILITIES DESIGN -- RAINGARDEN



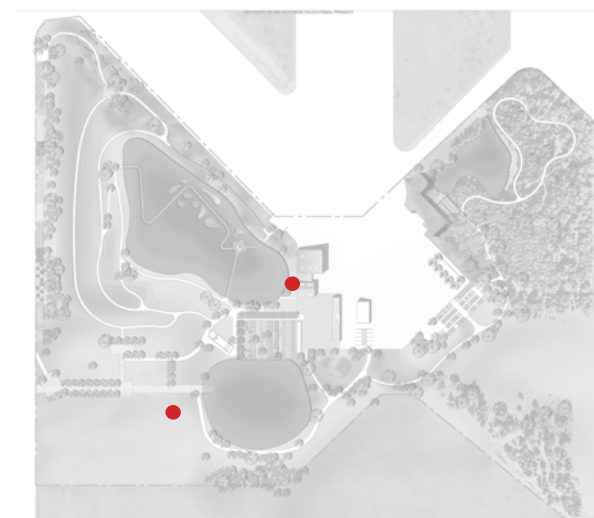
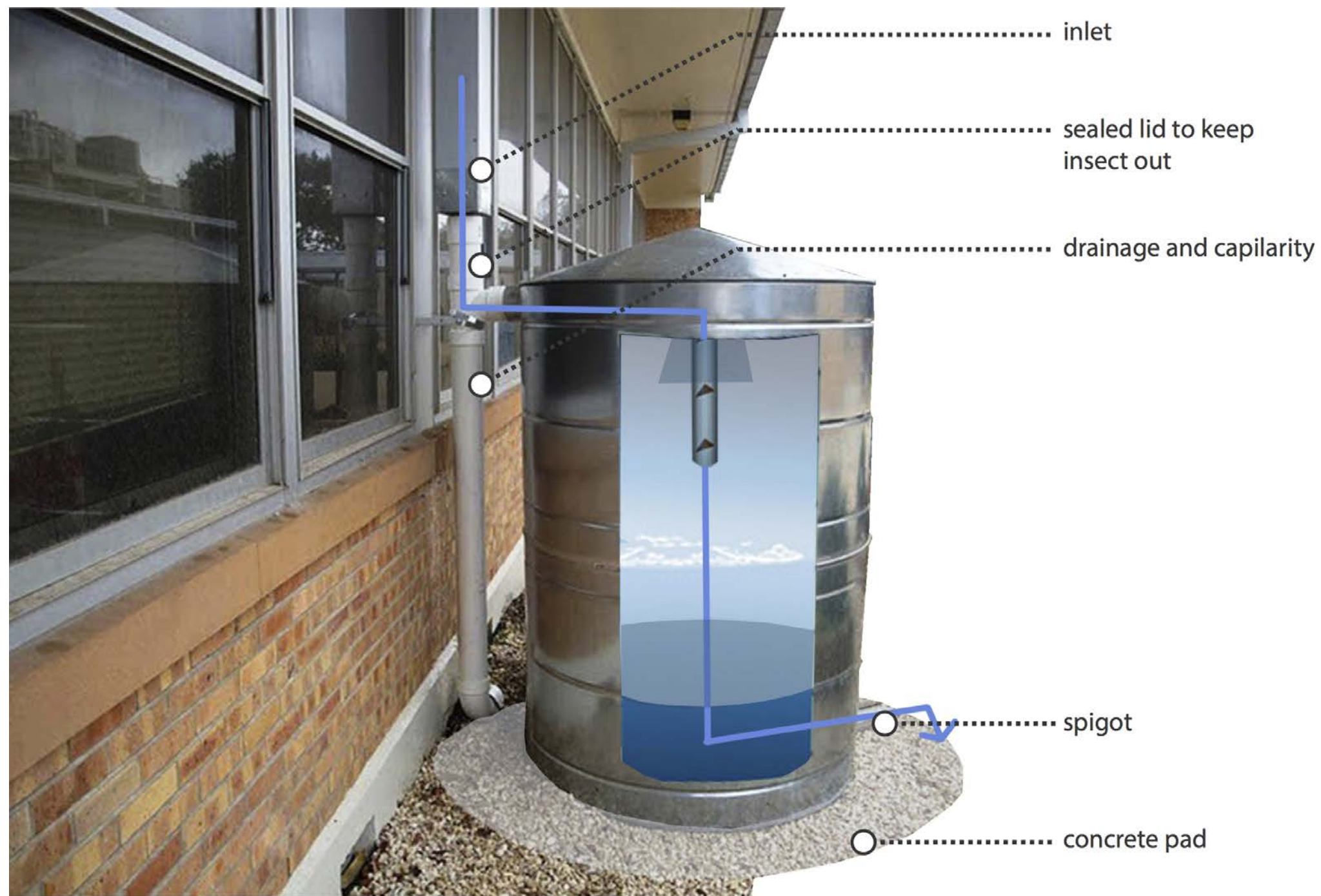
Index Map

4. FACILITIES DESIGN -- WILD FLOATING ISLAND



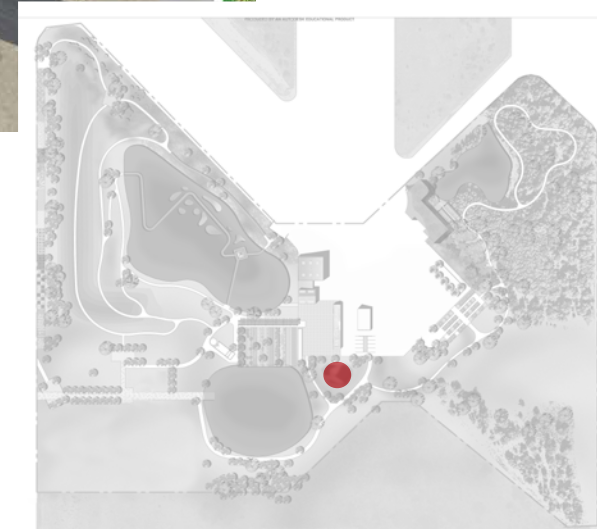
Index Map

4. FACILITIES DESIGN -- RAINWATER HARVESTING



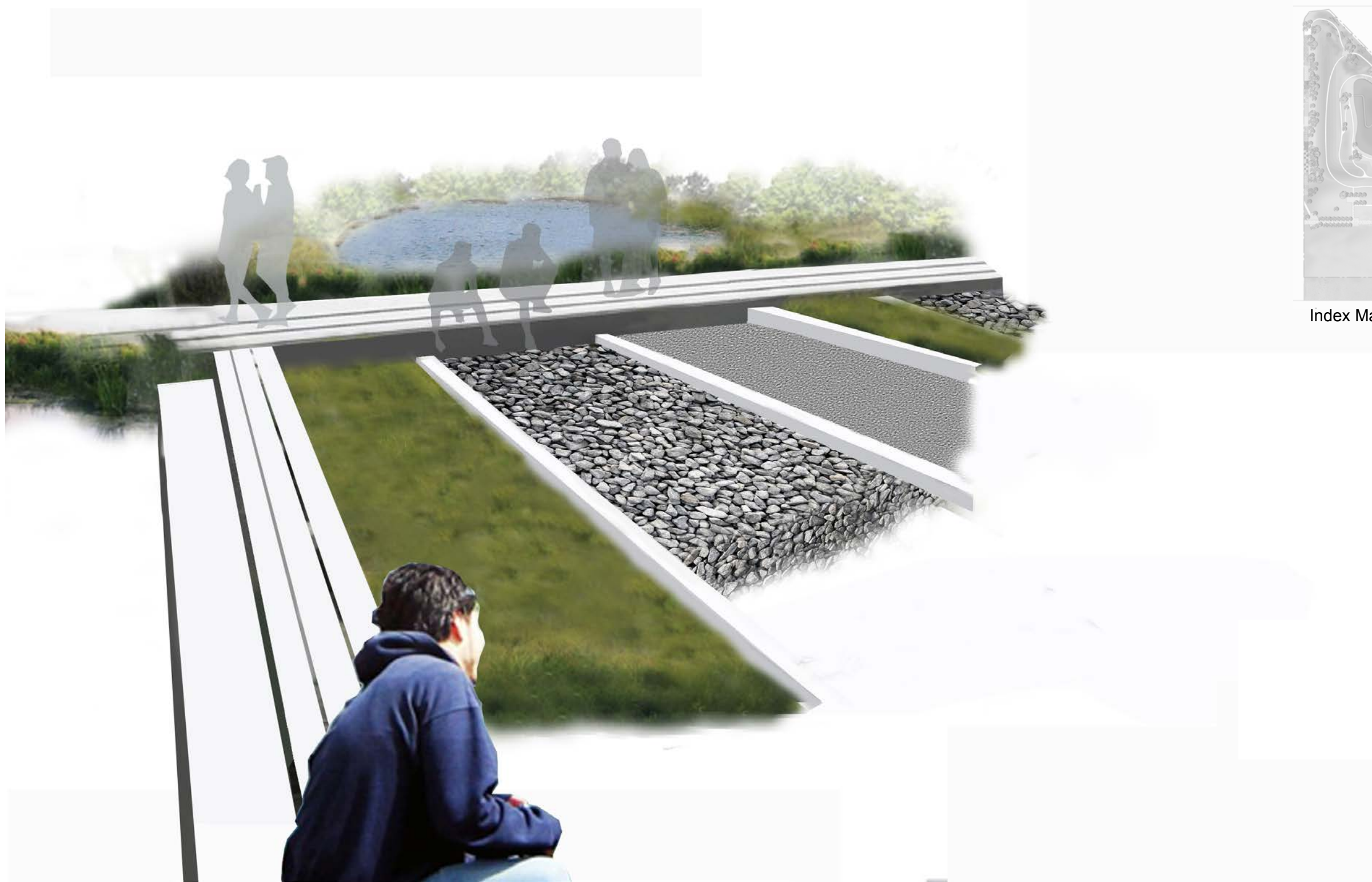
Index Map

4. FACILITIES DESIGN -- INFILTRATION BASIN

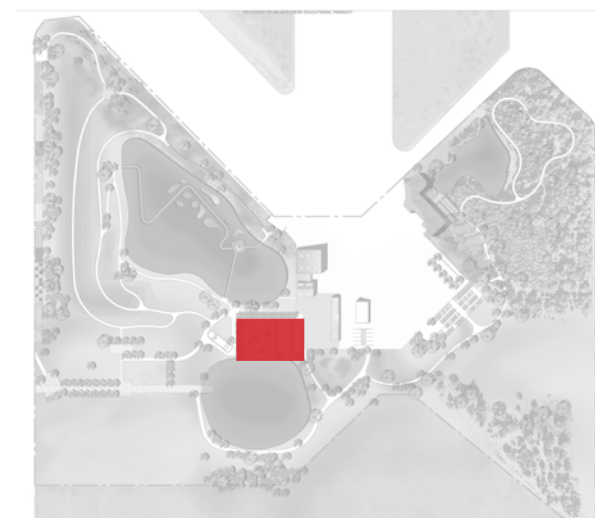
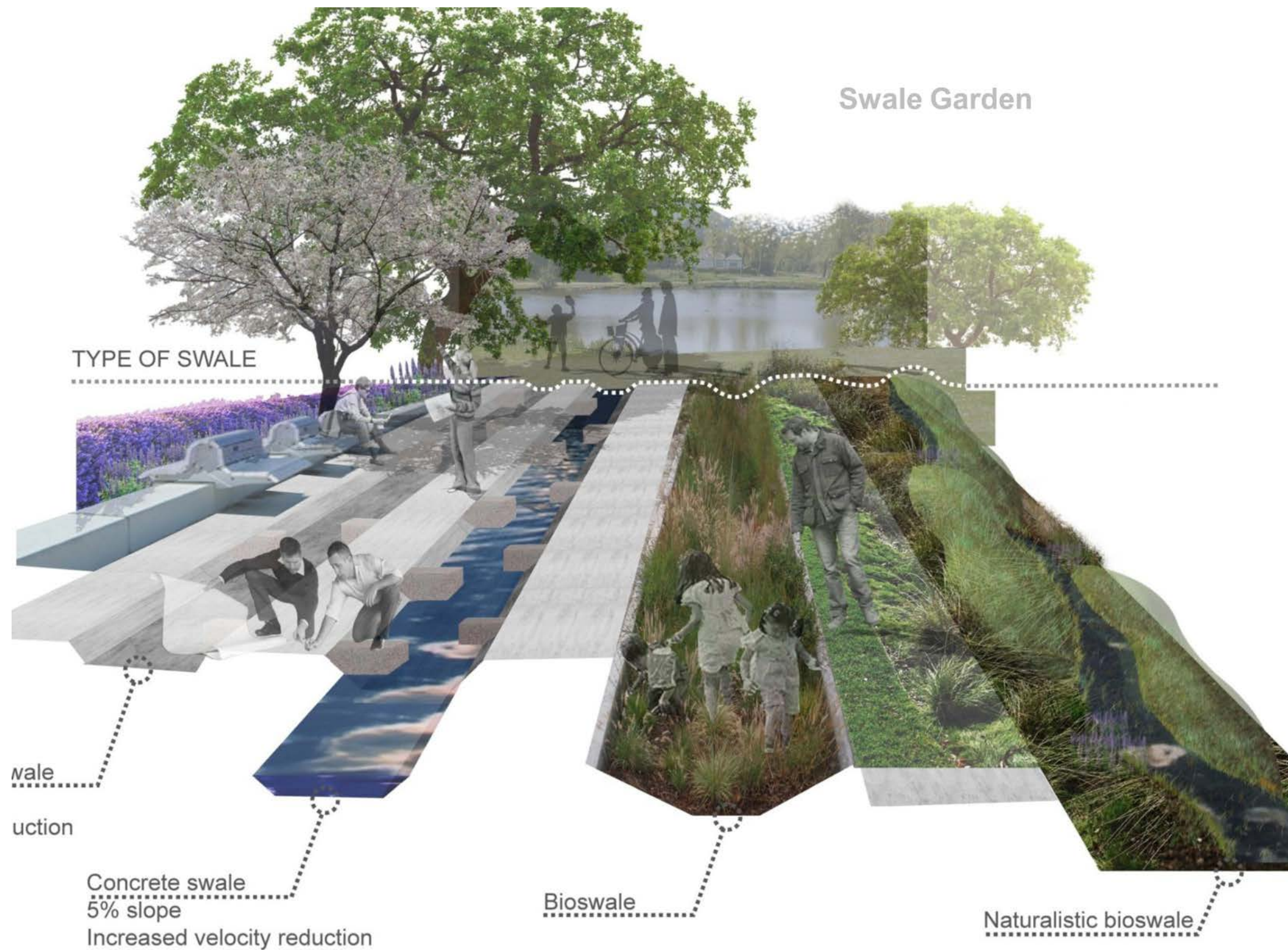


Index Map

4. FACILITIES DESIGN -- SEDIMENT TEST

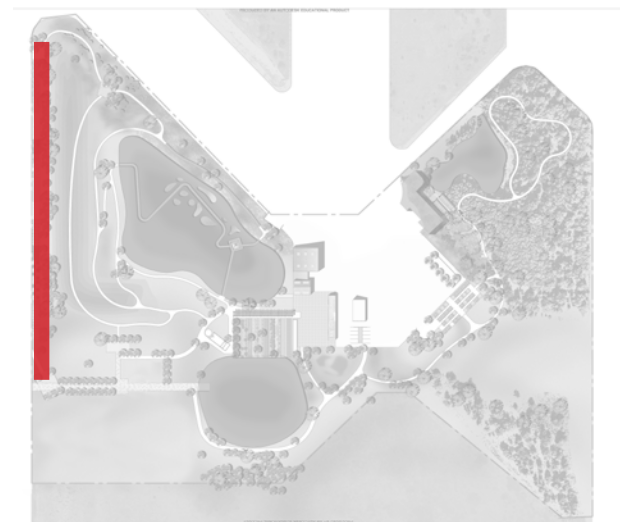
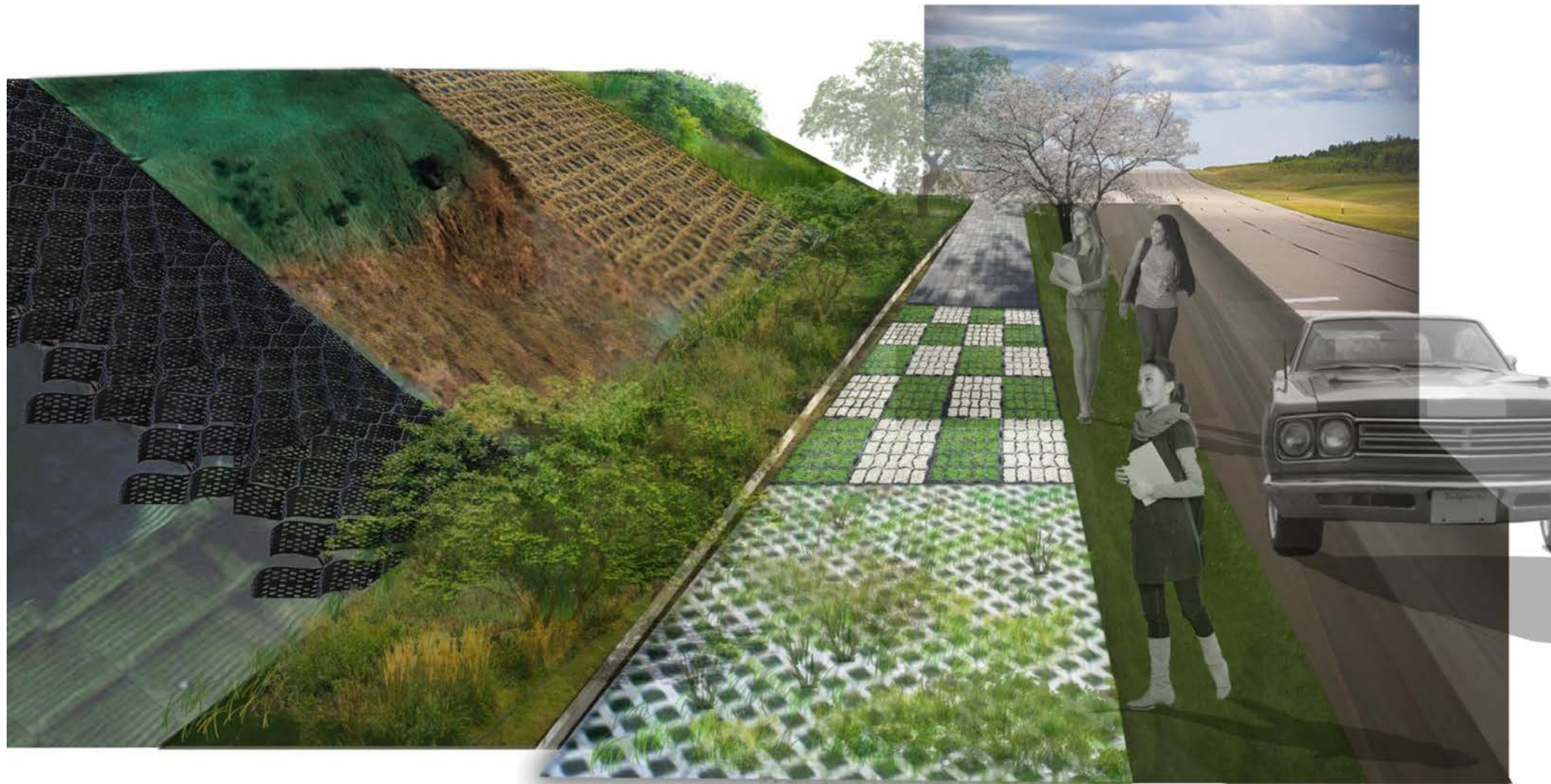


4. FACILITIES DESIGN -- SWALE GARDEN



Index Map

4. FACILITIES DESIGN -- EROSION AND PAVEMENT CARPET



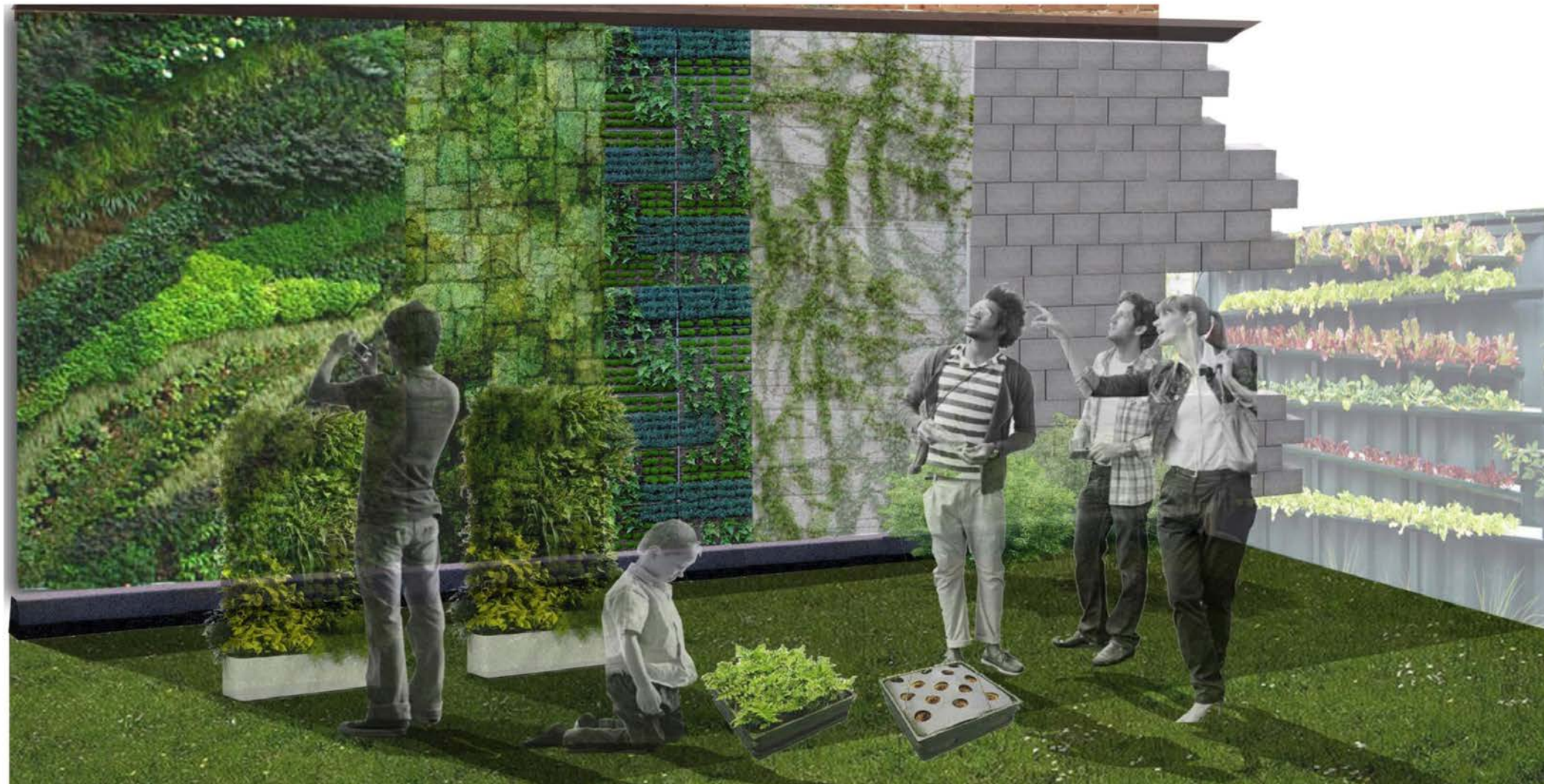
Index Map

4. FACILITIES DESIGN -- POROUS PAVEMENT SCULPTURE



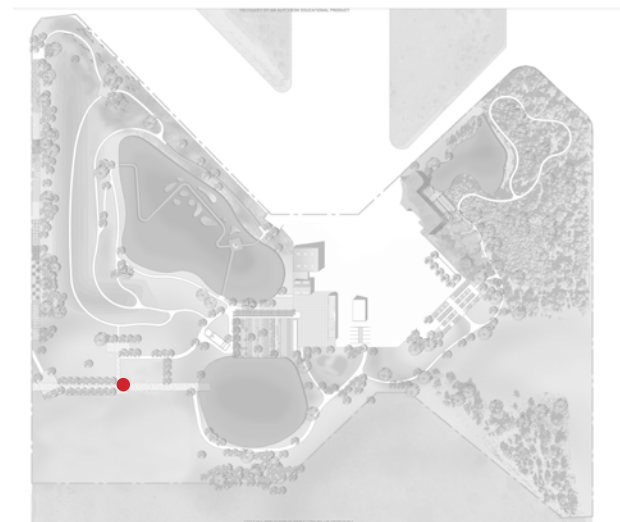
Index Map

4. FACILITIES DESIGN -- POROUS PAVEMENT SCULPTURE



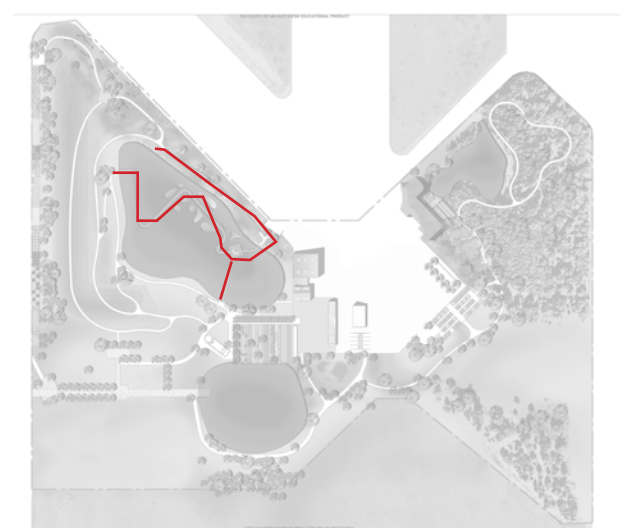
Index Map

4. FACILITIES DESIGN -- MAIN ENTRANCE



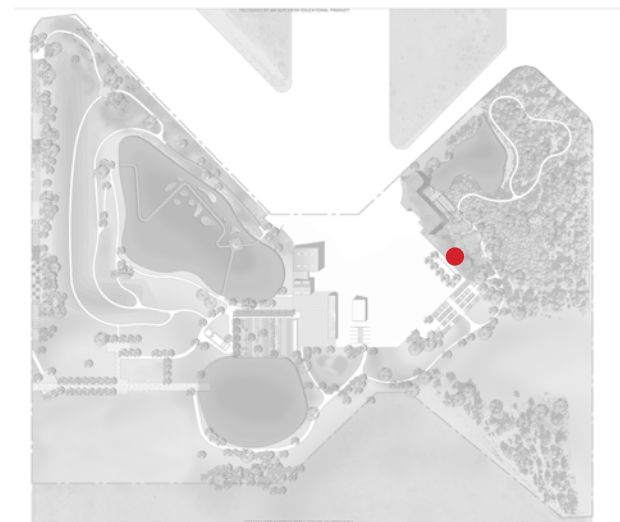
Index Map

4. FACILITIES DESIGN -- BOARD WALK



Index Map

4. FACILITIES DESIGN -- SUCCESSION DEMONSTRATION



Index Map

5. COST ANALYSIS

No.	Features in Master Plan	Projects	Material	Size (ft)	Unit	Quantity	Unit Price (\$)	Construction Cost (\$)	Contingency Cost (\$)	Total (\$)	Cost / Feature (\$)	Note	Reference
1	Porous Pavement Station	Dwarf Walls	Concrete	2 X 1.5	foot	234	\$4.73	\$1,107	\$221	\$1,328	\$4,322	can use recycled material to reduce the cost, e.g., gabions	Ref.3
		Instruction Board	Wood & concrete		count	1	\$1,000.00	\$1,000	\$200	\$1,200			
		Pavers	Porous Pavement		sq ft	3322	\$0.45	\$1,495	\$299	\$1,794			Ref 1. p.368
2	Parking Lot	Existing					\$0.00	\$0	\$0	\$0	\$0		
3	Education Center	Building Floor Area	Concrete		sq ft	1464	\$176.20	\$257,957	\$51,591	\$309,548	\$309,548		Ref.2. p.112
4	Covered Dining Area	Pergola	Wood	14 X 10	sq ft	3586	\$43.90	\$157,425	\$31,485	\$188,910	\$286,312		Ref. 5
		Pavers	Wood		sq ft	2100	\$38.50	\$80,850	\$16,170	\$97,020			Ref. 1 p.136
		Green Land	Grass		sq ft	1026	\$0.31	\$318	\$64	\$382		No trees included	Ref. 1 p.396
5	Erosion Control Station	Instruction Board	wood & concrete		count	1	\$1,000.00	\$1,000	\$200	\$1,200	\$3,425		
		Dwarf Walls	Concrete	2 X 1.5	foot	174	\$6.44	\$1,121	\$224	\$1,345		can use recycled material to reduce the cost ,e.g., gabions	Ref.3
		Pavers	Porous Pavement		sq ft	1630	\$0.45	\$734	\$147	\$880			Ref. 1. p.368
6	Porous Pavement Demonstration	Pavers	Porous Pavement		sq ft	14000	\$0.31	\$4,340	\$868	\$5,208	\$5,208		Ref 1. p.396
7	Erosion Control Demonstration	Erosion Control Blanket	Erosion Control Covers		sq ft	49490	\$3.10	\$153,419	\$30,684	\$184,103	\$184,103	average price of 12 types of erosion control treatment	Ref. 1. P.330
8	Xeriscape & Mesic Native Species Station	Pavers	Porous Pavement		sq ft	1825	\$0.45	\$821	\$164	\$986	\$3,507		Ref. 1. p.368
		Dwarf Walls	Concrete	2 X 1.5	foot	171	\$6.44	\$1,101	\$220	\$1,321		can use recycled material to reduce the cost, e.g. gabions	Ref. 3
		Instruction Board	Wood		count	1	\$1,000.00	\$1,000	\$200	\$1,200			
9	Xeriscape & Invasive Species Demonstration	Green Land	Native Grass		sq ft	36770	\$0.16	\$5,883	\$1,177	\$7,060	\$7,060	price twice on native lawn	Ref. 1. p.395
10	Mesic and Invasive Species Demonstration	Green Land	Native Grass		sq ft	21593	\$0.16	\$3,455	\$691	\$4,146	\$4,146	price twice on native lawn	Ref. 1 p.395

11	Board Walk	Board Walk	Wood	6-foot wide	foot	1172	\$38.50	\$45,122	\$9,024	\$54,146	\$54,146		Ref. 1 p.136
12	Upper Lake	Upper Lake	Existing				\$0.00	\$0	\$0	\$0	\$0		
13	Floating Islands	Floating Islands			sq ft	2000	\$32.00	\$64,000	\$12,800	\$76,800	\$76,800		Ref. 4
14	Wetland Station	Pavers	Wood		sq ft	900	\$0.45	\$405	\$81	\$486	\$44,885		Ref. 1 p.368
		Instruction Board	Wood			1	\$1,000.00	\$1,000	\$200	\$1,200			
		Pavilion	Wood	20 X 20 X10	sq ft	1	\$35,999.00	\$35,999	\$7,200	\$43,199			Ref. 5
15	Rainwater Harvesting Demonstration	Rain Garden	Vegetaed		sq ft	3635	\$0.16	\$582	\$116	\$698	\$3,307	price twice on native lawn	Ref. 1. p.395
		Cistern	Poly-mart	100 Gal	count	1	\$174.00	\$174	\$35	\$209			Ref. 6
		Accessories			set	1	\$2,000.00	\$2,000	\$400	\$2,400			Ref. 6
16	Bioswale & Rainwater Harvesting Station	Arbor	Wood	14 X10	foot	2100	\$43.90	\$92,190	\$18,438	\$110,628	\$114,142		Ref. 5
		Pavers	Porous Pavement		sq ft	2709	\$0.45	\$1,219	\$244	\$1,463			Ref.1. p.368
		Instruction Board	Wood	1	count	1	\$1,000.00	\$1,000	\$200	\$1,200			
		Dwarf Walls	Concrete	2 X 1.5	foot	150	\$4.73	\$710	\$142	\$851		can use recycled material to reduce the cost, e.g., gabions	Ref. 3
17	Model -Sediment Control	Model-Sediment Control	Existing				\$0.00	\$0	\$0	\$0	\$0		
18	Bioswale Garden (Bioswale Demonstration)	Bioswale Garden (Bioswale Demonstration)	Existing				\$0.00	\$0	\$0	\$0	\$0		
19	Porous Pavement Sculpture	Porous Pavement Sculpture	Concrete with fountain	3 X 3 X 8	count	1	\$3,000.00	\$3,000	\$600	\$3,600	\$3,600		
20	Lower Lake	Lower Lake	Existing				\$0.00	\$0	\$0	\$0	\$0		
21	Bio-filtration Basin	Bio-filtration Basin	Native grass		sq ft	13104	\$0.08	\$1,048	\$210	\$1,258	\$1,258	native lawn price	Ref. 1. p.395
22	Gathering Plaza	Pavers	Porous Pavement		sq ft	10286	\$0.45	\$4,629	\$926	\$5,554	\$6,320		Ref. 1. p.368
		Green Land	Grass & Trees		sq ft	2057	\$0.31	\$638	\$128	\$765			Ref. 1. p.396
23	Green House	Green House	Existing				\$0.00	\$0	\$0	\$0	\$0		
24	SEC Lab	SEC Lab	Existing				\$0.00	\$0	\$0	\$0	\$0		
24	Storage Building	Storage Building	Existing				\$0.00	\$0	\$0	\$0	\$0		
26	Living Wall Demonstration	Living Wall Demonstration	Modular	120 X10	sq ft	1200	\$23.80	\$28,560	\$5,712	\$34,272	\$34,272		Ref. 7

27	Parking for Researchers	Pavers	Existing				\$0.00	\$0	\$0	\$0	\$149	Ref. 1 p.396
		Green Land		Grass	sq ft	400	\$0.31	\$124	\$25	\$149		
28	Living Wall & Green Roof Station	Dwarf walls		2 X 1.5	foot	181	\$4.73	\$856	\$171	\$1,027	\$2,338	can use recycled material to reduce the cost, e.g., gabions Ref. 3
		Instruction Board			count	1	\$1,000.00	\$1,000	\$200	\$1,200		
		Pavers	Porous Pavement		sq ft	204	\$0.45	\$92	\$18	\$110		
29	Green Roof Demonstration	Seeding Beds	Concrete	10 X 10	count	36	\$1,550.00	\$55,800	\$11,160	\$66,960	\$71,330	Ref. 1 p.55 Ref. 1 p.368
		Pavers	Porous Pavement		sq ft	8092	\$0.45	\$3,641	\$728	\$4,370		
30	Succession Station	Dwarf walls	Concrete	2 X 1.5	foot	123	\$4.73	\$582	\$116	\$698	\$9,693	can use recycled material to reduce the cost, e.g., gabions Ref. 3
		Instruction Board	Wood		count	1	\$1,000.00	\$1,000	\$200	\$1,200		
		Pavers	Existing				\$0.00	\$0	\$0	\$0		
		Planting Beds	Concrete	8 X 8	count	7	\$928.00	\$6,496	\$1,299	\$7,795		
31	Succession Demonstration	Succession Demonstration	Vegetated		sq ft	31416	\$0.16	\$5,027	\$1,005	\$6,032	\$6,032	price twice on native lawn, no trees included Ref. 1 p.395
32	Nature Trail	Nature Trail	Gravel	6-foot wide	sq ft	7506	\$5.80	\$43,535	\$8,707	\$52,242	\$52,242	Ref. 3
Total:										\$1,288,144		
Note: The cost of tree planting is not included in this analysis.												
Reference:												
RSMMeans Site Work & Landscape Cost Data, 31st Annual Edition, 2012												
RSMMeans Cost Per Square Foot, 31st Annual Edition, 2012												
http://www.homewyse.com/												
http://www.floatingislandinternational.com/												
1	http://www.gazebocreations.com/											
2	http://www.rainharvest.com/											
3	http://www.plantsonwalls.com/											
4												
5												
6												
7												

PART 9

Conclusion



SOUTH REGION
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CONCLUSION

Establishing the continuing education program in the SEC Lab is meeting the on-going demand from various professionals, as well as students. Professional landscape architects, architects, engineers, and planners are required to update their knowledge to maintain their license or certificate annually. Low impact development and soil erosion topics have become popular in the industry, resulting from the globally increased concern on the environment. In addition to the market of professionals, college students of related majors will benefit from the education curriculum developed from this project.

The SEC Lab has its unique strength to serve this promising market effectively. Firstly, SEC Lab is located in the center of the “Texas Triangle.” Most professionals of Texas are located in Houston, Dallas, Austin, and San Antonio, providing marketing connection for the SEC Lab geographically. Secondly, by comparing most similar programs throughout the United States, SEC Lab is a prominently competitive one that possesses land and various LID facilities on site, essential to accommodate hands-on training courses. Finally, researchers in the SEC Lab are experts who have already developed a series of training courses and taught these course materials for years. With these advantages, SEC Lab has a great potential in making prominent contribution to the LID continuing education.

The master plan of the SEC Lab indicates the direction for the future development of the Lab to accommodate the continuing education program, which will cover porous pavement, bioretention, bioswale, sediment control, erosion control, constructed wetland, infiltration basin, rainwater harvesting, rain garden, green roof and native plants and invasive plants management. With the master plan, the development of the SEC Lab is now visually promising and will contribute greatly to serving the public, the professionals and the college students, yet financially feasible in the long run.