Tufts University
Department of Urban and Environmental Policy

Planning for Low Impact Development (LID) and Sustainable Site Design
UEP 294-08

Spring Semester 2012

Fridays 9:00 AM – 11:30

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Course Summary: This course is designed to present a comprehensive approach to site planning and development that incorporates low-impact development (LID) approaches and techniques. LID is a conservation-based site planning and design process that sets aside critical open space buffers, reduces impervious surfaces and concentrates development into appropriate "building envelopes". It also includes a broad range of best management practices including green roofs, bioretention, rain gardens, vegetated swales, constructed wetlands and infiltration systems. These practices reduce stormwater runoff and provide effective water quality treatment. They can also be designed to balance the hydrologic budget and thereby achieve sustainability. LID is a smart growth technique that is gaining significant attention by land use planners, regulatory officials, civil engineers and the environmental community. It provides a "win-win" situation in that environmental impacts are significantly reduced at lower site development costs. The course will provide valuable site planning and design skills to students and practitioners.

Grading & Exams: Grades will based upon two take-home exams (related to a selected case study/project) and participation in class. A field trip will also be organized to observe LID development features in the field and to meet first-hand with developers and regulators who have been directly involved in LID.

Target Audience The course is designed for students and practitioners in the fields of Planning, Engineering, Environmental Sciences and Public Policy. A technical background is not required. However the course will discuss and integrate hydrologic and ecological principles and will include training on how to design best management practices.

Topic Areas

1 Goals of the Course/Overview of LID

Content: This lecture provides an overview of the course, its requirements and objectives. The overview will discuss the status of LID as a site planning and regulatory tool, its potential to address sustainability issues, the constraints that have precluded its wider implementation and opportunities to broaden its application and to enhance its benefits. LID will be presented as a truly interdisciplinary practice that integrates natural sciences (hydrology, soils, ecology), engineering, planning and policy.

2 Sustainability & LID Performance Standards

Content: What are the goals that we are trying to achieve with LID? Hydrologic balance and water quality protection are clearly at the top of the list. What should the development standards be for projects in stream basins that already have depletions of baseflow or in watersheds to already-impaired streams where TMDLs have been established? We can also integrate carbon emission reduction goals into site plan design to some extent. In some project locations where a resource area is deemed to be already over its carrying capacity, a Positive Impact Development might be required . This class will explore these various performance standards or goals and how to achieve them.

Reading: LID Workshop Manual 3:1 – 3:11 and the proposed Massachusetts Stormwater Regulations (http://www.mass.gov/dep/service/regulations/newregs.htm#storm)

3 The Context for LID: Smart Growth

Content: This course segment will examine the land development and site planning process in the context of broader planning issues related to smart growth and sustainability principles. It will compare and contrast conventional engineering and site planning processes with the LID approach. Conventional practices are economically driven, with only afterthought given to environmental impacts and sustainability. LID site planning involves a resource-based approach that starts with the mapping of critical resources including wetlands, drinking water sources, habitat areas and scenic views. Homes and other development sites are then selected to maximize views and to provide meaningful protection of environmental resources. Finally the LID process then selects appropriate transportation networks including roads, bicycle trails and pedestrian ways.

Reading: LID Workshop Manual, Sections I and II and Smart Growth & Smart Energy Toolkit, LID, ORSD, TDR, TOD Modules (http://www.mass.gov/envir/smart_growth_toolkit/)

4. Better Site Planning

Content: A discussion of an alternative approach to site planning that begins with the identification of important environmental and cultural site features (such as wetlands, soils, vegetation, views, historical features), siting and orientation of buildings, formulating a road network, and finally drawing lot lines. This process is almost opposite to the conventional subdivision process that begins with drawing lot lines.

5. LID Best Management Practices

Content: This will include detailed descriptions and design considerations for a broad range of LID practices including green roofs, green walls, bioretention, rain gardens, vegetated swales, constructed wetlands and infiltration systems. Design drawings and actual photographs will be used to illustrate these techniques. Design guidelines and sizing criteria will be presented as methods to determine appropriate locations, sizes of facilities and other design elements.

Reading: LID Workshop Manual, Section III

6. Costs and Benefits of LID

Content: A limited number of studies suggest that LID costs the same or less than conventional development. These analyses will be explored and discussed. How well does LID work. Field performance studies have been conducted as several locations to examine how well LID techniques actually work.

Reading: EPA Cost Study (http://www.epa.gov/owow/nps/lid/costs07/)

7. Implementing LID: Land Use Codes and Incentives

Content: This section of the course will explore how to implement LID planning and best management practices in the context of land use regulations. Local land use regulations including zoning and subdivision codes will be explored as opportunities to encourage and/or require LID developments.

Several model codes will be evaluated as potential guidance to regulatory agencies.

Reading: Smart Growth & Smart Energy Toolkit, LID Model Bylaw

8. LID Case Studies

Content: Several real-world LID case study projects will be evaluated in

detail. Case studies will include explanation of why the projects incorporated LID, relative costs (compared to conventional development), water quality analyses (showing the treatment benefits) and aesthetic features.

Reading: LID Workshop Manual, Section IV

9. Field Trip

Content: A field trip will be organized to allow students to visit actual (built) LID projects and to discuss them with the owners, developers and/or designers. Currently a trip to the award-winning Pinehills project in Plymouth, MA is planned. This project has won national awards as the Best Planned Community in the USA and has numberous LID features. The field trip is estimated to include approximately 7 hours of "contact time" and will substitute for two classes (TBA).

10. LID Review Exercise:

Content: The class will be provided with a conventional development site plan. The class will be divided into three groups: 1) the applicant, 2) the Planning Board and 3) the abutters/environmental advocacy group. Each group will meet and discuss the plan. A mock Planning Board hearing will be held at which the applicant will present the conventional plan. The Planning Board will try to negotiate LID features. The abutters and environmental group will advocate for their interests.

Reading: Site Plan to be provided

11. Class Presentations

Class participants will give brief presentations of their projects, explaining the site existing conditions, the conventional development plan and their recommendations for an amended LID plan.

Assignment – LID Case Study

You have been hired as a "peer reviewer" to provide a second opinion on how to re- design a project to incorporate LID features and to balance the hydrologic budget. You are to assume that the project is in a sensitive watershed that already has water quality problems and some evidence of lowered water levels. This should include starting from "scratch" and conducting a resource-based site planning approach to laying out the development. However, you must provide the same "development program" including the same number of units and floor area for the buildings.

Suggested Steps:

a) Select a case study: This should be a real project that is before a local regulatory agency. The project should include at least three residential units and/or 5,000 square feet of commercial, industrial or governmental space. Select a case study location (town) that you have easy access to.

b) Obtain the proposed project plans: This should include a set of site plans that show existing conditions, site topography and a proposed project plan that includes drainage/grading and other features (Planning Board or Zoning Board of Appeals if a 40B Application). Other helpful materials might include a Notice of Intent (Conservation Commission), a drainage report (stormwater management) and any other environmental assessment/impact reports.

c) Obtain and review applicable laws/codes: Most likely this will include the towns zoning and subdivision codes (Planning Board or town web site) and possibly the MA Wetlands Protection Regulations (if within 100 feet of wetlands).

d) Site Analysis Map/Report: Analyse the existing conditions to determine site constraints and opportunities. Mark up a plan incorporating an LID site planning process and specific LID best management practices and write a brief report (3-4 pages describing this and how they should be incorporated into a development plan). Sizing calculations are to be included to demonstatrate the effectiveness of your proposed plan.

e) LID Plan/Report: Based upon the site criteria and applicable local codes and state laws, design an alternative plan that incorporates LID features. Prepare a brief report (3 – 5 pages) that describes your rationale for the selection of BMPs and how they will reduce pollutants and balance the hydrologic budget.