Innovative Stormwater Design and the Evolving Regulatory Environment

Presented to Broward Leaders Water Academy

February 11, 2011

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Discussion Topics

- Traditional Stormwater Management
- Innovative Stormwater Design and Green Infrastructure
- The Evolving Regulatory Environment

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Traditional Stormwater Design

- Preliminary site plan
  - sets the sizes and locations of the building, parking and landscape areas to maximize the development potential of the site
  - usually without considering the stormwater management requirements.
- The County has experienced increased urban density and begun a transition to urban redevelopment as available land for development has dwindled.
- Shortage of available land/difficulty in piecing together redevelopment sites results in smaller project areas.

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Traditional Stormwater Design

- Urban densification/redevelopment sites are typically more constrained.
- The lack of space leaves engineers with no room to hide traditional stormwater facilities “out back”, as with larger suburban developments.
  - Stormwater facilities are placed in highly visible areas.
- Typical “retention/detention pond” facilities are often out of place in the urban environment and detract from the activity-packed land use that creates a vibrant and attractive urban neighborhood.

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Which sometimes results in...

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When County Code would allow the use of something like…

Or this...

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Or even this...

Innovative Design/Green Infrastructure

- Front loaded design process requires collaboration by professionals from land planning, architecture, landscape architecture and civil engineering during the early feasibility stages of site design.
- Prevents the stormwater management from being an afterthought that has to be squeezed into the design after site plan approval.
- Encourages design professionals to jointly educate themselves on emerging techniques.

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Innovative Design/Green Infrastructure

- Treat stormwater as a resource, rather than a nuisance.
- "Green Infrastructure" approaches infiltrate, evapotranspirate or reuse stormwater through the soil and vegetation.
- Green infrastructure approaches include
  - green roofs, tree boxes, rain gardens, vegetated swales, pocket wetlands, infiltration planters and vegetated median strips.
- Green infrastructure facilitates or mimics natural processes that also recharge groundwater, preserve baseflows, moderate temperature impacts, and protect hydrologic and hydraulic stability.

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Innovative Design/Green Infrastructure

- Cleaner Water - Vegetation and green space reduce the amount of stormwater runoff
- Enhanced Water Supplies - Most green infiltration approaches result in stormwater percolation through the soil to recharge the groundwater and the base flow for streams.
- Cleaner Air - Trees and vegetation improve air quality by filtering many airborne pollutants and can help reduce the amount of respiratory illness.

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Innovative Design/Green Infrastructure

- **Increased Energy Efficiency - Green space helps lower ambient temperatures and helps shade and insulate buildings, decreasing energy needed for heating and cooling.**

- **Community Benefits - Trees and plants improve urban aesthetics and community livability by providing recreational and wildlife areas and can raise property values.**

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Rain Garden in Portland Oregon.

Landscape Architecture Magazine, Sept. 2004.

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Bioswales on Portland's Division Street infiltrate and treat stormwater runoff.

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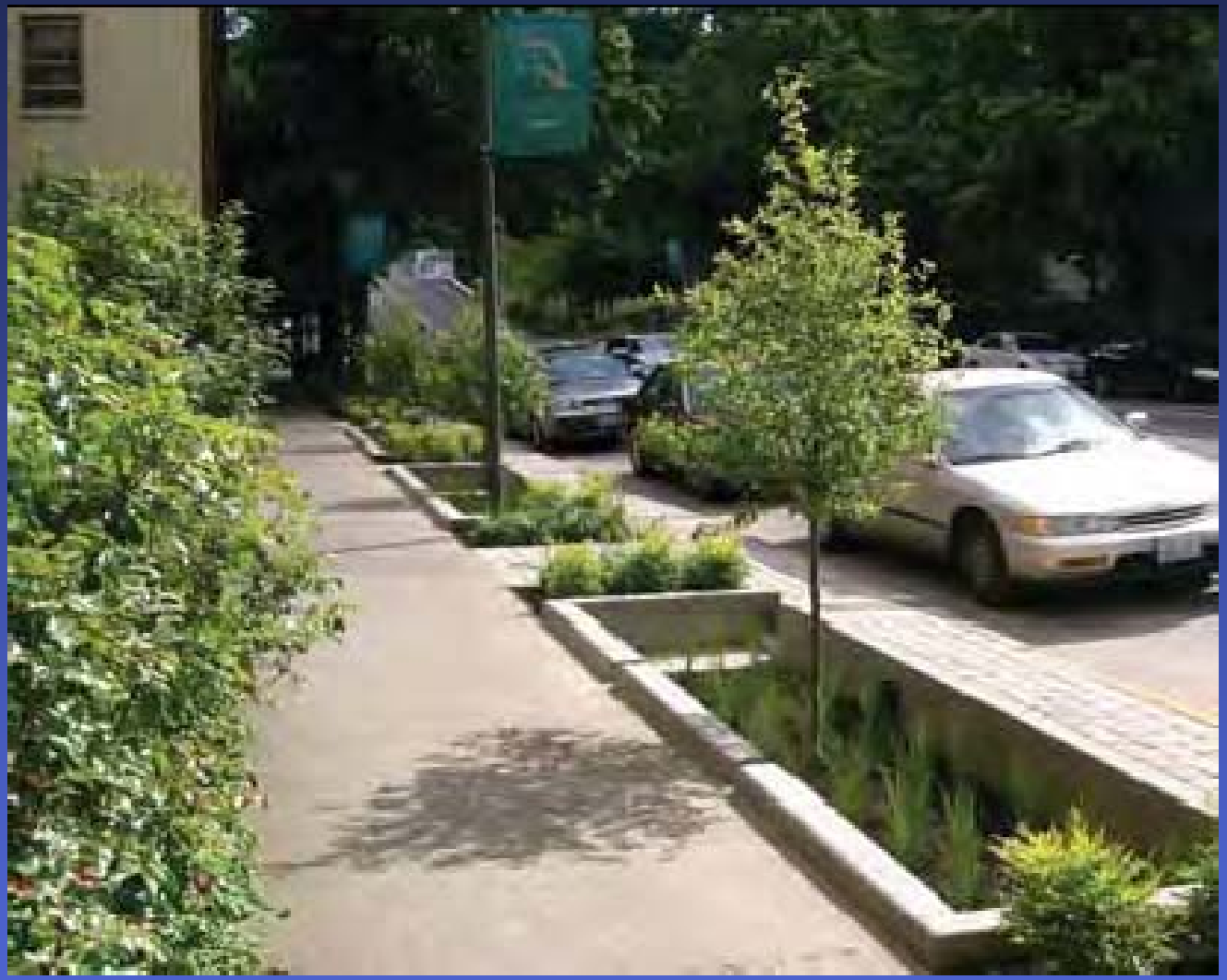

Street planters in Portland, OR, are used in highly developed urban areas to introduce green space and manage stormwater runoff.

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The green roof at Chicago's City Hall

Temperatures above the Chicago City Hall green roof average 10° to 15°F lower than a nearby black tar roof.

During the month of August this temperature difference may be as great as 50°F. The associated energy savings are estimated to be $3,600 per year.

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Infiltration areas capture and infiltrate stormwater before it reaches the collection system.

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Broward Innovation Examples

- Broward County Code is flexible and allows innovative/alternative designs.

- Each of the following projects demonstrates an innovative way in which water quality treatment standards and flood protection were achieved and permitted in Broward County.

Voluntary Constructed Wetland with Conservation Easement

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Voluntary Constructed Wetland with Conservation Easement

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Dry Retention Area with Pervious Rubber Surface

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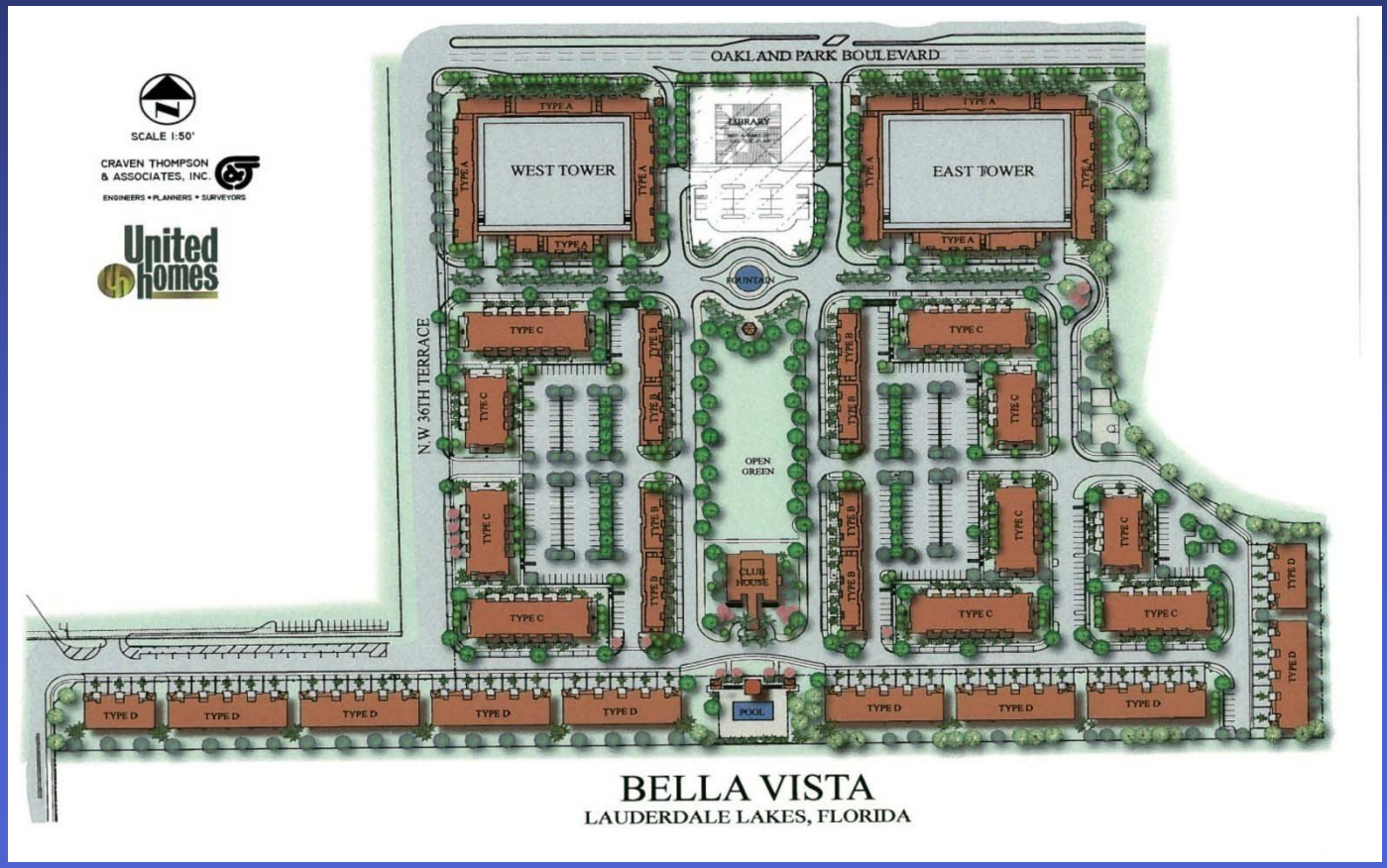
Composite underground tank storage allowed a passive park and two parking lots to be constructed in place of a traditional lake



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Outlook

- **Widespread adoption of these types of practices is limited by design, construction and maintenance cost concerns.**

- **Projects incorporating innovative design and integration may become more prevalent as the Federal/State regulatory changes currently in progress increase the demands on local governments and other dischargers.**

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The Evolving Regulatory Environment

- The Problem
  - Impaired water bodies under the Federal Clean Water Act
- The Federal/State Response
  - Total Maximum Daily Loads
  - EPA Numeric Nutrient Criteria (NNC)
  - EPA/FDEP National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit

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Impaired Waters in the State of Florida

- **Statewide nutrient impairments:**
  - **1,918 miles of rivers and streams**
  - **378,435 acres of lakes**
  - **569 square miles of estuaries**

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Blue-Green Algae Bloom on Lake Munson

Leon County, May 2006

FDEP file photo

Total Maximum Daily Loads

- TMDL= The amount of a specific pollutant that a water body can receive and still meet the adopted water quality standards

- EPA/FDEP performs statistical analysis to determine the maximum pollutant load and the associated required load reduction for all impaired water bodies
  - Load Allocation

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Total Maximum Daily Loads

- What happens after a TMDL is established?
  - Enforcement by EPA/FDEP
- What if we cannot meet our allocation?
  - "Not feasible using current technology!"
  - "No approved BMPs!"
  - "Times are tough!"
- FDEP may take enforcement against a municipality or other nonpoint source discharger if we fail to comply. [403.067(7)(b)h, Florida Statutes]

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Total Maximum Daily Loads

- Counties/Municipalities are required to meet the TMDL reductions under our current NPDES/MS4 Permit.
- EPA's numeric nutrient criteria may impact future and existing TMDLs by changing the way nutrient levels in waterbodies are assessed.
- Numeric nutrient criteria for South Florida are currently scheduled to be finalized by August 2012

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Nutrient Criteria

continued

- Why is this issue important?

EPA Numeric Nutrient Criteria

- Compliance with nutrient criteria will require a significant investment
- Potential implementation activities
  - Best management practices
  - Upgraded/eliminated septic systems
  - Stormwater retrofits
  - Upgrades to treatment technologies
  - Restoration of wetlands

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New Municipal NPDES MS4 Requirements

- **TMDL implementation will largely fall upon counties and municipalities through NPDES MS4 permit requirements.**
  - **<u>May</u> include:**
    - **TMDL Monitoring and Assessment**
    - **Stormwater Event Monitoring of outfalls**
    - **Additional BMPs**
    - **Annual reporting on status**

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Conclusions

- Federal/state water quality regulations will require additional actions and investments by local and regional governments
- Compliance will require a tiered approach
  - Innovative stormwater management
  - Infrastructure improvements
  - Best management practices
  - Assessments
  - Extensive reporting
- On the positive side – coordinated approach will facilitate compliance and many of the necessary tools and resources already exist

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