Radcliff City Hall Goes Green to Protect Karst
Radcliff Green Infrastructure Demonstration Project

August 23, 2016

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Agenda

- Background
- Goals
- Funding
- Project Planning
- Project Design
- Project Construction
- Operation & Maintenance
- Summary
Project Background

- MS4 Community of approx. 22,000 residents
- New Stormwater Ordinance in 2010
  - Mandated new developments address stormwater quality
  - 60% elected to pay in-lieu fee instead
- Pre-retrofit: **3.5 acres** of city government buildings
  - 95% Impervious
- Current runoff drains to nearby sinkhole
Sea of Asphalt
1. Raise awareness about Green Infrastructure
2. Educate agency officials, engineers, developers and contractors
3. Promote use of Green, instead of in-lieu fee
4. Enhance water quality of runoff
5. Reduce peak discharges
6. Cost Tracking
7. Determine long-term sustainability
8. Fix existing drainage issues
Saunders Springs

- Tourism Resource
- 26 acres Heavily Forested
- Flows from Cave Mouth
- Historic Mill ~1800’s
- Former Drinking Water Supply for Fort Knox
- Highly Diverse Forest Ecology
  - 80+ Native plants
  - 30+ trees
Project Funding

- Funded in part by grant from US EPA
- Program was developed to mitigate runoff pollution
  - Can pay for 60% total project cost
  - In-Kind Funding

Est. Project Cost: $665,274
  - KDOW: $274,200
  - City of Radcliff: $391,074
Project Design

LD&D Green Infrastructure Demonstration Projects

Sacred Heart Academy

Kosair Children's Medical Center

Louisville MSD Basin Retrofit Feasibility
Project Planning

- As many BMP’s as possible
- Position BMP’s in specific target areas to maximize runoff collection
- Native Plants with deep root systems
- 21 Separate BMP’s used
- Allows for comparisons in:
  - Appearance
  - Effectiveness
  - Maintenance
  - Longevity
- Selected LD&D for Design Services
Project Planning

The Problem – “Sea of asphalt”

- Pre-Retrofit – 95% Impervious
Project Planning

- Conceptual Rendering
- Re-designed entire parking lot layout
Project Design

By the numbers:

- FEMA reports that 25% of reported flood damage is related to stormwater.
- This site filters 2.5 million gallons of rainwater per year (80% of annual stormwater).
- BMP’s that allow water to seep into ground remove harmful pollutants*
  - Sediment: 70-100%
  - Phosphorus: 30%
  - Nitrogen: 25%
  - Trace Metals: 50-90%
  - Oil and Grease: 67-93%
Underdrain Design

- Provides bypass during large storm events
- Prevents standing water
- Increases void space

Bio-retention soil shall be amended with 40% screened topsoil, 40% sand, 10-15% compost/manure, and 5-10% fine gravel or other ratios at the discretion of the restoration ecologist. Soil amendments to be performed by contractor and verified by the restoration ecologist.
Project Outcome

- 90% of total BMP drainage area is impervious
- Reduced pavement area by 10%
- Gained 1 parking space by re-design
Community Center Design

Before

After
Project Construction

- Use of City Crews
- Coordination
- Some Specialty Crews (Pavers)

Project Construction Challenges:
1. Phasing
2. Scheduling
3. Timing
4. Utility Coordination
Project Construction
Rain Garden

Before
Project Construction
Rain Garden

After
Project Construction
Rain Garden

During

After - During Rain Event
During Rain Event
Project Construction

Before

11 14 2011
Project Construction

After
Project Outreach Signs
Project Construction

After
Project Construction

Before

11.14.2011
Project Construction

After
Installation
Project Construction
Pervious Pavers

After
Project Construction
Articulated Paver

Installation
During Rain Event
Installation
Project Construction
Pervious Concrete

After
Project Construction
Reinforced Gravel Grid

Before

11 14 2011
Project Construction
Reinforced Gravel Grid

Installation
Project Construction
Reinforced Gravel Grid

After
Native Plants
# Project Construction

## Various BMP Estimated Installation Costs:

<table>
<thead>
<tr>
<th>BMP</th>
<th>Est. Cost (per SF)</th>
<th>Actual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permeable Pavers</td>
<td>$8-12</td>
<td>$10.80</td>
</tr>
<tr>
<td>Rain Garden/Bio-Swale</td>
<td>$8-12</td>
<td>$18.00</td>
</tr>
<tr>
<td>Pervious Concrete</td>
<td>$6 – 8</td>
<td>$9.70</td>
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<tr>
<td>Infiltration Trench</td>
<td>$6</td>
<td>$10.20</td>
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<tr>
<td>Articulated Block Permeable Pavement System</td>
<td>$10 – 12</td>
<td>$14.60</td>
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<tr>
<td>Porous Paving Grid</td>
<td>$6</td>
<td>$7.20</td>
</tr>
<tr>
<td>Underground Storage</td>
<td>$2,000/ea</td>
<td>$2,000</td>
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</tbody>
</table>

* Represent tentative installation costs
City of Radcliff “Dirty Jobs”

Small Crew and Minimum Equipment
Operation & Maintenance

- City will employ it’s own maintenance crews
- Large variety of BMP’s = large variety of maintenance requirements
- Proper maintenance is key to long term effectiveness
- All BMP’s should be inspected periodically

Maintenance responsibilities will be continuously monitored by city crews to develop a proper maintenance schedule
Documenting Progress
Summary

1. Raise Awareness of BMP’s
   - Ideal location for public viewing
   - Educational Signage

2. Educate Local Industry Professionals
   - Field day (5/16/14) with 69 documented participants
   - KSA quarterly meeting (10/23/14) with 76 documented participants

3. Promote Usage
   - Cost data for feasibility

4. Enhance Water Quality
   - Natural infiltration removes sediment/pollutants
Summary

5. Reduce Peak Discharges
   ✓ Reduction of impervious surface

6. Cost Tracking
   ✓ Familiarize local professionals with actual installation costs

7. Long-Term Sustainability
   ✓ Maintenance requirements/costs

8. Fix Existing Drainage Issues
   ✓ No more flooding of City Hall
Thank You

Come Take a look!
411 W Lincoln Trail
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