DEVELOPING THE SEDIMENT AND EROSION CONTROL LABORATORY TO BECOME A HANDS-ON TRAINING AND EDUCATION CENTER

Ming-Han Li, Pengzhi Li, Jett McFalls, Beverly Storey and Galen Newman

Texas A&M Transportation Institute
Texas A&M University System
College Station, Texas 77843-3135

Southwest Region University Transportation Center
Texas A&M Transportation Institute
Texas A&M University System
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Supported by general revenues from the State of Texas.

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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.
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

Ming-Han Li, Ph.D., P.E., P.L.A.
Associate Professor / Texas A&M University
Associate Research Engineer / Texas A&M Transportation Institute

Pengzhi Li
Graduate Research Assistant / Texas A&M Transportation Institute

Jett McFalls, P.L.A.
Assistant Research Scientist / Texas A&M Transportation Institute

Beveley Storey, P.L.A.
Associate Research Scientist / Texas A&M Transportation Institute

Galen Newman, Ph.D.
Assistant Professor / Texas A&M University
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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.

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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.

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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

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

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- 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, allowing 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 certificates 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.
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.
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?

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.

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.

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.

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.
### 5. SUMMARY OF CASE STUDY

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

**Provider Location Duration Hands-on Price CEUs**

- **Joseph Regenstein Jr. School of Chicago Botanic Garden**: Chicago, IL (2-7 years, Design Studio)
- **Joseph Regenstein Jr. School of Chicago Botanic Garden**: Chicago, IL (8 days, Field Trip)
- **Environmental Resource Center**: San Antonio, TX, Dallas, TX, Houston, TX (3 days, None)
- **Rutgers University**: New Brunswick, NJ (13 days scattered, None)
- **Rutgers University**: Hillsborough, NJ (1 day, None)
- **Landscape Communications, Inc.**: Long Beach, CA (1.5 hour, None)
- **Landscape Communications Inc.**: Long Beach, CA (1.5 hour, None)
- **HalfMoon Education Inc.**: El Paso, TX (1 day, None)
- **Rutgers University**: New Brunswick, NJ (3 days, None)
- **Rutgers University**: New Brunswick, NJ (3 days, Computer Modeling Based)

**Price and CEUs**:

- **Garden Design**: $13/hr, Certificate
- **Healthcare Garden Design**: $149 (one day), $3,495 (full), LA CES--56
- **Hazardous Waste Management**: $795, CEUs--1.6
- **Landscape Management**: $2,055, Certificate
- **Pond Design, Management and Maintenance**: $325, LA CES--7.25
- **Water Management through Connectivity**: $40, LA CES--1.25, LEED--1.5, APLD--1.5
- **Permeable Pavers as a Stormwater LID BMP**: $40, LA CES--1.25, LEED--1.5, ALPD--1.5
- **Low Impact Development**: $259, CEUs--1.8, New York PE--14
- **Stormwater Management**: $840, CEUs--1.8, New York PE--18
- **HEC-RAS**: $840, CEUs--1.8, New York PE--18
<table>
<thead>
<tr>
<th>Topic/Keyword</th>
<th>Provider</th>
<th>Location</th>
<th>Duration</th>
<th>Hands-on</th>
<th>Price</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Science, Hydrology, Geology, Water quality, Baseline Testing and Citizen Science</td>
<td>B.F. Environmental Consultant Inc. &amp; Wikes University</td>
<td>Wikes-Barre, PA</td>
<td>1 day for each</td>
<td>Field Trip</td>
<td>$310 for each</td>
<td>PDHs-8 for each</td>
</tr>
<tr>
<td>Slop Stability and Land Slides</td>
<td>University of Wisconsin-Madison</td>
<td>Santa Clara, CA</td>
<td>3 days</td>
<td>None</td>
<td>$1,295</td>
<td>CEUs--2.1 PDHs--21</td>
</tr>
<tr>
<td>WinSLAMM v.10 Urban Stormwater Management Goals</td>
<td>University of Wisconsin-Madison</td>
<td>Madison, WI</td>
<td>2 days</td>
<td>None</td>
<td>$995</td>
<td>CEUs--1.4 PDHs--14</td>
</tr>
<tr>
<td>Design of Stormwater, Erosion &amp; Sediment Control System</td>
<td>University of Arkansas and Oklahoma State University</td>
<td>Bentonville, Arkansas</td>
<td>3 days</td>
<td>Computer Hands-on Exercises and Field Trip</td>
<td>$875</td>
<td>CEUs--2.4 CEUs rsw--24</td>
</tr>
<tr>
<td>Georgia Stormwater Management Workshops</td>
<td>College of Environment + Design, University of Georgia</td>
<td>Athens, GA</td>
<td>3 days</td>
<td>Demo, Field Trip, Studio</td>
<td>$420</td>
<td>CEUs--2.1</td>
</tr>
<tr>
<td>2011-2012 Stormwater Management Training Series</td>
<td>Cornell Cooperative Extention Orange County</td>
<td>Middletown, NY</td>
<td>1 day for each, 6 days in total</td>
<td>None</td>
<td>$225 for each</td>
<td>CEUs--0.7 for each</td>
</tr>
<tr>
<td>Current Issues in Stormwater Regulation</td>
<td>Water Law Resource.com</td>
<td>Mechanicsburg, PA</td>
<td>1 day</td>
<td>None</td>
<td>$349, or $448 with manual and CD</td>
<td>PDHs--7.2 LA CES--6.0 AICP CMs</td>
</tr>
<tr>
<td>Stormwater Retrofitting Demystified</td>
<td>National Estuarine Research Reserve</td>
<td>Laure, MD</td>
<td>1 day</td>
<td>None</td>
<td>Unknown</td>
<td>AICP CMs--6.0</td>
</tr>
<tr>
<td>Designing with Natural Stone</td>
<td>Design Arts Seminars, Inc.</td>
<td>Dallas, TX</td>
<td>1 day</td>
<td>None</td>
<td>$245</td>
<td>LA CES--8.0</td>
</tr>
<tr>
<td>SWAT Workshops</td>
<td>Texas A&amp;M University</td>
<td>College Station, TX</td>
<td>5 days</td>
<td>Computer Based</td>
<td>$500 first 2 days, $200 3rd day, $500 rest 2 days</td>
<td>CEUs--0.8 per day</td>
</tr>
<tr>
<td>Topic/Keyword</td>
<td>Provider</td>
<td>Location</td>
<td>Duration</td>
<td>Hands-on</td>
<td>Price</td>
<td>CEUs</td>
</tr>
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<td>----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Professional Workshop Series</td>
<td>Lady Bird Johnson Wildflower Center</td>
<td>Austin, TX</td>
<td>3 days in total</td>
<td>None</td>
<td>$170 per day</td>
<td>CEUs--0.7 per day (calculated)</td>
</tr>
<tr>
<td>Florida Stormwater, Erosion and Sedimentation Control Inspector Training</td>
<td>Cheryl L. Moore Constructing, LLC</td>
<td>Tampa, FL</td>
<td>2 days</td>
<td>None</td>
<td>$175 per day</td>
<td>CEUs--1.2 PDHs--8.0 LA CES--12.0</td>
</tr>
<tr>
<td>and Certification Program</td>
<td></td>
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</tr>
<tr>
<td>Principles and Practices of Erosion and Sediment Control (ESC) CEU Series</td>
<td>Stormwater USA Online Training and Certification</td>
<td>Online</td>
<td>9 hours</td>
<td>None</td>
<td>$449</td>
<td>CEUs--0.9 PDHs--9.0</td>
</tr>
<tr>
<td>Intro to Erosion and Sediment Control-Subcontractor Short Course</td>
<td>Stormwater USA Online Training and Certification</td>
<td>Online</td>
<td>1 hours</td>
<td>None</td>
<td>$99</td>
<td>CEUs--0.1 PDHs--1.0</td>
</tr>
<tr>
<td>EPA Stormwater Management Training Course Online</td>
<td>EPACampus.com</td>
<td>Online</td>
<td>8 hours</td>
<td>None</td>
<td>$96</td>
<td>CEUs--0.8</td>
</tr>
<tr>
<td>Stormwater Management during Construction</td>
<td>EPACampus.com</td>
<td>Online</td>
<td>8 hours</td>
<td>None</td>
<td>$96</td>
<td>CEUs--0.8</td>
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<tr>
<td>Stormwater Management: An Introduction</td>
<td>RedVector.com, Inc.</td>
<td>Online</td>
<td>2 hours</td>
<td>None</td>
<td>$78</td>
<td>CEUs--0.2 LA CES--2.0 PDHs--2.0</td>
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<tr>
<td>Erosion &amp; Sediment Control</td>
<td>RedVector.com, Inc.</td>
<td>Online</td>
<td>8 hours</td>
<td>None</td>
<td>$216</td>
<td>CEUs--0.8 LA CES--8.0 PDHs--8.0</td>
</tr>
</tbody>
</table>
### Topic/Keyword
- **Pervious Concrete: A Stormwater Solution**

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

### Notes:
- 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.

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

- CISEC, CPESC, and CPSWQ
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/](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.
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](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 aspect rum 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.
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,
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: 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](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.
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](http://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 (1d)  
- 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](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;
- Implementation of 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:** 1.25 LA 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:** 1.25 LA 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.
6.9 Low Impact Development

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

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

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

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
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](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).
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](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 floodway 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 culvert and different modeling approaches available in the program. The course will also include analysis of a second example problem that will illustrate 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 preview problem and a Q&A session.

Specific topics will include:
- The basic theories of open channel, floodway, 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 ensure “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.
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/soilscienetraining.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 Slope 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](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.
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](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.
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](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.
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)
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](http://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
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.
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](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. - 5:00 p.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](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/](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](http://floridastormwater.com/floridastormwaterclass/Welcome.html)

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
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
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
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-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 Control Measures
--Surface Stabilization
--Outlet Protection
--Runoff Conveyance Measures
--Inlet Protection
--Sediment Traps and Barriers
--Stream Protection
--Other Related Practices
6.30 Pervious Concrete: A Stormwater Solution

Provider: NRMCA Education and Training
Course Address: Webinar
Education Period: 8 hours, 12:00-1:30 p.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

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: 1 hour
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.
**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  
**Website:** [http://www.greenued.com/leed-cmp-packages](http://www.greenued.com/leed-cmp-packages)  
**CEUs:** Depends

### 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):**

<table>
<thead>
<tr>
<th>Course</th>
<th>GBCI CE Hours</th>
<th>LEED Specific Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educating the Client (2/2)</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>Introduction to Sustainable Sites (1/0)</td>
<td></td>
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<tr>
<td>Exemplary Performance for LEED NC (3/3)</td>
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<tr>
<td>Life-Cycle Assessments and Analysis (1/0)</td>
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<tr>
<td>Going Green Being Green Saving Green (1.5/0)</td>
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<tr>
<td>Minimum Program Requirements (1.5/1.5)</td>
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<tr>
<td>Green Cleaning Strategies (2/2)</td>
<td></td>
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<tr>
<td>Understanding Green Roofs (1/0)</td>
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<tr>
<td>Indoor Air Quality Overview (1/0)</td>
<td></td>
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<tr>
<td>Water Efficiency (1/0)</td>
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</tbody>
</table>

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

### 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

**Courses Included (CMP Hrs / LEED Specific Hrs):**

<table>
<thead>
<tr>
<th>Course</th>
<th>GBCI CE Hours</th>
<th>LEED Specific Hrs</th>
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</thead>
<tbody>
<tr>
<td>Educating the Client On Green Building</td>
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<tr>
<td>Low-Emitting Materials</td>
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<tr>
<td>Exemplary Performance for LEED NC</td>
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<tr>
<td>Process Water Management</td>
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<tr>
<td>Green Cleaning Strategies</td>
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<tr>
<td>Site Considerations: Where to Develop</td>
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<tr>
<td>Going Green, Being Green, Saving Green</td>
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<tr>
<td>Stormwater Management</td>
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<tr>
<td>Integrated Project Delivery</td>
<td></td>
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<tr>
<td>Minimum Program Requirements of LEED</td>
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<tr>
<td>Introduction Energy &amp; Atmosphere</td>
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<td>Understanding Green Roofs</td>
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<tr>
<td>Introduction to Indoor Environmental Quality</td>
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<tr>
<td>Urban Heat Island Effect</td>
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<tr>
<td>Life-Cycle Assessments</td>
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<td>Water Efficiency</td>
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</tbody>
</table>

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

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

- **Courses Included:** 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.**

<table>
<thead>
<tr>
<th>Course</th>
<th>GBCI CE Hours</th>
<th>LEED Specific Hrs</th>
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</thead>
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<tr>
<td>Residential Green Building (4)</td>
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<tr>
<td>Intro to High Performance Guidelines (2)</td>
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<tr>
<td>Sustainable Design Materials &amp; Resources (3)</td>
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<td>Achieving LEED Credits in NC Projects (6)</td>
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<td>Stormwater Harvesting: A Green Concept (3)</td>
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<td>Renewable Sources of Energy: Wind Power (3)</td>
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<tr>
<td>Stormwater Management (3)</td>
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<tr>
<td>Green Design: Sustainable Lighting Design (3)</td>
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<tr>
<td>Sustainable Design - A Primer (2)</td>
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<tr>
<td>Solar Electric Generation: Technologies (5)</td>
<td>2.5</td>
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<tr>
<td>Sustainable Design in Brick Masonry (1)</td>
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<tr>
<td>Green Design: Brownfield Redevelopment (2)</td>
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<td>Going Green with BIM and GIS (2)</td>
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<td>Green Urban Design (2)</td>
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<td>Going Green Being Green Saving Green</td>
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<td>Minimum Program Requirements (1.5/1.5)</td>
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<td>Understanding Green Roofs (1/0)</td>
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<td>Indoor Air Quality Overview (1/0)</td>
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<td>Water Efficiency (1/0)</td>
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</tbody>
</table>

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

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.
PART 3

Analysis and SWOT

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

- The schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
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<tr>
<td>Task 1. Review training course.</td>
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<td>Task 2. ID strengths &amp; weaknesses</td>
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<td>Task 3. Design charrette</td>
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<td>2</td>
<td>1</td>
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<td>1</td>
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<td>Task 4. Course modules</td>
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<td>Task 5. Large-scale models</td>
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<td>1</td>
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<td>Task 7. Master plan and final report</td>
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<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

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

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.

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**

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

**Annual Average Precipitation in Texas**
1.2 Climate Context

1.2.2 Temperature

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.

Temperature in Brazos

Season Wheel—Monthly Average High Temperature

Map Source: Perry-Castañeda Library Map Collection
Website: http://www.lib.utexas.edu/maps/atlas_texas/
1.3 Potential Market Context ---- Academic Schools

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 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.tnris.org/
1.4 Potential Market Context ---- Professionals

Potential professionals related to our project in total to 2010
Potential professionals related to our project 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/

<table>
<thead>
<tr>
<th>Occupation Title</th>
<th>Annual Average Employment to 2010</th>
<th>Annual Average Employment to 2020</th>
<th>Number Change 2010–2020</th>
<th>Percentage Growth 2010–2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture &amp; Engineering Occupations</td>
<td>218,160</td>
<td>258,230</td>
<td>40,070</td>
<td>18.4%</td>
</tr>
<tr>
<td>Architects, Surveyors, and Cartographers</td>
<td>15,430</td>
<td>18,440</td>
<td>3,010</td>
<td>19.5%</td>
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<tr>
<td>Architects (Except Landscape and Naval)</td>
<td>6,450</td>
<td>10,030</td>
<td>3,580</td>
<td>18.7%</td>
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<tr>
<td>Landscape Architects</td>
<td>1,220</td>
<td>1,400</td>
<td>180</td>
<td>14.8%</td>
</tr>
<tr>
<td>Cartographers and Photogrammetrists</td>
<td>920</td>
<td>1,170</td>
<td>250</td>
<td>27.2%</td>
</tr>
<tr>
<td>Surveyors</td>
<td>4,480</td>
<td>5,850</td>
<td>1,370</td>
<td>29.6%</td>
</tr>
<tr>
<td>Engineers</td>
<td>1,200</td>
<td>1,600</td>
<td>400</td>
<td>33.3%</td>
</tr>
<tr>
<td>Aerospace Engineers</td>
<td>8,990</td>
<td>10,530</td>
<td>1,540</td>
<td>17.1%</td>
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<tr>
<td>Agricultural Engineers</td>
<td>290</td>
<td>350</td>
<td>60</td>
<td>20.7%</td>
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<tr>
<td>Biomedical Engineers</td>
<td>1,350</td>
<td>1,940</td>
<td>590</td>
<td>43.8%</td>
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<td>Chemical Engineers</td>
<td>4,960</td>
<td>5,760</td>
<td>800</td>
<td>16.1%</td>
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<td>Civil Engineers</td>
<td>2,140</td>
<td>2,580</td>
<td>440</td>
<td>20.7%</td>
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<td>Computer Hardware Engineers</td>
<td>7,620</td>
<td>8,730</td>
<td>1,110</td>
<td>14.6%</td>
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<tr>
<td>Electrical Engineers</td>
<td>11,730</td>
<td>13,750</td>
<td>2,020</td>
<td>17.2%</td>
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<tr>
<td>Electronics Engineers, Except Computer</td>
<td>12,710</td>
<td>14,440</td>
<td>1,730</td>
<td>13.6%</td>
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<tr>
<td>Environmental Engineers, (Except Mining Safety Engineers and Inspectors)</td>
<td>3,160</td>
<td>3,860</td>
<td>700</td>
<td>22.2%</td>
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<tr>
<td>Industrial Engineers</td>
<td>13,790</td>
<td>16,340</td>
<td>2,550</td>
<td>18.5%</td>
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<tr>
<td>Marine Engineers and Naval Architects</td>
<td>740</td>
<td>910</td>
<td>170</td>
<td>23.0%</td>
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<tr>
<td>Materials Engineers</td>
<td>1,650</td>
<td>2,050</td>
<td>400</td>
<td>24.2%</td>
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<td>Mechanical Engineers</td>
<td>16,920</td>
<td>20,060</td>
<td>3,140</td>
<td>18.6%</td>
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<tr>
<td>Mining and Geological Engineers, (Including Mining Safety Engineers)</td>
<td>600</td>
<td>760</td>
<td>160</td>
<td>26.7%</td>
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<tr>
<td>Nuclear Engineers</td>
<td>490</td>
<td>580</td>
<td>90</td>
<td>18.4%</td>
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<tr>
<td>Petroleum Engineers</td>
<td>17,670</td>
<td>24,420</td>
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</tr>
<tr>
<td>Engineers, All Other</td>
<td>7,360</td>
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<td>Drafters, Engineering Technicians, and Mapping Technicians</td>
<td>69,030</td>
<td>77,700</td>
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<tr>
<td>Architectural and Civil Drafters</td>
<td>8,740</td>
<td>8,820</td>
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<td>Civil Engineers</td>
<td>3,900</td>
<td>4,220</td>
<td>320</td>
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<tr>
<td>Mechanical Drafters</td>
<td>6,390</td>
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<td>Aerospace Engineering and Operations Technicians</td>
<td>920</td>
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<tr>
<td>Civil Engineering Technicians</td>
<td>11,310</td>
<td>12,570</td>
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<tr>
<td>Electrical and Electronics Engineering Technicians</td>
<td>16,190</td>
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<td>Environmental Engineering Technicians</td>
<td>1,320</td>
<td>1,650</td>
<td>330</td>
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<td>3,890</td>
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<td>6,220</td>
<td>7,150</td>
<td>930</td>
<td>15.0%</td>
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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/7PA%20ID%3D67%26SUBID%3D114

Website: http://www.texasindustryprofiles.com/apps/gis/clustersgis/
1.5 Potential Market Context ---- Public

1.5.1 Increasing Population

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

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.


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.

Accessibility
The site is far away from the developed area, thus the service tends to be a difficulty of the project. Fortunately, transportation services are still acceptable. The site to downtown Bryan is 8 miles away through TX-21, and to Texas A&M University main campus is 10 miles away through University Dr. and TX-47.
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

2.3 Topography

Topography Map of Riverside Campus

Legend
- SEC Lab
- Riverside Campus Boundary
- Contours

0 0.25 0.50 0.75 1 Mile
2.4 Soil Analysis

Soil Map of Riverside Campus

Legend
- SEC Lab Boundary
- Riverside Campus Boundary
- AxB
- BuA
- 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
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.
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

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)

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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.
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

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
5.1 Team 1-- Master Plan

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

- Tree Box Filter
- Sidewalk
- Infiltration Trench
- Biofuel Garden
- Floating Island
- Discuss Platform
- Green Roof Display Area
- Erosion Control Material Display Area
- Coffee and Eating Area
- Water Screen
- PerVIOUS Paving Experimental Area
- Water Wheel
- Parking Lots
- Forest Trail
- Parking Lots
- Picnic
- SEC Lab
- Greenhouse
- Lecture Breakfast
- Sediment Test
- Parking Lots
- Rain Garden
- Discuss Platform

SCALE

N
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
16. Green House
17. Pixilated Parking
18. Soil Storage
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 McFalls, 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

9.1 Team 1

1. SITE ANALYSIS

2. HYDROLOGY ANALYSIS

3. WATER POLLUTION SOURCE

4. SLOPE ANALYSIS

5. ECOREGION ANALYSIS

6. SOIL ANALYSIS

7. SOLAR ANALYSIS

Note: Specific design products are available in CDs attached with the report.
Note: Specific design products are available in CDs attached with the report.
9.1 Team 1

Clean-Collect-Convey
SEC Lab Hands On Training Course

Note: Specific design products are available in CDs attached with the report.
9.2 Team 2

Note: Specific design products are available in CDs attached with the report.
9.2 Team 2

TAMU Riverside Campus Design Project ——— LID training program

Texas A&M University  Department of Landscape Architecture and Urban Planning  Group 2: Yucheng Wang, Xiaolan Su, Biliang Yang

Instructor: Gilem Newman

System 3
- Curb/Cut
  - Flow control
- Rain Garden
  - Spreading + Soak
  - Infiltration + Infiltration + Infiltration + Infiltration

System 4
- Bioretention
  - Flow control
- Riparian Buffer
  - Spreading + Soak
  - Infiltration + Infiltration + Infiltration + Infiltration + Infiltration

System 5
- Infiltration
  - Spreading + Soak
  - Flow control
- Riparian Buffer
  - Spreading + Soak
  - Infiltration + Infiltration + Infiltration + Infiltration + Infiltration

Curriculum Program

One-day Training
10:00-10:20
LID introduction - indoor lecture
- Water cycle, theory, phytoremediation
10:20-12:00
- System Components
  - Curb/Cut, Level Spreader, Infiltration, Riparian Buffer, Vegetative Wall
  - Spread/Filter Strip, Riparian Buffer, Rain Garden, Bioretention, Infiltration, Bare, Vegetated Wall, Vegetated Roof
  - Soak/Riparian Buffer, Rain Garden, Bioretention, Infiltration, Bare, Vegetated Roof, Rain Barrel, Permeable Paving
12:00-13:00
Lunch
- Review knowledge learned
13:30-15:00
- System integration
  - Integrate system components together to simulate system components
14:30-15:00
- Sample Development
  - Demonstrate real system components to the students
15:00-18:00
- Phytoremediation System
  - All the plants distributed throughout the site are phytoremediation based plants. All the plant types are collected in the Phytoremediation Botanical Garden
15:00-17:00
Course Conclusion/Group Project
- Conclusion and Q&A

Soak Facilities
- Riparian Buffer, Rain Garden, Bioretention, Infiltration, Bare, Vegetated Roof, Rain Barrel, Permeable Paving

Spread Facilities
- Riparian Buffer, Rain Garden, Bioretention, Infiltration, Bare, Vegetated Roof, Vegetated Wall

Slow Facilities
- Cut Curb, Level Spreader, Infiltration, Bar, Bioretention, Vegetative Wall

Phasing
- PHASING I (13 year)
  - 30 people 2-day training
- PHASING II (20 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.
9.3 Team 3

Note: Specific design products are available in CDs attached with the report.
9.3 Team 3

**GREY TO GREEN**
TEACHING LID THROUGH CONTRAST

Design Concept and Perspective

- Erosion and Pavement Carpet
- Successional Plant Growth
  - Recording Wall

3-Tiered Walkway

- Multiple levels
  - Pathways
  - Vegetation

Main Entrance

- Accessible entry
  - Open space
  - Natural elements

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

- The schedule

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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: 
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: 
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

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

- The schedule

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- 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

Section Design

Digital Model Construction

Physical Model Construction

Educational Tool

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

Infiltration/Recharge Facility (enhanced infiltration)

- No liner or geotextile fabric allows the in-situ soils to infiltrate to their maximum capacity.
- Soil medium consisting of 50~60% sand, 20~30% top soil, and 20~30% leaf compost allows a high infiltration capacity.
- In-situ soils must have a high porosity to allow runoff to infiltrate at a rate of greater than 1"/hr

Filtration/Partial Recharge Facility

- Place filter fabric over the gravel blanket in the vicinity of the underdrain pipe only.
- A liner between the in-situ soils and the planting soil medium prevents the effluent from penetrating into the ground and reduces the likelihood of groundwater contamination.

Filtration Only

- By capping the underdrain pipe, this facility type may be used to capture accidental spills and contain the level of contamination.

- The gravel blanket area may be used to achieve several different functions when the underdrain pipe discharge elevation is set.
- No filter fabric is used on the side walls or at the invert of the facility.

- Gravel blanket around underdrain helps keep free of possible soil transport.
Among these four variations of bioretention design, we select the *Filtration/Partial Recharge Facility* as a widely applied practice to build a educational model.
Specifically, we need a more detailed section design to construct the model.

- Ponding Area
- Mulch Layer
- Sand & Soil Mix Medium
- Fine Gravel Layer
- Coarse Gravel Layer
- Underdrain
- Vegetation

Section Design
Digital Model Construction
Physical Model Construction
Educational Tool
2. DIGITAL WORKING

Step 01: Empty the dumpster

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”
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.

1/2" Thickness Plexiglass Board
Size: 72" X 41.5"

4 Galvanized Steel Bars of 1.5" X 1.5" Length: 2 for 67"; 2 for 36"

4 Faucets
Step 04: Window installation

Attached by bolts and NP1

Window Installation View 01

Window Installation View 02

Section Design
Digital Model Construction
Physical Model Construction
Educational Tool
Step 05: Separating board installation

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

3/4" Thickness Marine Playwood as Separating Board
Size: 70" X 42"

Weld onto the Side

NP1 Attaching onto the Window

Weld onto the Bottom

Separating Drainage System

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

2” Thickness 3/4” Red Lava

24” Thickness Sandblasting Sand

3” Thickness 3/8” Rainbow Gravel

8” Thickness 1-1/2” Washed Gravel

2” Thickness 3/4” Red Lava

35” Thickness Fine Sand

Fill-in Materials Installation
The aggregates filled the dumpster layer by layer, and were washed layer by layer, forming this clean model here.

Step 08: Final Installation

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

Step 09: Educational tool enhancement

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

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<tr>
<th>Material</th>
<th>Size/Lines</th>
<th>Amount</th>
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<tr>
<td>Rust Primer</td>
<td>12 oz</td>
<td>1</td>
<td>Walmart</td>
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<tr>
<td>Painting</td>
<td>1 Gallon</td>
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<td>Galvanized Steel Bars</td>
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<td>72&quot;x41.5&quot;</td>
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<td>Faucets</td>
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<td>2-way Valve</td>
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<td>Valley Valve</td>
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<tr>
<td>3-way Valve</td>
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<tr>
<td>NP1</td>
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<td>3/4&quot; Marine Plywood</td>
<td>70&quot; X 42&quot;</td>
<td>2</td>
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<td><strong>Filling Material (amount unit: Cubic Yard)</strong></td>
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<td>Washed Gravel</td>
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<td>Sandblasting Sand</td>
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<td>2</td>
<td>NEI Construction</td>
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<tr>
<td>Rainbow Gravel</td>
<td>3/8&quot; size</td>
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<tr>
<td>Red Lava</td>
<td>3/4&quot; size</td>
<td>2 bags</td>
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<tr>
<td>Washed Sand</td>
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<tr>
<td>Geotextile</td>
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</table>

Material List:
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 geo-textile.
The materials were filled into model.
The red lava rock was filled as mulch.
PART 7
Program Brochures

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

- The schedule

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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

Low Impact Development (LID)
A Hands-on Based Workshop
Friday, November 8th, 2013
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

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

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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
PART 8
Master Plan

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

- The schedule

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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 master 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. Develope 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

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<th>ACTIVITIES</th>
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<th>EXPECTATION</th>
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<tr>
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<td>Communication</td>
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<td>Experiment</td>
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</table>
3. ELEMENTS PREFERRED

LID Educational Facility:

- Bioswale
- Rain Garden
- Tree Box
- On-grade Cistern
- Wild Floating Island
- Green Wall 01
- Channels
- Infiltration Basin
- Water Screen
- Biofuel Garden
- Sediment Test

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

- Lake Side Overhead Structure
- Land Trail
- Phytoremediation Botanical Garden
- Water Terrace
- Board Walk
- Living Wall Garden

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

Recreational Facility:

- 3-Tiered Walkway

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

Some Other Facility:

- Signage

Note: The elements marked by yellow squares are preferred ones.
4. MERGED MASTER PLAN

Legend:
- Porous Pavement Station
- Parking Lot (107 Units including 14 Staff parking)
- Education Center (Classrooms and Offices)
- Covered Dining Area
- Erosion Control Station
- Porous Pavement Demonstration
- Erosion Control Demonstration
- Xeriscape & Mesic Native Species Station
- Xeriscape and Invasive Species Demonstration
- Mesic and Invasive Species Demonstration
- Board Walk
- Upper Lake
- Floating Islands (Wetland Demonstration)
- Wetland Station
- Rainwater Harvesting Demonstration
- Bioswale & Rainwater Harvesting Station
- Model - Sediment Control
- Bioswale Garden (Bioswale Demonstration)
- Porous Pavement Sculpture
- Lower Lake
- Bio-infiltration Basin
- Gathering Plaza
- Green House (Existing)
- SEC Lab (Existing)
- Storage Building (Existing)
- Living Wall Demonstration
- Parking for Researchers
- Living Wall & Green Roof Station
- Green Roof Demonstration
- Succession Station
- Succession Demonstration
- Nature Trail
4. FACILITIES DESIGN-- BIOSWALE

Index Map
4. FACILITIES DESIGN -- RAINGARDEN

- 30'-500 sq. ft. area
- oldawn surface
- 4" to 8" deep berm
- vegetation; succulents, herbs, grasses
- amended soil mix
- filter fabric
- 3/4" gravel base
- perforated underdrain
- overflow system for poorly-drained soils or large storm events

Index Map
4. FACILITIES DESIGN -- WILD FLOATING ISLAND
4. FACILITIES DESIGN -- RAINWATER HARVESTING

- inlet
- sealed lid to keep insect out
- drainage and capilarity
- spigot
- concrete pad
4. FACILITIES DESIGN -- INFILTRATION BASIN
4. FACILITIES DESIGN -- SEDIMENT TEST
4. FACILITIES DESIGN -- SWALE GARDEN
4. FACILITIES DESIGN -- EROSION AND PAVEMENT CARPET
4. FACILITIES DESIGN -- POROUS PAVEMENT SCULPTURE
4. FACILITIES DESIGN -- POROUS PAVEMENT SCULPTURE
4. FACILITIES DESIGN -- MAIN ENTRANCE
4. FACILITIES DESIGN -- BOARD WALK
4. FACILITIES DESIGN -- SUCCESSION DEMONSTRATION
### 5. COST ANALYSIS

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<th>Projects</th>
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<th>Unit</th>
<th>Quantity</th>
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<th>Construction Cost ($)</th>
<th>Contingency Cost ($)</th>
<th>Total ($)</th>
<th>Cost / Feature ($)</th>
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<td>Dwarf walls</td>
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<td>foot</td>
<td>181</td>
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Note: The cost of tree planting is not included in this analysis.

Reference:

PART 9
Conclusion
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.