LOW IMPACT DEVELOPMENT DESIGN COMPETITION

2009 - 2010

Design Competition White Paper Subcommittee

David Batts, LEED AP
Market Manager
Construction EcoServices

Dimetra Hamilton
Director of Communications/Public Information Officer
Harris County Public Infrastructure Division

Matthew Newchurch, PE
Principal
Duplantis Design Group, PC

Nick Russo
Senior Environmental Coordinator
Harris County Public Infrastructure Department

Robert Adair
Steering Committee Chair
Houston Land/Water Sustainability Forum

Contents

1. Competition Background

Maintaining the anticipated pace of growth and development in the greater Houston area, where the population is expected to double in the next thirty years, requires that those with a vested interest in that development, particularly those in the design, development, construction and regulatory communities, adopt new ideas and employ new methods that will ensure that such growth can be sustained and that it will work to enhance our community rather than diminish it.

Low Impact Development (LID) practices, also known as 'Green Infrastructure', are a suite of tools for the developer and design professional's toolbox which have been proven to improve the sustainability of development. Site-focused, distributed, micro-scale controls act cumulatively to provide dramatic benefits in water quality, natural habitat expansion and recovery, and storm water runoff reduction while increasing quality of life and the livability of communities. Broad application of these practices can significantly reduce both the pressure on, and the scale required to meet traditional regional infrastructure needs. Although it is perhaps counterintuitive, these practices have also been shown to reduce development costs as well as the long term maintenance costs of storm water management.

Founded in 2007, the Houston Land/Water Sustainability Forum was formed to provide exposure to the full range of these sustainability practices, through educational programming. The Forum also set out to encourage their adoption, and their adaptation where needed for the soil, rainfall and topographic conditions found in our local environment—and to foster creativity in both their implementation and the regulatory structure that enables it.

Successful sustainable design inevitably requires a holistic approach and collaborative effort between the design, construction and regulatory professionals involved. This reality aided the development of the Forum's Steering Committee which includes leadership from these local constituent groups:

- American Institute of Architects, Houston (AIA)
- American Society of Civil Engineers, Houston (ASCE)
- American Society of Landscape Architects, Houston/Gulf Coast Section (ASLA)
- Associated General Contractors of America, Houston (AGC)
- Bayou Preservation Association (BPA)
- City of Houston, Green Building Resource Center
- City of Houston, Office of the Mayor
- City of Houston, Public Works & Engineering
- Energy Corridor District
- Greater Houston Builders Association (GHBA)
- Harris County Flood Control District
- Harris County Public infrastructure Department, Architecture & Engineering
- Harris County Public infrastructure Department, Watershed Protection Group
- Houston Council of Engineering Companies (HCEC)
- Houston-Galveston Area Council (H-GAC)
- International Erosion Control Association, South Central (SCIECA)
- United States Green Building Council, Houston Area Chapter (USGBC)
- Texas Coastal Watershed Program
- Texas Department of Transportation, Houston District

Although each of these groups provide a wide variety of discipline-significant educational programming to their membership, the Forum's locally-oriented cross-discipline programming focused solely on the issues associated with sustainable development fills an important gap. Since its programming actively includes all related disciplines, the Forum brings an important intermingling of ideas, fosters valuable interdisciplinary relationships and provides a foundation to ensure that all parties to collaborative design efforts are equally prepared to recognize the opportunities and address the challenges inherent in sustainable development.

The Low Impact Development Design Competition, was designed to build on the previous two year's well-attended and highly successful educational programming which included lectures, panel discussions, in-depth one and two day workshops, and local case study explorations. Launched on September 1, 2009, the goal of the Competition was to rapidly accelerate the adoption, adaptation and implementation of Low Impact Development practices in the Houston-area by achieving the following objectives.

- Provide a hands-on learning experience through which design, construction and development professionals in the Houston area would gain meaningful experience in working with Low Impact Development methodologies which could be applied to their everyday practices.
- Demonstrate to local design professionals, and to the development, civic and regulatory communities, the economic, environmental and marketing benefits that are available to those developers and local governmental entities who adopt and innovate with respect to sustainable site development.
- Encourage through the body of work represented by the entries submitted, greater use of these beneficial techniques for sustainable development in our area.
- Recognize the participants, finalist and winning design teams for their creativity, innovation and application of sustainable site design, fostering the development of leaders and drivers of change.

Ultimately the Competition involved more than 230 design professionals including, architects, builders, civil engineers, construction consultants, environmentalists, hydrologists, landscape architects, land planners, transportation engineers, irrigation consultants and others, working in 22 integrated teams. The participants represented 42 firms and organizations, overwhelmingly Houston-based, but with members hailing from California, Colorado, Georgia, Illinois, Kansas and North Carolina.

The firms represented included a cross-section of the Houston area's top design firms. Among the highly regarded group of civil engineering firms were several of the most conservative and ostensibly least likely to embrace a methodology that turns the traditional drainage paradigm upside down. Some weren't involved because of a burning desire to do so, but rather entered as a result of pressure from a competition sponsor or being concerned how it would look if they didn't. The fact that some of these very same firms earned finalist spots and even won speaks to the quality and adaptability of their people. That their teams were among the most outspoken in their new found beliefs about the value and desirability of implementing LID speaks to the viability of sustainable development practices to change the way we develop.

2. Competition Parameters

2.1 Important Elements Position the Competition for Maximum Impact.

The competitors had the option of competing in one of three Design Challenge categories and the subject properties in each category were real properties with owners who were interested in a LID-based design for their very real project. The design teams received all the data that would have been made available to any design team working with the property's owner in a typical for-profit transaction. Although there was no direct connection between placing in or winning the Competition and getting the actual design work for the project that will be constructed, the opportunity was clear and was unmistakably a driving factor for competitors. Significantly, with respect to the credibility of the Competition results, the subject properties in each Design

Challenge represented very challenging sites on which to implement a LID-based design. Flat topography, minimal existing vegetation and heavy clay soils were the norm on all three sites. If LID could be adapted to work in these conditions, in Houston's climate, it could work anywhere.

Equally important decisions were made with regard to property and prize money sponsors. The goal was to drive change. Meeting that goal meant that as many of the key parties required to actually make it happen, had to be involved at the highest level. Subject properties were provided by Harris County (Precinct 2), the City of Houston (Tax Increment Reinvestment Zone 15) and one of the area's most respected developers, Mischer Investments, LP.

The $15,000 cash prizes for each of the three Design Challenge categories were provided by the Houston Chapter of the American Society for Civil Engineers, the Architecture Houston Foundation and by Mischer Investments. Underwriting was provided by the Bayou Preservation Association, an important water quality-focused environmental organization and well-known local environmental philanthropist Terry Hershey. Mission-critical logistical support was provided by the Houston Chapter of the American Institute of Architects.

This meant that the County, the City, architects, civil engineers, environmentalists and developers joined together to make the Competition a reality, and to demonstrate the broad support which would signal that this competition was important.

The Competition was conducted in a two-stage format. All submittals were judged by a panel of six Expert Judges, each highly respected in her or his discipline and each with a level of notoriety that made them attractive to competitors seeking validation from important and influential judges. Submittals were assigned numbers to insure anonymity and scoring was weighted to make the Expert Judges scores equal 80% of the total, final scores for teams reaching the finals.

The second-stage judging was done by a twenty-person Jury Panel at the very high-profile Finals Event. This panel was dominated by leading commercial and residential developers, along with important County and City leadership and a host of local and national dignitaries. The presence of a large group of Developers and local government leadership was a powerful incentive to competitors eager to establish or underscore credibility with those in a position to provide them new work.

In the final analysis, the Finals Event, which drew the competition to a close, may have embodied the most important decision made in the development of the competition, the decision to use a seven-minute 'lightning' format for the finalists' presentations. Inspired by the 'two-minute elevator pitch' common in the world of technology companies seeking venture capital, the theory is that 'if you can't get my attention and make me believe you've got a good concept in two minutes, you're not likely to do it in twenty.' Although the finalists were actually given seven minutes, their presentation was made more challenging by the fact that presenters did not have access to a slide advancement remote; their PowerPoint had to be automated, limited to a maximum of twenty slides and timed for precisely seven minutes. Undoubtedly, many of the 320+ in attendance that night came with expectation of seeing at least one spectacular 'flame-out.' The difficulty of the assignment definitely added to the excitement of the event.

In spite of the degree of difficulty, the decision to use the 'lightning' format was actually driven by the desire to get as many teams into the finals event as possible. That was good for the competitors and it was critical to the Forum's goal of getting as many good ideas, interesting designs and thought provoking information on Low Impact Development as possible in front of as many developers and influencers (the Jury Panel) as possible. Educating and challenging them in an exciting, first-class, fast-paced setting that eliminated the option of boredom was critical to meeting the long-term goals of the Competition. The primary trade-offs were that the amount of information that could be conveyed, in terms of technical data to back up the competitors' findings associated with cost comparisons and other elements was limited, and that the lightning approach might put too high a value on the skill of the presenters to exploit the format rather than the strength of the submittals. Organizers decided that the benefits far outweighed the potential negatives. In fact, the presenters for the winning teams were not always the best in any given category, and the back up information was made available shortly after the competition on the

Forum's website (www.houstonLWSforum.org) in the form of the full, original submittals of each submitting team.

2.2 Diversified Design Challenge Categories Offer Choices

In an effort to ensure broad participation and use the competition platform to explore a wide variety of applications for LID, three categories of Design Challenges were available to competitors.

- **Suburban Residential Development**
  This challenge was based on a 640 acre master planned community property "Ventana Lakes" for which a traditional design had been completed, but not executed. The property, formerly a rice field, is located in the rapidly developing West Houston-Katy area and is bisected by a major pipeline and a large drainage channel. Residential lots of 50', 60' and 70' and target lot counts from the traditional development were guiding factors in the design criteria for this Design Challenge.

- **Urban Re-Development**
  This challenge involved designing a new 24/7 pedestrian thoroughfare in the redeveloping East Downtown Houston. The project encompassed the design for six blocks of Right of Way connecting the entrance to the new downtown soccer stadium (projected completion in 2012) and a proposed Sister City park to the South. Mixed use, entertainment, parking, traffic on cross streets and building massing were all a part of design criteria of this centerpiece for the revitalization of East Downtown (EaDo).

- **Green Roadway Project**
  The challenge entailed developing a sustainable road section which might well be a preview of a new County standard road section to be used when expanding a typical two-lane section with ditches on either side, to a four lane section. Located in a heavy industrial area near Houston's Ship Channel, the roadway leads visitors to the historic San Jacinto Monument which memorializes the decisive victory in the Republic of Texas' battle for Independence from Mexico. The road is envisioned as a 'linear museum' with various markers and educational elements, and is expected to be constructed in the very near future.

Actual site plans, maps, soils information, pre-development conditions data, drainage outfall, various studies and all other available information was provided to competitors for each property.

2.3 Competition Rules and Submittal Requirements

Integrated design teams which included at least civil engineer, one architect (except for the roadway project which allowed the substitution of a transportation engineer) and one landscape architect were required. Teams were strongly encouraged to add planners and other relevant disciplines to their teams to increase their chances of success. This focus on the integrated team helped create and deepen interdisciplinary relationships for all the teams and was one of the most remarked upon elements by competitors during post-competition debriefings.

Teams were required to submit their design challenge solutions in electronic format and in addition, to submit two 30"x40" presentation boards which captured the most important elements of their designs. Submittals were required to contain images, drawings, site plans, drainage plans, landscape plans, elevations and details; a written overview of their design concept; justification of the hydrologic/drainage modeling used to develop their design conclusions; and an explanation of project costs and a comparison of those costs with the project if developed traditionally. In short, there were 'a lot of moving parts' as one competitor characterized it, and far more than typically required for a design competition. However, the submittal requirements were designed to elicit the most helpful information in promoting LID as a broadly beneficial, cost-effective alternative to traditional development after the competition results were in.

2.4 General Design Criteria

Although each Design Challenge had its own set of design criteria and specific goals, all shared a set of overarching goals that framed their designs.

- Conserve natural resources that provide natural functions associated with controlling and filtering storm water.
- Use decentralized, small-scale landscape features and LID Integrated Management Practices (IMP) to work as a system to:
    - Reduce the amount of runoff by mimicking the natural hydrologic function of the site and matching predevelopment hydrology.
    - Minimize the use of and/or reduce the size of pipe and other centralized control and treatment infrastructure.
    - Lower the total cost of development when compared to traditional infrastructure design.
- Minimize and disconnect impervious surfaces, lengthen time of concentration and promote bio-filtration of runoff to improve the quality of storm water leaving the site.
- Minimize or eliminate the use of potable water resources needed for irrigation and where practical provide for the reuse of rain water.
- Use enhanced quality of life values and reduced maintenance costs inherent in LID practices to increase marketability of the development and long term property values.

2.5 Judging

The stage one Expert Judges panel was, as mentioned previously, a blue ribbon group of highly qualified and well-known experts in their respective fields. Three are involved in the sustainability arena on a full time basis. Although the other three are more typically involved in traditional design issues on a daily basis, each had a good understanding of the methodology and rationale involved in sustainable development, and it was important to the Forum that each be challenged to find any 'holes' in the LID approach. It was hoped that they would come away from the judging process believers, and use their positions and influence to help pave the way for widespread implementation. It was a good mix and the judging process went smoothly. All were provided with an electronic transmission, shortly after team submittals were received on December 14, 2009, which included copy of the general instructions, criteria and rules provided to the teams, design criteria and corollary data provided to the teams for each design challenge, the electronic submittal packages received from each team and a scoring guidance document which outlined the overall criteria for the competition and suggested a scoring template. Each was asked to review the information prior to the Expert Judges Meeting, to score the submittals based on their own area of expertise and to come to the Judges Meeting with a 'top three' in mind in each category.

Once gathered at the Judges Meeting on January 8, 2010, there was a consensus opinion that the quality of the submittals received was very high and that identifying finalists was going to be very difficult. The electronic submittal from each team, within each Design Challenge category, was projected onto a screen and viewed page by page and discussed by the judges. The initial review was broad, and focused on eliminating any submittals that widely missed the mark in terms of overall criteria and design goals. Next the judges went through the remaining submittals again. The second pass was where the real work was done. The review became increasingly detail oriented and compliance with the finer details of the criteria became the determining factor in a submittal making it to the top five, then the top four and so on. As the day progressed, the difficulty of separating the finalists from the top four or five led the judges to look for another perspective to aid in selection. Knowing the Forum's focus on the 'here and now' and its desire to drive implementation of Low Impact Development sooner rather than later, they determined to look at the top designs in each category again, this time with permitting and constructability in the short term in mind. Which projects could actually be permitted and built today, under existing

ordinances, with the fewest variances? It was this approach that led to the final separation of finalists from the high quality field of entries.

Stage two judging took place at the Finals Event and, as noted, was carried out by a twenty-person Jury Panel made up of leading local developers, key city and county leadership, politicians and other well-placed influencers, including the Chief of the EPA's Nonpoint Source Control Branch.

The Jury members were provided the corollary data and Design Challenge details in each category, prior to the finals. At the Finals Event each was given a score card for each category with the finalist teams listed. Jurors were asked to rank the team presentations by considering them based on their own particular expertise and interests. City and County representatives were to view and rank the projects based on their own areas of interest: permitting, water quality concerns, etc. When scorecards were collected the tabulations involved reversing the score given to the highest value for that category. A score of "1" became "3 points" in the three-team finals for the Suburban Residential Design Challenge, for instance. These point totals were plugged into a spreadsheet to combine them with the stage one scores in an 80-20 weighted formula. Although the final scores closely followed the stage one scoring, it was possible for an outstanding score from the finals Jury Panel to trump the scores given by the Expert Judges. This is exactly what happened in the Suburban Residential category.

Follow-up discussions with a majority of Jury Panel members in the weeks following the Competition were enlightening. Each one interviewed was enthusiastic about what they learned. Developers tended to be concerned about the permitting issues and needed more data to feel comfortable with the universal findings that indicated that a LID-based design could be implemented less expensively than a traditional design. All in the developer group had already had conversations, appointments and presentations from one or more of the finalist teams within a week or two of the Completion and were pursuing those discussions in the interest of discovering how/if the LID approach would work for their own current or upcoming projects.

3. Green Roadway Category

3.1 Storm Water Management

The purpose of this portion of the design challenge was to use Low Impact Development techniques in an effort to mitigate the post-development flow rates to below pre-development flow rates for a roadway expansion project in Harris County, Texas. There were a total of nine teams that competed on this design challenge and the post-developed flow rate results were quite different for each group. Methods used by the design teams to determine the hydrologic properties of this project include the Rational Method, SCS Unit Hydrograph Method, and the SCS Lag Method. The pre-development flow rates were given to the design teams as part of the package of existing conditions details, however some teams calculated their own pre-development flow rates for the purposes of this design competition.

In the post-developed condition for the 100-yr storm event, the percent reduction of runoff ranges from as low as 3% to as high as 91%, with the average being 38.5%. Among finalists, the reduction was 45%.

3.2 Storm Water Quality

Across the country, Low Impact Development (LID) is a favored solution for reducing pollutant loads from rain water runoff. The Houston Land Water Sustainability Forum's LID Design Competition sought data from each design team which quantified the impacts that Low Impact Development might have on downstream pollution reductions in Houston's watersheds.

Although LID was a new concept in the Houston area, and there is very little local test data available, most design teams opted to look to the Environmental Protection Agency (EPA) and other resources for test data that would match the Best Management Practices that they employed in their design. A broad range of pollutants were discussed, but due to the specifics of local watersheds, the Forum was most interested in Total Suspended Solids (TSS),

Phosphorous, Heavy Metals, Hydrocarbons, and Bacteria. Below is a chart summarizing the average expected pollutant removals by our competitors in the Green Roadway Design Challenge Category.

POLLUTANTS					
Type	TSS	Heavy Metals	Hydrocarbons	Bacteria	Phosphorous
Green Roadway	90%	78%	75%	90%	53%

Pollutant removal percentages varied substantially depending on the source from which it was obtained, but we expect the implementation of LID features in future Houston developments will be a source for local field testing data going forward.

3.3 Financial Findings

An important aspect of the LID competition was the presentation of financial data for each project since the competition criteria required the contestants to evaluate the LID cost compared to a traditional development design for the subject property. Traditional development costs for the Green Roadway category for the four finalist team submittals averaged $5,062.605.

The average construction costs for the LID-based design submitted by the four finalists were $4,428,746.00. Compared to the traditional designs, the average cost savings with the LID Green Roadway designs was 11% for all submittals and 13% for the four finalists.

Although the competing teams did not factor in the cost of offsite detention, which would very likely be required in a traditional design for this project, the cost differentials would have been even greater between the LID and traditional designs.

4. Suburban Residential Category

4.1 Storm Water Management

There were a total of nine teams that competed in this design challenge and the post-developed flow rate results were quite different for each group. Methods used by the design teams to determine the hydrologic properties of this project include the Rational Method, SCS Unit Hydrograph Method, and the SCS Lag Method. The pre-development flow rates were given to the design teams as part of the package of existing conditions details; however some teams calculated their own pre-development flow rates for the purposes of this design competition.

In the post-developed condition for the 100-yr storm event, the percent reduction of runoff averaged 36% for the finalists.

4.2 Storm Water Quality

Pollutant removal percentages varied substantially depending on the source from which it was obtained, but we expect the implementation of LID features in future Houston developments will be a source for field testing data going forward.

POLLUTANTS					
Type	TSS	Heavy Metals	Hydrocarbons	Bacteria	Phosphorous
Suburban Residential	80%	85%	79%	N/A	64%

4.3 Financial Findings

The average cost reductions for the LID-based development produced by the finalist teams was 17%. One team in the competition reported a higher cost for the LID-based development. However, that team's submittal included an extensive wastewater re-use system and very high-level amenity treatments which were not included in the traditional design. This was one of only two submittals in which the LID-based projects was not less expensive than the traditional design.

5. Urban Redevelopment Category

5.1 Storm Water Management

In the post-developed condition for the 100-yr storm event, the percent reduction of runoff for the finalist submittals ranged from 45% to 75%, and averaged 60%.

5.2 Storm Water Quality

Pollutant removal percentages varied substantially depending on the entity from which it was obtained, but we expect the implementation of LID features in future Houston developments will be a source for field testing data going forward.

POLLUTANTS					
Type	TSS	Heavy Metals	Hydrocarbons	Bacteria	Phosphorous
Urban Redevelopment	89%	93%	N/A	80%	N/A

5.3 Financial Findings

In this Design Challenge the competitors found the task of determining a viable cost for the traditional development for comparison with the LID-based project particularly difficult. The lack of existing infrastructure and the undersized character of what does exist exacerbated the problem. As a result of these and other issues, the cost differential between the LID and traditionally developed projects ranged from 2% less for one submittal to 12% more for the LID project in another.

6. Summary

Perhaps the best summary of the Competition and the aspects which were most significant is the one penned by Finals Jury member, Dov Weitman, EPA Chief of the Nonpoint Source Control Branch who broadcast this summary in an e-mail, shortly after the Competition:

"RE: "Amazing Houston LID Competition"

"I want to let all of you know about an incredible, energizing experience I had last week in Houston. I participated as a member of the Jury Panel for the Finals Event in the Houston Land/Water Sustainability Forum's Low Impact Development Competition on January 27. The bottom line is they just implemented an amazing consciousness-raising process that has hundreds (at least) of developers, civil engineers, architects, landscape architects, etc., thinking differently about stormwater than they did 6 months ago. And the way they did it seems to me to be replicable in cities across the country. I hope you'll read on, follow up on a couple of the links, and think about what you could do in a particular city or state.

First, as general background, here is the Forum's Mission Statement:

Our mission is to enhance, enable and integrate sustainable use of land and water for the Houston area's continued growth and economic vitality.

Across this country and the world, new ideas, methods, materials and technologies aimed at positively impacting the sustainability of land and water resources have been widely adopted, some are even being developed right here in Houston. This forum has been formed to provide exposure to the full range of these practices, to encourage their adoption, their adaptation where needed for the conditions found in our community—and to foster creativity in both the development of new solutions and the regulatory infrastructure that enables them.

Maintaining the pace of growth and development in the greater Houston area requires that those with a vested interest adopt new ideas and employ new methods that will ensure that growth can be sustained. The forum seeks to engage the broadest possible range of constituent groups, in a collaborative effort that focuses on practical application rather than abstract theory in the exploration of incremental answers to some of the Houston area's most significant land/water sustainability issues.

As you can see, this is not an LID forum or WQ forum. But the Forum (which consists largely of organizations and people concerned with boosting Houston's economic growth and sustainability, including businesses, nonprofits and local government) had the vision to recognize the role that LID can play in the Houston area's growth and economic vitality. They decided that a competition to develop the best LID project(s) would be a great way to publicize the issue and increase the comfort of professionals to propose LID projects to their clients. They expressed their goal as follows: ***"Our goal in this competition is to dramatically accelerate the adoption, adaptation and implementation of Low Impact Development and other sustainable development practices in the Houston area."***

They implemented the entire process in 5 months. They launched it in September 1, implemented a semi-final process, and then held the "finals" on January 27. They identified 3 actual projects that will be implemented in Houston or Harris County (where Houston is located), and solicited the submission of proposed LID plans for one or more of these projects. Contest rules required that each applicant include a licensed civil engineer, architect, and landscape architect on their team. In the vast majority of cases, 3 or four firms would partner (e.g., a civil engineering firm, landscape architecture firm, and a developer). At the other end of the spectrum, at least one submittal was submitted by a single large company (AECOM) that had all of the required licensed professional staff in-house. A few teams included a partner from outside of Texas, but the vast majority of participants were from Texas, and most of those were based in the Houston area.

*It is notable that, to date, Houston doesn't have many LID projects. There are a few green roofs (it seems like all of them are on medical facility buildings -- don't ask me why, maybe doctors are moved by the air pollution reduction benefits****). Most of the participants in this competition did not have experience designing or implementing LID projects, so the whole concept, and what it can accomplish, was a total eye-opener for many participants.*** *What brought them to the table was civic pride (I learned that there is a lot of that in Houston); the competitive urge; enhanced reputation; a hope to be hired to participate in implementation of the project; and $15,000 in prize money to the winners in each of the 3 categories, provided by American Society of Civil Engineers; Architecture Center Houston Foundation; and Mischer Investments (a development company). (Houston's chapter of American Institute of Architects, and numerous other organizations, also participated.)*

The three projects were:

1. Green Roadway: A re-development of a mile-long road/highway (expanding 2-lane to 4-lane of a road that has historic significance as well as proximity to a major tank farm near the water)

2. Urban Re-development: About 6 blocks of a street in East Houston that is intended to be a major redevelopment (complete with a large stadium, residences, shopping, restaurants, etc.) and provide a model for applying smart growth principles to redevelopment

3. Suburban Residential: A new square-mile development in Harris County

Much more detail on the structure of and rules pertaining to the competition is available at http://www.houstonlwsforum.org/designCompetition/program.html#Judging. I'll just mention a couple of key points about the rules: Applicants had to demonstrate that the hydrograph for their LID proposal matched or was below the conventional development option for the 5-year, 10-year, and 100-year storm. In addition, they were required to rely principally on LID to handle the stormwater. Thus, while some of us might prefer to have seen a matching of hydrographs for e.g., the one and/or two-year storms, their rules did have the effect of "forcing" reliance on LID approaches, and indeed a few proposals completely eliminated traditional infrastructure. There was provision for some non-LID storage of excess water in large storms for at least the suburban development (contest rules required identification of an outlet), whereas the green roadway designs typically handled all water without any auxiliary storage. (I believe Houston's 90th percentile storm event is 1.8 inches, but I'm prepared to be corrected on this one. I couldn't quickly find out its 95th percentile.)

Another rule was that the LID alternative could not be more expensive than the conventional stormwater treatment alternative. More on that below.

22 teams entered the competition. These teams comprised 49 firms, and many firms had multiple participants in the projects. Indeed, when the three winning teams came up to the stage at the end of the evening to be awarded their prizes (big fake checks pending the real ones), they generally had more than 10 participants. I would estimate that there were 300-400 people in the room at the final presentation, and not all participants were present.

The Bottom Lines

1. Many of the participants (and apparently some of their CEO's) were blown away by the results of their own analyses, in particular the following:

a. LID can practices can in fact manage all or most storm events on site and can in fact replace traditional infrastructure.

b. LID is cheaper than or as cheap as the conventional alternative and provides so many attractive features that it is a "no-brainer" (in the words of one engineer in his presentation). The main savings identified were the elimination or reduction of pipe and pavement. One presenter also noted the savings in long-term maintenance -- i.e., no need to inspect and to pull up and replace aging pipes. The co-presenter for the winning submission in the suburban development category (who also participated on one of the green roadway submissions) told me later that he had never worked on LID before, and when his firm asked him to participate on the project he figured, OK, sounds interesting. And now that he's been through the project analysis and saw the cost savings, he appears to be a total evangelist for it.

2. Almost all of the teams "got" the aesthetic aspects of the project. Whether it was the green roadway, urban re-development, or suburban development, there were tons of green and colorful flowers thrown in and just great efforts to link the project to its setting. (One presenter in the Green Roadways competition proudly noted that their design would assure color in all seasons.) The winner of the suburban development competition placed so many rain gardens that the presenter stated that every property has a rain garden within close view of the front or rear of the house. The presenter also pointed out that one advantage of distributed LID practices is that it spreads the amenities throughout the development

3. Apparently, some CEO's/managers participated with the idea that was a good thing to do civically but it was not going to be a big deal and change the way they do business. After the work was done and their staff came to them to show the cost savings and aesthetic benefits, that was a real wake-up call. Several companies have already instructed their staff to promote future projects based on LID to their clients.

4. One fascinating thing: Among the 9 finalist presentations I saw and materials I read, nobody once mentioned the benefits that LID provide to protecting stream structure. I guess that's just not something they think about when they look at the Houston Ship Channel! There was some recognition and discussion of pollutant reduction in several presentations; pride in reducing water

use by X% by collecting and reusing rainfall; and lots of good feelings about saving on stormwater infrastructure. Even the suburban residential development presentations, which do have a small stream in the neighborhood (Ventana Run), never discussed hydrologic impacts on the water body. What this says to me is that you don't need to fully appreciate all of the water quality benefits of LID to be in favor of it.

5. The 9 finalist projects that I saw did not include any green roofs, and I don't know if any of the other projects included green roofs. What I saw primarily was a lot of bio-infiltration/rain gardens and some pervious pavement (at least one project was very heavily reliant on the latter).

6. Both of the urban re-development projects that made it to the final competition were very creative and showed how to integrate LID into the broader redevelopment framework (large sidewalks and a plaza designed to promote public use of the space also served as useful areas for infiltration).

7. One jury panelist, a landscape architect whose work focuses on office parks, told me that her clients are very interested in "green development" because they want to attract young talent, and that's what those prospective employees want.

***Next Steps**:*

1. It will take a few months, but 2 gigabytes worth of presentations, data, graphs, etc., will be made available on their web site cited above. Please note the information that we will have access to will provide:

a. A large number of cost comparisons between LID and conventional stormwater solutions applied in 3 different types of real-life settings.

b. Lots of creative LID designs that show how to integrate LID into smart growth designs and into highway designs, both of which are greatly needed, as well as new residential developments.

c. References to Houston-based firms who now have some experience designing such projects.

2. Some information may become available sooner. I'll keep you posted.

3. This process can be replicated anywhere: New York City, Los Angeles, Boston, Miami, you name it. It's a simple yet amazing idea.

We keep talking about how to get the word out on the effectiveness of LID as well as the costs savings and benefits that it provides. Here's a way to encourage the industry to convince itself rather than have us do it! I hope that we all can think of ways to use this example to think of and implement processes that can be used effectively to promote LID."

7. Timeline

Competition Timeline

Registration opened	September 1, 2009
Registration closed	November 7, 2009
Submittals due	December 14, 2009
Submittals to Expert Judges	December 16, 2009
Expert Judge's Meeting	January 8, 2010
Finalists announced	January 11, 2010
Finals Event	January 27, 2010

8. Participants

8.1 Finals Jury Panel

American Society of Civil Engineers-Houston
Carol Ellinger Haddock
Senior Assistant Director PW&E
City of Houston

Architecture Center Houston Foundation
Ian Powell
Partner, PBK Architects
President-Elect, AIA Houston

Bayou Preservation Association
Terry Hershey
Director

City of Houston TIRZ 15
Ralph DeLeon
TIRZ 15 Program Manager

Corinthian Development
Jimmy Pappas
President

Environmental Protection Agency
Dov Weitman
Chief Nonpoint Source Control Branch

General Growth Properties, Inc.
Christopher Gilbert
Project/Construction Manager

Gilbane Building Company
Dan Gilbane
Development Manager

Harris County Flood Control District
Mike Talbott
Director

Harris County Precinct 2
Commissioner Sylvia R. Garcia
Harris County

Harris County Public Infrastructure Department
Missing Name
Director of Architecture & Engineering

Hines Interests
Andrew Steffen
Project Manager

Lovett Homes
Frank Liu
Principal

Metro National Corporation
Bill Huntsinger
VP-Planning

Mischer Investments
David Nussbaum
Vice President-Development

Peron Development
Perry Senn
Principal

Rice University, Center for Sustainability
Richard Johnson
Director of Sustainability

SpawGlass Civil Construction
Amer Al-Nahhas
President

The Wolff Companies
David Hightower
Executive VP and Chief Development Officer

Wulfe & Company
Ed Wulfe
President

8.2 Expert Judges

Civil Engineering
Arthur L. Storey, PE
Executive Director, Public Infrastructure Department, Harris County TX

Landscape Architecture
Dana Nunez Brown, ASLA
Principal, Brown + Danos landdesign, Baton Rouge LA

Low Impact Development
Larry Coffman
President, LNSB, LLP Stormwater Services Group, Chesapeake Beach MD

Architecture
Greg Papay, FAIA
Principal, Lake|Flato Architects, San Antonio TX

Hydrology
Stephen Costello, PE
Principal, Costello, Inc. and Councilman, City of Houston, Houston TX

Residential Development
Ted Nelson
Regional President, Newland Communities, Houston TX

8.3 Houston Land/Water Sustainability Forum Steering Committee

American Institute of Architects, Houston
Kimberly Hickson, AIA, LEED AP
Project Director
Gensler

American Society of Civil Engineers, Houston
Jennifer Walker, PE, CFM
Principal
Watearth, Inc.

American Society of Landscape Architects, Houston/Gulf Coast
Margaret Robinson
Principal
Asakura Robinson Co.

Associated General Contractors, Houston
Tamara Hancock
Executive Director

Bayou Preservation Association
Janet K. Wagner
Principal
J.K. Wagner & Company, Inc.

City of Houston
Sheila Blake, CBO, MBA
Assistant Director
Public Works & Engineering

City of Houston
Steve Stelzer, AIA, LEED® AP
Program Director
Green Building Resource Center

Energy Corridor District
Robert Rayburn, ASLA, LEED® AP, ISA
Senior Project Manager

Greater Houston Builders Association
David Nussbaum
Vice President-Development
Mischer Investments, LP

Harris County Public infrastructure Department
John Blount, PE
Director, Architecture & Engineering

Harris County Public Infrastructure Department
Nick Russo
Assistant Manager, Watershed Protection Group

Harris County Flood Control District
Sherri Dunlap, MBA, DEng, CPESC
Manager - Applied Technology & New Products

Houston Council of Engineering Companies
Charles Penland, PE, LEED® A.P.
Senior Principal
Walter P. Moore & Associates

Houston-Galveston Area Council
Carl Masterson
Regional Program Coordinator

International Erosion Control Association, South Central Chapter
Robert Adair
President
Construction EcoServices

Texas Coastal Watershed Program
Christina LaChance
Program Coordinator
Texas Agri-Life Extension Service

Texas Department of Transportation
Ethan Beeson, RLA
Landscape Architect

United States Green Building Council
David Batts, LEED® AP
Marketing Manager
Construction EcoServices

8.4 Low Impact Development Design Competition Sub-Committee

Adriana Clowe, PE
Bury + Partners
Project Manager

David Batts, LEED AP
Market Manager
Construction EcoServices

Dimetra Hamilton
Director of Communications/Public Information Officer
Harris County Public Infrastructure Division

Hayley Pallister
Marketing Director
Asakura Robinson Company, LLC

Janet Wagner
Principal
J. K. Wagner & Company

Joe Castillo
Planning
Harris County Infrastructure Department

John Blount, PE
Director of Architecture & Engineering
Harris County Public Infrastructure Department

Kimberly Hickson, AIA, LEED AP
Project Director
Gensler

Matthew Newchurch, PE
Principal
Duplantis Design Group, PC

Nick Russo
Environmental
Harris County Public Infrastructure Department

8.5 Competitors

Green Roadway Design Challenge

Team 07186 GR
Harris County
Grace Tsai
Renetta Moss
Michael Cunningham
Tom Vu
Melvic Degracia
Dwayne Rogers
Alan Tran

Team 07183 GR
Walter P. Moore
Camila Daza
Won Lee
Knudson, LP
Bryan Jahnsen
Chris McBride
Angela Martinez
Conservation Design Group

Team 07181 GR
Edminster Hinshaw Russ
Justin Ring
Raymond Chong
Staci Duncan
Davidson Landscape Architecture
Kolby Davidson

Team 07188 GR
English + Associates
Kathleen English
Matthew Duggan
Clay Stephens
Dennis Hopkins
Sonia Escobar
David Hopper
Rose Lopez
Asakura Robinson
Margaret Robinson
Elizabeth Renton
CivilTech
Rich Gallegos

Team 07187 GR
AECOM
Sid Edmonds
Jim Sipes
Russell Bynum
Jennifer Hundl
Ross Gordo
June Tsou
Adam Guerra
Young-Ae Chung
Anna Hansen
John Sexton
Kurt Smith

Team 07182 GR
LJA Engineering
Clay forester
John Phillips
Charles Stevens
Jessica Koutny
Alan Munger
Jared Ciarella
Andres Pulido
David Rivera
Fugro Consultants
Donald Anderson

Team 07184 GR
Dannebaum Engineering
Sandy Lasser
Steven McGarraugh
Elizabeth Johnson
Liz Parent
Susan Kelly Humphries
Jeff Scarborough
Candyce Ward
Robert Pina
Jason Schultz
Alan Hirschman
TBG Partners
Meade Mitchell
Jeff Stuart
Pete Simpson
Kyle Grist
Terracon Consultants
Patrick Beecher

Team 07185 GR
Pate Engineers
Keith Young
Allen McKee
Terri Crauford
TBG Partners
Sean Compton
Kimberly Doerle
Matt Jagunic
Amy Harr
Travis Crow
Lady Bird Johnson Wildflower Center
Steve Windhager
Julie Raisch
Emily Manderson
John Hart Asher II

Team 07189 GR
Klotz Associates
Les Pittman
Mary Keilers
Ed Conger
Brent Baldwin
Katherine Mears
Justin Mickey
Erin Dozal
Jennifer Steen
Morena Arredondo
Ilene Warnke, Mike Wheeler
Yasmin Martinez
Andres Juarez
Fergus Graham
Rick Carle
Chris Williams
Clark Condon Associates
Rebecca Pittman
David Daughtry
Courtney Landreth
Jason Rainosek

Suburban Residential Design Challenge

Team 19185 SR
LandPlan Engineering
Matthew Murphy
Allen Belot
C.L. Maurer
Alison Daniels
Jeff Martin
DAF Studio
David Forbes

Team 19182 SR
DPR Associates
Hy Nguyen
Dawn Becker
RD Architecture
John Dazey
TSR Group
Quint Redmond

Team 19189 SR
Edminster Hinshaw Russ
Justin Ring
Christopher Browne
Staci Duncan
Legend Home Corp.
David Carlson
Davidson Landscape Architecture
Kolby Davidson

Team 19186 SR
Jacobs Engineering
Dwayne Culp
Muhammad Hussain
Preston Smith
Calli McMullin
Neil Thomas
Bret Tabor
David Smith
Knudson, LP
Adrienne Bottoms

Team 19184 SR
Jones & Carter
Thomas Stroh
MCCM Architects
Richard Cate
KGA DeForest Design
Robert DeForest
Kerry R. Gilbert & Associates
Kerry Gilbert

Team 19183 SR
Brown & Gay
Paul Dodd
Karena Hauter
Lance McLeod
Geoff Freeman
Tracy Youngblood
Ronnie Harris
SWA Group
Kevin Shanley
Matt Baumgartner
InSite Architecture
Antonio Flamenco

Team 19181 SR
Crabtree Group
Paul Crabtree
Cameron Wilkins
Tracy Vandaveer
David Daley
Asakura Robinson
Pat Chang
HBL Architects
Daniel Barnum
Texas A&M University
John Jacobs
Dreiling-Terrones
Martin Dreiling
Richard Terrones
Jacob Furlong
Dean Gunderson
Victoria Yay
Texas AgriLife Extension
Christina La Chance

Team 19188 SR
English + Associates
Kathleen English
David Hopper
Richard Rodriguez
Rose Lopez
Matthew Duggan
Christine Chen
Dennis Hopkins
Chris Hale
Sonia Escobar
Asakura Robinson
Margaret Robinson
Elizabeth Renton
Watearth, Inc.
Jennifer Walker
CivilTech
Rich Gallegos

Team 19187 SR
Walter P. Moore
Doug Coenen
Aniruddha Dutta
Kevin Sullivan
Daniel Falenstine
Gareth Young
Kirksey
Robert Inaba
Dan Hassebroek
Trace Saenz
Jeff Chapman
Julie Hendricks
Rick Birkinshaw
Asakura Robinson
Keiji Asakura
Jessica Krug

Urban Redevelopment Design Challenge

Team 21183 UR
English + Associates
Kathleen English
David Hopper
Matthew Duggan
Christine Chen
Dennis Hopkins
Chris Hale
Sonia Escobar
Asakura Robinson
Margaret Robinson
Elizabeth Renton
Watearth, Inc.
Jennifer Walker
CivilTech
Rich Gallegos

Team 21182 UR
Edminster Hinshaw Russ
Justin Ring
Christopher Browne
Staci Duncan
Llewelyn-Davies Sahni
Randhir Sahni
James Anderson
Ranjan Roy
Alex Arzu
Raul Hernandez
Bobbi Nasso
Davidson Landscape Architecture
Kolby Davidson
T.O.D. Houston
Dr. Audrey Trotti
James Phelan

Team 21185 UR
Jacobs Engineering
Jesus Molinet
Michael Mindlin
Shawn Massock
Dwayne Culp
Andy Johnston
David Dale Suttle
Suzanne Dean
Kimberly Culp
Kate Clark
Alan Knox
Randy Sorensen
Ana Laura Davila
Olga Finkelshteyn
Anne Herndon
Adam Koransky
Lady Bird Johnson Wildflower Center
Steve Windhager
Joanna Frye
RCLCO
Todd LaRue

Team 21184 UR
Walter P. Moore
Kevin Sullivan
Gareth Young
Gensler
Rives Taylor
David Williams
Kim Kelly
Lisa Graiff
Clark Condon Associates
Josh LaMartina
Ethan Primm
Matt Dawson
John Schnure
Paul Weathers
Elizabeth Gilbert
Riley Anderson
Dan Pope Associates
Dan Pope

8.6 Finalists

Team 07187 Green Roadway
AECOM
Sid Edmonds
Jim Sipes
Russell Bynum
Jennifer Hundl
Ross Gordon
June Tsou
Adam Guerra
Young-Ae Chung
Anna Hansen
John Sexton
Kurt Smith

Team 07189 Green Roadway
Klotz Associates
Les Pittman
Mary Keilers
Ed Conger
Brent Baldwin
Katherine Mears
Justin Mickey
Erin Dozal
Jennifer Steen
Morena Arredondo
Ilene Warnke, Mike Wheeler
Yasmin Martinez
Andres Juarez
Fergus Graham
Rick Carle
Chris Williams
Clark Condon Associates
Rebecca Pittman
David Daughtry
Courtney Landreth
Jason Rainosek

Team 07185 Green Roadway
Pate Engineers
Keith Young
Allen McKee
Terri Crauford
TBG Partners
Sean Compton
Kimberly Doerle
Matt Jagunic
Amy Harr
Travis Crow
Lady Bird Johnson Wildflower Center
Steve Windhager
Julie Raisch
Emily Manderson
John Hart Asher II

Team 07181 Green Roadway
Edminster Hinshaw Russ
Justin Ring
Raymond Chong
Staci Duncan
Davidson Landscape Architecture
Kolby Davidson

Team 19189 Suburban Res
Edminster Hinshaw Russ
Justin Ring
Christopher Browne
Staci Duncan
Legend Home Corp.
David Carlson
Davidson Landscape Architecture
Kolby Davidson

Team 19184 Suburban Res
Jones & Carter
Thomas Stroh
MCCM Architects
Richard Cate
KGA DeForest Design
Robert DeForest
Kerry R. Gilbert & Associates
Kerry Gilbert

Team 19183 Suburban Res
Brown & Gay
Paul Dodd
Karena Hauter
Lance McLeod
Geoff Freeman
Tracy Youngblood
Ronnie Harris
SWA Group
Kevin Shanley
Matt Baumgartner
InSite Architecture
Antonio Flamenco

Team 21184 Urban Redev
Walter P. Moore
Kevin Sullivan
Gareth Young
Gensler
Rives Taylor
David Williams
Kim Kelly
Lisa Graiff
Clark Condon Associates
Josh LaMartina
Ethan Primm
Matt Dawson
John Schnure
Paul Weathers
Elizabeth Gilbert
Riley Anderson
Dan Pope Associates
Dan Pope

Team 21182 Urban Redev
Edminster Hinshaw Russ
Justin Ring
Christopher Browne
Staci Duncan
Llewelyn-Davies Sahni
Randhir Sahni
James Anderson
Ranjan Roy
Alex Arzu
Raul Hernandez
Bobbi Nasso
Davidson Landscape Architecture
Kolby Davidson
T.O.D. Houston
Dr. Audrey Trotti
James Phelan

8.7 Winners

Green Roadway

Team 07187
AECOM
Sid Edmonds
Jim Sipes
Russell Bynum
Jennifer Hundl
Ross Gordon
June Tsou
Adam Guerra
Young-Ae Chung
Anna Hansen
John Sexton
Kurt Smith

Suburban Residential

Team 19189
Edminster Hinshaw Russ
Justin Ring
Christopher Browne
Staci Duncan
Legend Home Corp.
David Carlson
Davidson Landscape Architecture
Kolby Davidson

Urban Redevelopment

Team 21184
Walter P. Moore
Kevin Sullivan
Gareth Young
Gensler
Rives Taylor
David Williams
Kim Kelly
Lisa Graiff
Clark Condon Associates
Josh LaMartina
Ethan Primm
Matt Dawson
John Schnure
Paul Weathers
Elizabeth Gilbert
Riley Anderson
Dan Pope Associates
Dan Pope